

**DIVERSITY AND DISTRIBUTION OF
ETHNO-MEDICINAL PLANTS IN LOHIT
AND ANJAW DISTRICTS OF
ARUNACHAL PRADESH**

BY

Sheelawati Monlai

(Reg.No. MZU/Ph.D/112)

**THESIS SUBMITTED IN FULFILMENT OF THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL SCIENCE**



**DEPARTMENT OF ENVIRONMENTAL SCIENCE
MIZORAM UNIVERSITY
AIZAWL – 796 004
MIZORAM, INDIA**

2013

CERTIFICATE

This is to certify that a Ph.D thesis entitled, “Diversity and distribution of ethno-medicinal plants in Lohit and Anjaw Districts of Arunachal Pradesh” submitted by Smt. Sheelawati Monlai, a Research Scholar in the Department of Environmental Science, Mizoram University Aizawl, embodied the record of original investigation under our supervision. It is further certified that the scholar’s bonafide researches and the research findings have not been submitted for the award of any degree in this or any other University or institute.

She is allowed to submit the Thesis for examination for the award of the Degree of Doctor of Philosophy in Environmental Science.

Dated the 21st December 2012

(Prof. H.Lalramnghinglova)
Supervisor


(Dr. A. Arunachalam)
Joint Supervisor

DECLARATION

I, **Mrs. Sheelawati Monlai**, hereby declare that the subject matter of this thesis entitled **“Diversity and Distribution of Ethno-Medicinal Plants in Lohit and Anjaw Districts of Arunachal Pradesh”** is the research work done by me under the supervision and guidance of Prof. H. Lalramnginglova, Head of Environmental Science, Mizoram University, Tanhril, Aizawl and Joint supervisor Dr. A. Arunachalam, NERIST, Department of Forestry. The work was carried out in the Department of Environmental Science, Mizoram University, Aizawl as well as in the Restoration Ecology and Natural Resource Management Laboratory, Department of Forestry, North Eastern Regional Institute of Science and Technology (NERIST), Nirjuli. The contents of this thesis did not form the basis of any previously awarded degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University, Aizawl for the award of the degree of Doctor of Philosophy in Environmental Science.

(Mrs. Sheelawati Monlai)

CONTENTS

	Pages
i) Supervisors Certificate	i
ii) Declaration	ii
iii) Acknowledgement	iii
iv) Contents	iv-viii
v) List of figures & Tables	
Chapter 1: INTRODUCTION	
1.1. Evolution of Ethno botany and Ethno medicine	1-4
1.1.i. Global Perspective	5-9
1.1.ii. Regional Scenario	9-11
1.1.iii. Scenario in Arunachal Pradesh	11-12
1.2. Scope and Objectives	12-13
Chapter 2: REVIEW OF LITERATURE	
2.1 World Scenario	14-23
2.2 Indian Scenario	23-38
2.3 Arunachal Pradesh Scenario	38-39
Chapter 3: STUDY AREA	
3.1 General information on Arunachal Pradesh	40
3.2 General aspects of Undivided Lohit District	41-43
3.3. Lohit District	44-45
3.4 Anjaw District	45-47
3.5 The Communities	48-52
3.6. Land Use system	52-56

Chapter 4: METHODOLOGY	Pages
4.1 Interview	57-59
4.2 Socio- Economic Survey	59
4.3 Herbarium Methodology	59-62
4.4 Identification and Preservation	62-63
4.5 Ecological Analysis for Ethno-medicinal Plants	63-66
4.6 Ethno-medicinal Knowledge of different tribes	66-67
Chapter 5: TAXONOMICAL ENUMERATION OF ETHNO- MEDICO BOTANY AMONGST THE TRIBES	67-258
Chapter 6. RESULTS AND DISCUSSIONS	
6.1 Socio-economic status	269-271
6.2 Community structure and dynamics of major tribal groups across the study sites	271-279
6.3 Documentations of NTFPs	280-283
6.4 Medicinal plants	283-287
6.5 Quantity analysis data (Density, abundance, frequency and IVI)	287-303
6.6 Rare, Endangered and Endemic species	303
6.7 Utilization and Conservative perspectives of Medicinal Plants	303-307
6.8 Ex-situ Conservation	307
6.9 Utilization Value Index of the medicinal Plants	307-314

Chapter 7: SUMMARY AND CONCLUSION	Pages
7.1 Summary	315-318
7.2 Conclusion	318-321
7.3. Recommendation	321-322
References	323-339
List of Figures	
Fig 3.1-Arunachal Map showing the two districts.	41
Fig 3.2.a& 3.2.bVegetation maps of the two districts	43
Fig.3.3 Map of Lohit Dist	44
Fig. 3.4 Map Anjaw District	46
Figure: 6.1 (a&b). IVI curve for Lohit District& Anjaw District	296
Figure: 6.2. Number of families and species of Dicots	299
Figure: 6.3. Number of families and species of Monocots	300
Figure: 6.4 Relationship between Species and Genera in Anjaw and Lohit District	302
Figure: 6.5. Pie diagram showing plants habits/forms	305
Figure: 6.6. Pie diagram showing plants parts used	305
Figure: 6.7. Histogram showing diseases against number of plants used	312
Figure: 6.8. a. Plant species and plant part used as medicines	313
Figure 6.8.b. Plant parts used in relation to the diseases	313
 2. List of Tables	 Pages
Table 3.4.1.Year-wise revenue and expenditure (2000-2005).	46
Table 3.2. Area under forest	47

Table 3.3. Home garden (Cash crops)	56
Table 6.1. Status of Socio-economic welfare	266
Table 6.2: Community structure and dynamics of major tribal groups across the study sites	272-279
Table 6.3. Commonly consumed wild vegetables of the ethnic tribes	280
Table 6.4.(a). Species diversity (with spl. reference to medicinal plants) in Lohit district	288
Table 6.4.(b). Species diversity (with spl. reference to medicinal plants)in Anjaw district	293
Table 6.5. Total no. of Family, Species and Genera represented by Dicots, Monocots, Gymnosperm & Pteridophytes	302
Table 6.7.Utilization Value index	308-311

Chapter 1

Introduction

1.1. Evolution of Ethno botany and Ethno medicine

Medicinal plants are intimately connected with the history of mankind. Ethnobotanical knowledge is very ancient in India and its records might well be the earliest in the world. The traditional systems of medicinal practices had their roots in ethnobotany. It must have been the first knowledge, which the early man had acquired by sheer necessity, intuition, observation and experimentation. Archaeological or palaeobotanical evidences about collection, use and cultivation of plant products by early man for food, house building, Van Zeist and Casparie, 1983 and references to herbal medicines in ancient scriptures suggests a very long history of ethnobotany. Yet, the term '*Ethnobotany*' was first coined "as study of plants used by the aborigines", by Hersberger, 1896, less than a century ago and till a few years ago the only book on the subject was '*Introduction to Ethnobotany*' by Faulks, 1958.

Ethnobotany is the study of the relationship between plants and people: From "ethno"- study of people and "botany"- study of plants. Ethnobotany is considered a branch of ethnobiology. Ethnobotany studies the complex relationship between (uses of) plants and cultures. The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and plants used for food, medicine, cosmetic, dying, textiles, for building tools, currency, clothing, ritual, social life and music.

Ethnobotany has its roots in botany, the study of plants. Botany, in turn, originated in part from an interest in finding plants to help illness. In fact, medicine and botany have always had close ties. Many of today's drugs have been derived from plants source at one time, pharmacologists researching drugs were required to understand the natural plant world, and physician were schooled in plants derived remedies. However, as modern medicine and drugs research advanced, chemically-

synthesized drugs replaced plants as the source of most medicinal agents in industrialized countries. Although research in plant sources continued and were still used as the basis for some drug development, the dominant interest (and resulting research fundings) shifted to the laboratory.

However, the former concept of ethno- biology in broader sense meant the study of the over all ethnic groups, their interaction with the nature and relation with the plants and animals in and around them. It also took into accounts with their religious practices, expertise in textiles and crafts. Infact, from it arose, the modern disciplines such as the ethno -botany, -zoology, -ecology, -crafts, -medicines, Accordingly, ethno-medicines are basically the original tribal medicine that deals with several health curing practices and the use of the natural products such as the plants, animals and minerals derivatives for prevention and treatment of diseases, as well as for maintenance of optimal physical and emotional health.

We are well aware that life on earth is being processed as it runs with the biological cycle and is alive due to the beautiful magic of biodiversity, which refers to variety within the living world. This infact proves the Darwin's natural selection on life, where the best evoled new species fights the odd to move on successfully to prevail upon the fragile species.

Diversity comprises of two distinct aspects namely, species richness and evenness. Species richness refers to the number of species per unit area, and evenness refers to their abundance, dominance or spatial distribution. The focus of biodiversity measurement is typically the species, because they are easily observed and mostly used in the studies of forest ecosystems (Barnes et al., 1998).

From the earliest times, the indigenous people use many of the diversified medicinal plants, minerals and animal organs usually in association with strange ritual and incantation, to drive away the evil that they believed to cause the dreaded diseases

to their beloved ones. Through ages of experience, they have been able to identify curatives for most of their health problems (Haridasan *et al.*, 2003). There are instances when the patients abandon modern treatments to address specific problems like fracture, piles, jaundice, nonetheless, there is a rigid decline in the population of herbal practitioners due to erosion of traditional knowledge systems. Thus, the collection of information about medicinal plants, their classification, management and their uses by the ethnic communities hold importance among the ethno botanical researches. The local people and researchers face the challenging task of not only documenting the knowledge on plants, but also applying the result of their studies to biodiversity conservation and community development.

It is true that the Himalayas are considered as the abode of life saving and reviving medicinal plants. They have always been looked as a sure source of essential drugs since time immemorial. Arunachal Pradesh in the Eastern Indian Himalaya is the 12th mega biodiversity region of the world. More than 545 species of orchids have been reported from the state, which is the highest number of orchid species known from any single state in India while the ethnic tribes inhabiting the state recognizes over 500 species of plants as having medicinal values. These plants are found in different altitudes and vegetation types. They are either the tropical, temperate or the alpine types according to the forest type and zone where they grow. Much of the tropical medicinal plants like Amla (*Emblica officinalis*), Bochi (*Acorus calamus*) Linn, Hilika (*Terminalia chebula*) Retz, Vasak (*Adhatoda zeylanica*) Medic, etc are found in low and mid hill regions. These tropical plants are commonly found in other state and elsewhere in India. However, the higher altitude medicinal plants are somewhat rare in other parts of the country, since temperate and alpine habitats are difficult to find everywhere. Aconite, kutki, ginseng, Himalayan yew, Mangista, Podophyllum, *Paris polyphylla smith* are few of such plants prevalent in our higher reaches. Some of these

medicinal plants like ‘Mishmi Teeta’ (*Coptis teeta*) Wall, are endemic to this state.

Traditional medical practice is valuable both in the empirical sense and medically, but it also has a role in validating the spiritual world. Above all, traditional medical practices are often affordable and accessible to the vast rural population in the country and as such remains at the forefront of primary medicine in the country.

In 1957 the World Health Organisation defined the traditional healer as:

“A person who is recognised by the community in which he lives as competent to provide health care using vegetable, animal or mineral substances, and certain other methods based on social, cultural and religious background as well as knowledge, attitudes and beliefs that are prevalent in the community regarding physical, mental and social well-being, and the causation of disease and disability”.

Traditional practitioners choose their profession with a sense of spiritual vocation

They are likely to be drawn into practice as a consequence of some incidents that suggest they heard a ‘voice’ or felt a calling from the spiritual world – much as nuns and monks do in the Hindu/Christian/Budhist tradition or as an inherent offspring of the same.

The major challenge being geographical constraints such as in accessible deep valleys, snow bound areas, etc that is blocking the botanical exploration process. Notwithstanding, the present study is aimed to study the status of medicinal plants and their socio- economic importance for rural people of Lohit and Anjaw districts of Arunachal Pradesh. The study will also constitute the diversity and ecological distribution of medicinal plants along an altitudinal gradient.

1.1.i. Global Perspective

The UN Convention on Biological Diversity (1992) defined biological diversity as “ the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and ecological complexes of which

they are a part; this includes diversity within (intraspecific) and between species (interspecific) of an ecosystems” (Anon.1992).

A current record of earth biodiversity is just 1.4 million; around 750,000 are insects, 41,000 are vertebrates and around 300,000 plants, out of which 33, 798 are threatened vascular plants species, and most of them are found in tropical rainforest cover only 7% of earth’s land surface, yet they are estimated to contain 50% of total species. Among the Mega-divers nations, Brazil, Colombia, Mexico, Madagascar, Equador, Peru, Zaire, China, India, Malaysia, Indonesia and Australia together accounts for the 70% of world’s total species diversity, increase knowledge base derived from indigenous communities have highlighted the issue of resource utilization with special emphasis on medicinal plants.

The knowledge of our medical plants has been mostly inherited traditionally through age old folk lore oral literature before the advent of writing technology. However most of the present day healing philosophy of herbal tradition of many regions of the world can be traced back from the antiquity which is evident through scriptures on ancient human civilizations flourished in Indus valley in India, Greece, Mesopotamia, Babylonia, Rome, Egypt and Howanghoo in (present mainland China). The World Health Organization has categorized the member states in to six major zones: South East Asians Zones, Eastern Mediterranean zone, Far East (Western Pacific Zone), European Zone, African and Mesoamerican Zones.

Pedanius Dioscorides, the Greek farmeco-botanist and Physician of roman army in the first century A.D wrote famous commentary on medicinal herbs that appeared in his work *de material libri cinque* concerning medical matter presented in five volumes which described about 600 plant drugs with number of animal and mineral origins. *Material medica* is a Latin term of any material or substance used in the composition of curative agent in medicine.

The use of *material medica* was historically based upon the theoretical foundation that medicines possess medical curative powers. From the earliest day of organized pharmaceutical and medical knowledge, all of the information pertaining to drugs and their uses was designated as *material medica* which means medical matter. The idea of *material medica* had for reaching effect an Islamic herbal tradition in Asia Minor and Middle East countries during 13th century. Among the Greek scientific texts that appeal to the Arab translators and artists of Baghdad, a center of manuscript production in the thirteenth century, were herbals and bestiaries of Greeks particularly of Dioscorides *material medica* as reported by Rogers (1980) in website (<http://www.netmuseum.org-2004>).

The system of traditional medicines practiced in South East Asia are formalized systems of indigenous medicines like Traditional Indian Medicines (Ayurveda), Siddha (South Indian origin), Unani (Arab origin), Traditional Chinese medicines (TCM), Tibetan medicines (Amchi), Burmese and Thai medicines. No formalized systems are practiced by traditional healers, bonesetters, practitioners of *Thaad* (elements system), home remedies and magico-religious by spiritualists. Yoga, naturopathy and homeopathy are basically practiced in India, Bangladesh, and Thailand.

The civilization of India is still considered oldest among the once flourished major civilizations of the world some 5000 years ago. Side by side, its scriptures on use of medicinal plants reflected in *Ayurveda* is well referred as oldest known book on traditional medical science in the world written in Indo-European languages between 4500 and 600 BC during Vedic age. In simple definition, *Ayurveda* is basically a science of life, prevention and longevity and it is the oldest, most holistic and comprehensive treatment of medical system available during ancient India.

The theoretical foundation of *Ayurveda* had developed during Vedic Era which adhered closely to the principle of fundamental connection between the microcosm and

macrocosm. The theory emphasized that human beings are minute representations of the vast and infinite Universe and contain within them make up the surrounding world. Comprehending the body comprehends the world and vice versa.

China has got about 32,200 higher plant resources, of which 30,000 are angiosperms and 2000 are ferns and allies. It has a majority number of endemic species (18000) of its total reported flora with a density of 3,340 plants per 1000 sq km. the recent edition of Encyclopedia of Traditional Chinese Medicinal Substance mentioned about 5757 mostly herbs and contains herbal mixtures of 15-20 items for single preparation. The fundamental philosophy of Traditional Chinese Medicines (TCM) has derive from The Internal Canon of medicine of yellow Emperor, a commercial Chinese medicine text produce in the per-Quinn period (12th century BC-221AD) contains records of medicines for biting and masticating the earliest form of decoction pieces . It is mentioned that the causes of illness depend on the pattern of internal disharmony which is expression of balance between yin and yang. The fundamental theories was accepted and fully incorporated into Chinese *Materia medica* (CMM) during Song Dynasty in AD 960- 1279 and the *Panax ginseng* is the one such herb mostly popularly used as standard herbal which dominates the Chinese and world market as health revitalizer which is also used in preparation of herbal tea.

Thailand with 12000 species of flowering plants, have also got unique art of traditional herbal healing systems which is deeply influence by Buddhist culture and philosophy. There were nearly 35,000 registered traditional herbal practitioners. These practitioners are not utilized by the government for delivering health service at any level in the country. Apart from practicing homeopathy and ayurvedic medicines, the Thai have developed for themselves a special naturopathy through messaging with herbal extracts which basically a Shan Buddhist art of healing.

There is a global interest on the herbal medicine, these days 80% of the people from developing countries depend on traditional medicines. In modern medicine reportedly, nearly 25% are based about the plant base or plant derived drugs (Cox, 1994). The world trade now estimated to be over US\$60 billion per year. In our country 8000 species are recognized as medicinal plants. All our medicinal systems, like Ayurveda, Unani, Homeopathy and Tibetan systems apart from the folk practices utilized the plants effectively. As per available statistic there are nearly 7850 manufacturing units utilizing medicinal plants as raw materials consuming large quantities in the country where 90% of the raw materials require come from the wild sources (Haridasan *et al.*, 2003) and these wild exploitation results in depletions of sources endangering the species. Thus it becomes necessary to acknowledge their importance among the general message and encourage proper documentation in this field.

The World Bank reports trades in medicinal plants, botanical drugs and raw materials revealed that the sector is growing at an annual growth rate of 5-15% (WHO, 2000). In 2001, US \$17.8 billion was spent in the United State on supplements, US \$4.2 billion of its budget for botanical remedies (De Smet, 2002). Presently, the united State is largest market for Indian botanical products accounting for about 50% of the total exports (Patwardhan *et al.*, 2005). Japan, Hong-Kong, Korea and Singapore are the major importer of Traditional Chinese medicines (TCM) taking 66% of China's botanical drugs export¹⁴ (Report of the Ministry of Commerce of the People's Republic of China, 2003).

Most of the published studies suggest that the use of herbal medicine is widespread, with as many as three in ten Americans using botanical remedies in a given year. However, the benefits of modern drugs are felt primarily developed countries, developing countries continue to rely on ethno-botanical remedies as their primary

medicines, leaving almost 75% of world poor population without access to the modern health care products whereas in rich countries, 25% of all medical drugs are based on plants and their derivatives. India's share in world herbal medicine market is US \$10 billion per annum and total market from Traditional Indian Medicines (TIM) is just US \$1.5 billion in 2002 by exporting its herbal products while China's trade on herbal products is US \$48 billion and earns US \$5 billion annually by exporting herbal products which five times more than India's export turnover (Singh *et al.*, 2003; Handa, 2004).

1.1.ii. Regional Scenario

Medicinal plants have traditionally occupied an important position in the socio-culture, spiritual and medicinal arena of the people of India. Interestingly, India is still known as the "Botanical Garden of the World", having the widest variety of plant species distributed through out the country across diverse ecosystem. All known types of agro climate, ecological and edaphic condition are met within India. The country lies in the tropical belt stretching over an area of 3,287,213 sq. km sharing 2.46% of total global landmass. The present forest coverage is 63.7 m ha (19.4%) of its total land area are sharing 1.8% of the global forest area; divided into 16 agro climate zones. The Indian region falls within a geographical tract of 68°51' and 97°25' E longitude and 6°45' and 37°6' N latitude, has been declared as one of the global 12th Mega-diversity hotspots namely the Western Ghats and Eastern Himalayas on the basis of species richness and endemism. There are 572 protected areas (150, 809.0 sq. km.) including national parks and wildlife sanctuaries which cover 4.8% of total geographical area of the country that acts as a hub centre of some of the potential medicinal and rare flora. An estimation of about 45,000 different plants species (15% of the world flora) and, out of which 17,500 are flowering plant, 48 are gymnosperms, 1200 are pteridophytes, 2825 are bryophytes, 6500 are algae, 14,500 are fungi and 2021 are lichens that are

known within Indian political boundary with a high percentage of endemism (Botanical Survey of India, 1983; MacKinnon and MacKinnon, 1986; IUCN, 1987). It is pertinent to note that majority of the medicinal species used in pharmaceutical firms are derive from flowering plants. India and China is the two major producers of medicinal plants, which account of the 40% of global biodiversity. The current status of angiosperm plants species used in Indian systems of medicines are around 1825 species distributed in top 9 families that are widely used for their therapeutic efficacies. Chaterjee estimated 6700 endemic species (61%) from India. Current estimation reflects that only 4900 species (31%) of flowering plant are endemic mostly concentrated to Central of Eastern Himalayan region with 2532 species and 1782 species restricted in peninsular while 1500 species are facing varying degrees of natural or anthropogenic threat. The Himalayas, with a total area of nearly 100 m ha dominates the floristic estimate of entire India subcontinent. The eastern Himalayan region differs significantly from Western Himalayan region climate as well as vegetation. Although, the degree of anthropogenic pressure varies with different parts of the country; human disturbances have become widespread future in the most of the forested areas in the Himalayas. Western Ghats has been studied widely, while more work has to be carried out in order to explore the biodiversity of Eastern Himalayas located in poorly indeterminate mountain terrains, where chances of finding newer species have been predicted.

The Northeast India harbors more than 8500 species of angiosperms which constitute about 50% of Indian's flora of both general and ethno-medicinal importance representing 200 families out of 315 flowering plant families currently known. It has total forest coverage of 163,799 sq. km. which account for 25% of the total forest cover in the country. Hooker, 1872-1887 did the first floristic account of the region. Subsequent floristic work of Kanjilal *et al.* 1934 reported 3500 species of angiosperm. Their report has added to the understanding of vast diversity of flora of this

region. Based on earlier floristic data, several workers have reported state wise tentatively such as Arunachal Pradesh with 3984 species, Assam with 3010 species, Manipur with 2376 spp, Meghalaya with 1886 spp, Mizoram with 2141 species. Nagaland with 2431 species and Tripura with 1463 species. Jamir in 1997 mentioned around 35 plant species from Naga hills and in 2007 Chaturvedi and Jamir brought out 5 rare families of ethno medicinal plants from the state of Nagaland. In Assam, Borthakur, 1976 mentioned 46 medicinal plants used by Mikir tribe of Karbi-Anglong district. Borthakur in 1996 have suggested on fusion of medicinal plants and indigenous knowledge system for the improvement of rural economy with respect to post natal cure in northeast India. Balakrishnan, 1983 presented the flora of Jowai (United Khasi and Jaintia Hills). Gogoi and Borthakur, 1991 have reported magico-religious plants of Khamptis of Assam. Sharma presented detail flora of Sivsagar district (present Jorhat and Dibrugarh) dealt purely systematic approach than ethnobotanical. Lalramnghinglova, 2003 reported 233 ethnomedicinal plants of Mizoram.

1.1.iii. Scenario in Arunachal Pradesh

Arunachal Pradesh alone harbors around 138 tribal groups both the major and the minor, all having their time tested age old cultural heritage and practices. The total population of the Arunachal spreading over 16 districts is about 1,019,177 (Population census, 2001). Jhum cultivation (Shifting) and Wet Rice agriculture is their primary occupation besides, rearing of Pigs, cows, goats, poultry, yak (reared for milk & meat in Walong & Kibithoo circles of Anjaw district), fishing and hunting for the sustenance of their livelihood. They are completely a forest dependent and have adequate knowledge about conservation of their natural resources mostly through their culture wisdom.

This state in particular has around 83,743 sq. km. of land and the forest coverage consist of 68% with rich biodiversity and ethnoculture heritage. It is the largest among the state of north-east India with 15 agro-climate and pytogeographical zone and is endowed with rich floral and faunal diversity. It is also considered as treasure plants use in preparation of ethno medicines practices among its culturally diverse 28 major and 110 sub-ethnic group house of medicinal plants most of which are yet to be explored and immense scope for the search of. Bhuyan, 1989 studied medicinal flora of Lohit district of Arunachal Pradesh. In 2003, Haridasan et al, have reported about 500 species medicinal plants from different agro climate zones of Arunachal Pradesh with status and cultivation prospect. Hui tag has enlisted around 300 medicinal plants from Lohit in his PhD works, However, the documentation work is still incomplete and some of the majority tribal group are unexplored in terms of medicinal plants utilization.

1.2 Scope and Objectives

A birds eye view on available literatures reveals that many tribal areas and tribal communities in the eastern Himalayan region of India are either under explored or unexplored condition with regards to their floral wealth used in curing diseases (Kala,2005).This region of the north east is infact considered as one of the richest biodiversity centre of the Indian subcontinent with that of the western ghats. So far information available, there is no proper documentation with regards to judicious utilization and management of medicinal plants. In fact, there is a scarcity of information on enumeration of ethno medicinal plants of Arunachal Pradesh which comprises of 16(sixteen) districts, relatively the largest state in terms of area and forest area within the North Eastern States of India. Covering these 16 districts needs lots of time and dedication. The fact also is true that these districts are all spreaded into different forest zones and are inhabited by diverse linguistic (each tribes differs from its

neighbouring district tribes), and are bestowed with vast variety of ethno-cultural and religious practitioners. Getting into their shoes and exploring their vegetation needs a very good understanding of these locals.

The existing eleven districts in Arunachal Pradesh were further divided into 16 districts on the basis of political governance, administrative convenience, agroclimatic conditions and ethno-biocultural perspectives in 2003. The former Lohit district selected was also divided into Anjaw and Lohit districts. These districts are as the study area of the present research because Anjaw district represents the alpine and temperate forest type of vegetation including high hill medicinal plants, trans-border affinities with Assam and China in Anjaw district; the Dibang valley and tropical vegetation present in Lohit district, and the bio-cultural traditions of the communities in both the districts are interesting in relation with traditional medicines and practices. The plant-based knowledge, largely oral, has been transferred from one generation to the next through traditional healers, knowledgeable elders or ordinary people without any written documents. It was found that the indigenous knowledge on plant resources was confined to elder members of the study area and the younger's have little or no contribution in this aspect. The study of ethno-botanical plants provides an opportunity for multi-disciplinary and interdisciplinary research work between botany, pharmacology and toxicology, chemistry, anthropology and herbal science.

In view of the above, the present study aims

1. To study the status of medicinal plants and their socio economic importance for rural people of Lohit and Anjaw districts of Arunachal Pradesh.
2. To compare the diversity and distribution of medicinal plants at altitudinal gradient, with consistent status of their microenvironment.
3. To assess the medicinal plants under rare, endangered and endemic categories.

Chapter 2

Review of Literature

2.1 World Scenario

The use of medicinal plants as a source for relief from illness can be traced back over five millennia to written documents of the early civilization in China, India and the Near east, but it is doubtless an art as old as mankind. Neanderthals living 60,000 years ago in present day Iraq used plants such as hollyback, these plants are still widely used in ethnomedicine around the world (Thomson, 1978; Stockwell, 1988). Plants have been an important source of medicine for thousands of years. Even today, the World Health Organization estimates that up to 80 per cent of people still rely mainly on traditional remedies such as herbs for their medicines. Plants are also the source of many modern medicines. It is estimated that approximately one quarter of prescribed drugs contain plant extracts or active ingredients obtained from or modelled on plant substances. The most popular analgesic, aspirin, was originally derived from species of *Salix* and *Spiraea* and some of the most valuable anti-cancer agents such as paclitaxel and vinblastine are derived solely from plant sources (Roberts, 1988; Katzung, 1995; Pezzuto, 1996). Green plants synthesise and preserve a variety of biochemical products, many of which are extractable and used as chemical feed stocks or as raw material for various scientific investigations. Many secondary metabolites of plant are commercially important and find use in a number of pharmaceutical compounds. However, a sustained supply of the source material often becomes difficult due to the factors like environmental changes, cultural practices, diverse geographical distribution, labour cost and selection of the superior plant stock and over exploitation by pharmaceutical industry.

Palmer (1910) was the first to carry out ethno botanical study in the south-west of the United States and found out plants used by the North American Indians for their food. The well-known ethno-botanists of the world, Dr. Richard Evan Schulte has

conducted ethno- botanical exploration in Oklahoma, Oaxala, Amazon, Mexico and in other region. He spent almost 12 years among the tribals and worked on hallucinogens, medicinal and toxic plants (Schultes, 1960, 1962, 1995). Berlin *et al.*, during several years of field work at Maya-‘speaking group of the highlands of Chaipas, a state of southern Mexico’, collected and documented many hundreds of folk botanical categories (Berlin *et al.*, 1974). Anderson (1985) investigated ethno botany of Akha tribes of Thailand and reported 121 species and the medicinal use or uses attributed to them. Bhatta Rai, N.K. (1990) has reported medicobotanical information on 51 empirically accepted prescription involving 36 plant species belonging to 36 genera and 27 families, collected from the rural inhabitants of Kabhrepalanchock District of the Central Nepal. Over all, the ethno-botanical survey revealed that these common ailments as the remedies are accepted by the majorities of the masses over generations. Ethnobotanical information on 71 plants from Tharu tribes of Chitwan District, and 86 plant species from Makawanpur District of Nepal were reported by Dangol and Gurung (1991) respectively, Joshi and Edington (1990) also reported medicinal plants of Central region of Nepal. Mahunnah (1991) has investigated 44 medicinal plants, belonging to 39 genera and 21 families, used by the Hehe and Safawa tribes, inhabiting the Southern highlands of Tanzania. Ethnobotanic information on 52 plant species of Sengkurong and 29 plant species of Bukit Udal of Durussalam were given by Mohiddin *et al* (1991, 1992) and Holdsworth (1991), respectively. Abbas *et al.* (1992) investigated 52 folk medicinal plant used in traditional medicine of Bahrain. Cunningham (1993). African medicinal plants with emphasis on conservation and primary health care. Yang and Walter (1992), compiled ethno-botanical information on 157 species of cucurbits in China. Out of these, 63 species are economic importance. Twenty six of these 63 species are under cultivation in China. A brief account of herbal remedies prescribed for various ailments in Sudan is given with mode

of application along with precautions(EC Rajah Mohammed, 1993).

Medicine, in several developing countries, using local traditions and beliefs, is still the mainstay of health care. As defined by WHO (1948), ‘health is a state of complete physical, mental, and social well being and not merely the absence of disease or infirmity’. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed (UNESCO, 1996). Furthermore, an increasing reliance on the use of medicinal plants in the industrialised societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies (UNESCO, 1998). Moreover, in these societies, herbal remedies have become more popular in the treatment of minor ailments, and also on account of the increasing costs of personal health maintenance. Indeed, the market and public demand has been so great that there is a great risk that many medicinal plants today, face either extinction or loss of genetic diversity.

Developed countries, in recent times, are turning to the use of traditional medicinal systems that involve the use of herbal drugs and remedies. About 1400 herbal preparations are used widely, according to a recent survey in Member States of the European Union. Herbal preparations are popular and are of significance in primary healthcare in Belgium, France, Germany and the Netherlands. Such popularity of healthcare plant-derived products has been traced to their increasing acceptance and use in the cosmetic industry as well as to increasing public costs in the daily maintenance of personal health and well being. Examples of such beauty-oriented therapeutics are skin tissue regenerators, anti-wrinkling agents and anti-age creams.

Most dermaceuticals are derived from algal extracts that are rich in minerals and the vitamin B group. Skincare products such as skin creams, skin tonics derived from medicinal plants are grouped together as dermaceuticals. Also, amongst the poor, cures

and drugs, derived from plants, constitute the main source of healthcare products. It has been estimated that in developed countries such as United States, plant drugs constitute as much as 25% of the total drugs, while in fast developing countries such as China and India, the contribution is as much as 80%. Thus, the economic importance of medicinal plants is much more to countries such as India than to rest of the world. These countries provide two third of the plants used in modern system of medicine and the health care system of rural population depend on indigenous systems of medicine.

Developing countries need to build up technological and scientific capabilities to develop and improve the production of medicinal principles for use in their countries and to conduct research and development (R&D) to develop products for export thereby, enabling countries to supply new markets which are being created as a result of consumer orientation of societies, increasing affluence and demand for green products. Sustainable use of this renewable natural resource will not only contribute to rural industrial development and poverty alleviation but also to biodiversity and forest conservation. Major requirements for establishing medicinal and aromatic plants based industries in developing countries are the following (Silva, 1997):

1. Availability of natural forest resources capable of being sustainably harvested.
2. Initiation of systematic cultivation programme
3. Selection of plants for processing based on facilities available and marketability
4. Fabrication or procurement of equipment, provision of required services (water, energy, chemical)
5. Transfer of expertise on agronomical practices, harvesting and post-harvest treatment.
6. Training in methods of processing and quality control
7. Actual processing with assistance from experts and NGO's and international agencies

8. Packaging and storage of finished products

9. Marketing outlets

The practise of traditional medicine is widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand. In China about 40% of the total medicinal consumption is attributed to traditional tribal medicines. In Thailand, herbal medicines make use of legumes encountered in the *Caesalpinaceae*, the *Fabaceae*, and the *Mimosaceae*. In the mid-90s, it is estimated that receipts of more than US\$2.5 billion have resulted from the sales of herbal medicines; and, in Japan, herbal medicinal preparations are more in demand than mainstream pharmaceutical products. Over three-quarters of the world population relies mainly on plants and plant extracts for health care. More than 30% of the entire plant species, at one time or other, were used for medicinal purposes. It is estimated that world market for plant derived drugs may account for about Rs.2,00,000 crores. The Indian contribution is less than Rs.2000 crores. Indian export of raw drugs has steadily grown at 26% to Rs.165 crores in 1994-1995 from Rs.130 crores in 1991-1992. According to an Anonymous (1997) (Occasional paper no. 54) the international market of medicinal plant related trade is about \$60 billion per year. The Indian market is estimated at Rs. 550 crores per year (\$140 million). The exports of essential oils and herbal products in 1995-96 were valued at about Rs.200 crores (\$50 million). The annual production of medicinal and aromatic plant's raw material is worth about Rs.200 crores. This is likely to touch US \$1150 by the year 2000 and US \$5 trillion by 2050 (Joy *et al.*, 2001). Inventorisation of herbal drugs used in traditional and modern medicines for a country like India, appears to be a stupendous task, where a number of well established indigenous or traditional systems, including Ayurveda, Unani, Siddha, Homoeopathy, Tibetan, Amchi, Yoga and Naturopathy are practised along with modern medicine for the management of total health care system. In all these systems a large number of plant drugs are used,

although there may be some common plants. Another problem in correct identification of plants is that the plant drugs in those systems of medicine are known by their classical, *Shastriya* or vernacular names. It is not easy to correlate these names with acceptable scientific names. One plant species can have many vernacular classical names and one name may refer to different plant species.

In a report entitled “*Future of Herbal Exports,*” published by the Associated Chambers of Commerce and Industry of India (ASSOCHAM, 2007), the establishing of Exclusive Export Promotion Zones (EPZ) in six selected Indian States is a main recommendation as a way to increase exports of Indian herbs and medicinal herbal products from current level of about Rs. 3,000 crore (= \$734,600,729 USD) to a projected figure of Rs 12,000 crore (= \$2,938,402,918 USD) by 2012. This recommendation is based in part on data that traditional herbal medicine exports to countries like US, Spain, UK, Australia, Russia and Indonesia have been growing at an average rate of over 25%. China and India are the largest producers of medicinal plants but India’s share in medicinal plant exports in global trade is just about 2.5% against 13% for China. The leading producers of medicinal plants in India are the States of Gujarat, Rajasthan, Haryana, Tamil Nadu, Andhra Pradesh and the Himalayan range, which together account for 75% of India's total herbal medicine exports.

ASSOCHAM suggests that EPZs to accelerate herbal exports are necessary for which grants and R&D support must occur through central allocations and resources. Furthermore, if EPZs are set up in these six States with a total central allocation of Rs. 30,000 crores (= \$7,346,007,295 USD), having facilities for research and development, it would not be difficult for India to accelerate its exports of herbs and herbal medicines, to the projected level of Rs. 12,000 crore within 5 years time. The Indian medicinal herbs that have established export demand in economies of scale and are already produced with international quality norms include psyllium husk and seed

(*Plantago ovata*), senna leaf and pod (*Cassia angustifolia*), sandalwood chips and dust (*Santalum album*), jojoba seed (*Simmondsia chinensis*), pyrethrum (*Tanacetum cinerariaefolium*), basil leaf (*Ocimum* spp.), hyssop herb (*Hyssopus officinalis*), and galangal rhizome and root (*Alpinia* spp.), among others.

The ASSOCHAM report highlights the fact that India has 15 agroclimatic zones with 15,000 medicinal plants of which the Indian Systems of Medicine (Ayurveda, Siddha and Unani) have identified 1,500 in their respective materia medica. About 70% of India's medicinal plants are found in tropical areas mostly in the various forest types spread across the Western and Eastern ghats, the Vindhyas, Chotta Nagpur plateau, Aravalis and Himalayas. Although less than 30% of the medicinal plants are found in the temperate and alpine areas and higher altitudes they include species of high medicinal value. Macro studies show that a larger percentage of the known medicinal plant occur in the dry and moist deciduous vegetation as compared to the evergreen or temperate habitats. About 90% of medicinal plants used by industry are collected from the wild. While over 800 species are used in production by industry, less than 20 species of plants are under commercial cultivation. Over 70% of the plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem and the whole plant in case of herbs. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants if biodiversity is not sustainably used.

The quality of medicinal plants depends on the geographical origin, time and stage of growth when collection has been done and post harvest handling. The collections in most cases are done by villagers or tribals residing in the vicinity of forest in their spare time. The plant part is collected without paying great attention to the stage of maturity, dried haphazardly and stored for long periods under unsuitable conditions. The quality of collected material, as such is often degraded.

The ASSOCHAM paper therefore suggests a multi-pronged and multi-dimensional strategy, in addition to the creation of EPZs, to improve quality control. The report seeks allocation of funds for conducting Rand D on product and process development to improve post-harvesting of herbs and create marketing agencies for efficient marketing of herbal potential through scientific channels of communications. The report concludes that the US and UK will continue to be 1st and 2nd largest export markets for Indian herbal medicinal products. Since 2004 herbal exports, despite fluctuations for a variety of factors, have still shown an over 30% increase. The same trend will likely be the case with other countries identified in the study including Germany, France, Pakistan and UAE.

Traditional and folklore medicine bequeathed from generation to generation is rich in domestic recipes and communal practice. Encompassing concepts and methods for the protection and restoration of health, traditional medicine has served as a fount of alternative medicine, new pharmaceuticals, and healthcare products. The best known examples of traditional medicine, differing in concept and protocol, are well-developed systems such as acupuncture and ayurvedic medicine that have been widely used to conserve human health in China and India. Gorman (1992) drew attention to the power of Chinese folk medicinal potions in treating maladies from eczema and malaria to respiratory disorders.

Plants, especially used in Ayurveda can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and /or reduced toxicity. The small fraction of flowering plants that have so far been investigated have yielded about 120 therapeutic agents of known structure from about 90 species of plants. Some of the useful plant drugs include *vinblastine*, *vincristine*, *taxol*, *podophyllotoxin*, *camptothecin*, *digitoxigenin*, *gitoxigenin*, *digoxigenin*, *tubocurarine*, *morphine*, *codeine*, *aspirin*, *atropine*, *pilocarpine*, *capsaicine*, *allicin*,

curcumin, artemisinin and ephedrine among others. In some cases, the crude extract of medicinal plants may be used as medicaments. On the other hand, the isolation and identification of the active principles and elucidation of the mechanism of action of a drug is of paramount importance. Hence, works in both mixture of traditional medicine and single active compounds are very important. Where the active molecule cannot be synthesised economically, the product must be obtained from the cultivation of plant material. The scientific study of traditional medicines, derivation of drugs through bioprospecting and systematic conservation of the concerned medicinal plants are thus of great importance. In the quest for new medicines to treat old and emergent diseases such as malaria and AIDS, attention is now being given to discovering the active ingredients encountered in the treasury of over 5,000 Chinese herbs, plants and roots that have been used routinely and traditionally. *Qinghaosu* and *Chaihu* are two such examples. Whereas the former, called *artemisinin* obtained from *Artemisia annua* is expected to yield, in the coming millennium, a potent new class of antimalarials, the latter, obtained from *Bupleurum chinense* and used as a popular remedy for hepatitis is the focus of intense research by the Japanese pharmaceutical industry. More recently, the biochemistry of *tianhuafen* or cucumber is being studied in the USA to decipher the identity of *compound Q*, an extract used in China and credited with remedial and relief properties in AIDS sufferers.

Over the past decade, herbal medicines have been accepted universally, and they have an impact on both world health and international trade. Hence, medicinal plants continue to play an important role in the healthcare system of a large number of the world's population (Akerele, 1988). Traditional medicine is widely used in India. Even in USA, use of plants and phytomedicines has increased dramatically in the last two decades. A National Centre for Complementary and Alternative Medicine has been established in USA. The herbal products have been classified under 'dietary

supplements' and are included with vitamins, minerals, amino acids and 'other products intended to supplement the diet' (Rao *et al.*, 2004). Use of plants as a medicinal remedy is an integral part of the South African cultural life (Brandt *et al.*, 1995). It is estimated that 27 million South Africans use herbal medicines from more than 1020 plant species (Meyer *et al.*, 1996; Koduru *et al.*, 2007). In fact, there are several medicinal plants all over the world, including India, which are being used traditionally for the prevention and treatment of cancer.

Medicinal plants possess immunomodulatory and antioxidant properties, leading to anticancer activities. They are known to have versatile immunomodulatory activity by stimulating both non-specific and specific immunity (Agrawala *et al.*, 2001; Pandey *et al.*, 2006). Plants contain several phytochemicals, which possess strong antioxidant activities. The antioxidants may prevent and cure cancer and other diseases by protecting the cells from damage caused by 'free radicals' – the highly reactive oxygen compounds. Thus consuming a diet rich in antioxidant plant foods (e.g. fruits and vegetables) will provide a milieu of phytochemicals, non-nutritive substances in plants that possess healthprotective effects. Many naturally occurring substances present in the human diet have been identified as potential chemopreventive agents; and consuming relatively large amounts of vegetables and fruits can prevent the development of cancer (Vecchia and Tavani, 1998; American Cancer Society, 2006).

2.2 Indian Scenario

Traditional pharmacopoeias reflect centuries of observations about plant ecology and the physiological effects of plants on humans (Holmstedt, 1995). Unfortunately, modern science and technology have devalued such knowledge. Alternatively, the marketing of herbal remedies and international medicinal plant research that compensates indigenous people for their knowledge and long-term plant production may provide economic opportunities while promoting biological and

cultural diversity (Balick 1994; Holmstedt 1995; Suffness *et al.* 1995; Masood 1998). Medicinal plant research also provides the biomedical community with the opportunity to return information to indigenous people so that they may improve their health practices (Elisabetsky, 1986).

The potential of higher plants as source for new drugs is still largely unexplored. Among the estimated 250,000-500,000 plant species, only a small percentage has been investigated phytochemically and the fraction submitted to biological or pharmacological screening is even smaller. Thus, any phytochemical investigation of a given plant will reveal only a very narrow spectrum of its constituents. Historically pharmacological screening of compounds of natural or synthetic origin has been the source of innumerable therapeutic agents. Random screening as tool in discovering new biologically active molecules has been most productive in the area of antibiotics Gerhartz *et al.*, 1985; Kroschwitz, and Howe-Grant, 1992). Even now, contrary to common belief, drugs from higher plants continue to occupy an important niche in modern medicine. On a global basis, atleast 130 drugs, all single chemical entities extracted from higher plants, or modified further synthetically, are currently in use, though some of them are now being made synthetically for economic reasons (Newman *et al.*, 2000).

Among ancient civilisations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in Ayurveda. In India, written records of the use of plants for curing human or animal diseases can be traced back to the earliest (4500-1600 BC), scripture of the Hindus, the Rig-Veda (Jain,1994), Ayurveda, the Indian Indigenous system of medicine, dating back to Vedic ages (1500-800 BC), has been in integral part of the

Indian culture (Weiss,1997). The *Rigveda* (5000 BC) has recorded 67 medicinal plants, *Yajurveda* 81 species, *Atharvaveda* (4500-2500 BC) 290 species, *Charak Samhita* (700 BC) and *Sushrut Samhita* (200 BC) had described properties and uses of 1100 and 1270 species respectively, in compounding of drugs and these are still used in the classical formulations, in the Ayurvedic system of medicine. However, unfortunately, much of the ancient knowledge and many valuable plants are being lost at an alarming rate. With the rapid depletion of forests, impairing the availability of raw drugs, Ayurveda, like other systems of herbal medicines has reached a very critical phase. About 50% of the tropical forests, the treasure house of plant and animal diversity have already been destroyed.

Ayurveda, Siddha, Unani and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda is most developed and widely practised in India. Ayurveda dating back to 1500-800 BC has been an integral part of Indian culture. The term comes from the Sanskrit root *Au* (life) and *Veda* (knowledge). As the name implies it is not only the science of treatment of the ill but covers the whole gamut of happy human life involving the physical, metaphysical and the spiritual aspects. Ayurveda recognises that besides a balance of body elements one has to have an enlightened state of consciousness, sense organs and mind if one has to be perfectly healthy. Ayurveda by and large is an experience with nature and unlike in Western medicine, many of the concepts elude scientific explanation. Ayurveda is gaining prominence as the natural system of health care all over the world. Today this system of medicine is being practised in countries like Nepal, Bhutan, Sri Lanka, Bangladesh and Pakistan, while the traditional system of medicine in the other countries like Tibet, Mongolia and Thailand appear to be derived from Ayurveda.

Ayurveda considers that the universe is made up of combinations of the five elements (*pancha mahabhutas*). These are *akasha* (ether), *vayu* (air), *teja* (fire), *aap*

(water) and prithvi (earth). The five elements can be seen to exist in the material universe at all scales of life and in both organic and inorganic things. In biological system, such as humans, elements are coded into three forces, which govern all life processes. These three forces (kapha, pitta and vata) are known as the three doshas or simply the tridosha. Each of the doshas is composed of one or two elements. Vata is composed of space and air, Pitta of fire, and kapha of water and earth. Vata dosha has the mobility and quickness of space and air; pitta dosha the metabolic qualities of fire; kapha dosha the stability and solidity of water and earth. The tridosha regulates every physiological and psychological process in the living organism. The interplay among them determines the qualities and conditions of the individual. A harmonious state of the three doshas creates balance and health; an imbalance, which might be an excess (vridhhi) or deficiency (kshaya), manifests as a sign or symptom of disease (Lad, 1985; Hankey, 2005).

Phytomedicines are also being used increasingly in Western Europe. Recently the US Government has established the “Office of Alternative Medicine” at the National Institute of Health at Bethesda and its support to alternative medicine includes basic and applied research in traditional systems of medicines such as Chinese, Ayurvedic, with a view to assess the possible integration of effective treatments with modern medicines. The development of systematic pharmacopoeias dates back to 3000 BC, when the Chinese were already using over 350 herbal remedies. Ayurveda, a system of herbal medicine in India, Sri Lanka and South-East Asia has more than 8000 plant remedies and using around 35,000-70,000 plant species. China has demonstrated the best use of traditional medicine in providing the health care. China has pharmacologically validated and improved many traditional herbal medicines and eventually integrated them in formal health care system. Further, it is important to bridge the gap between traditional medicinal plant knowledge and “western”

biomedical knowledge if we are to conserve biodiversity, continue to improve human health, and encourage development of sustainable indigenous livelihoods (Elisabetsky, 1986; Balick 1994; Suffness *et al.*, 1995; Masood, 1998). Linking traditional knowledge with biomedical science is difficult because we often do not understand how or why medicinal plants are selected, conceptualized, and used by indigenous people (Berlin, B.1992). Plant taste, especially bitterness, has been proposed as a universal biochemical cue for medicinal properties of plants (John *et al.*, 1990). Other factors that may contribute to plant selection include the distribution of plants within a landscape (Alcorn, 1981;) and cultural interpretations of plant characteristics other than taste (Etkin, 1988).

In India there are several formulations like herbal teas, extracts, decoctions, infusions, tinctures, etc are prepared from medicinal plants (Kraisintu, 1997).

Herbal teas, Herbal remedies: herbal tea or infusion mixtures are mixture of unground or suitably ground medicinal plants to which drug plant extracts, ethereal oils or medicinal substances can be added. Infusion mixtures should be as homogenous as possible.

Drug extracts: They are preparations obtained by extracting drugs of a certain particle size with suitable extraction agents (menstrua). The extract obtained after separation of the liquid from the drug residue is called miscella. It may already represent the final liquid dose form **e.g.** as a so called fluid extract, or be used as an intermediary product which is to be further processed as quickly as possible.

Aqueous drug extracts: The following degrees of comminution are used for the extract depending on the type of plant parts. Leaves, flowers and herbs shredded (4000mm); woods, barks and roots shredded (2800mm); fruits and seeds (2000mm). Alkaloid containing drugs powdered (700mm).

1. **Decoctions**: The drug in the prescribed comminution is put in to water at a temperature above 90°C. The container is suspended in a water bath and maintained at this temperature for 30 minutes, with repeated stirring. The mixture is then strained while still hot.
2. **Infusions**: One part of the comminuted drug is kneaded several times in a mortar with 3-5 parts of water and left to stand for 15 minutes. The rest of the boiling water is then poured on to the mixture, which is suspended in a container in a water bath and kept for 5 minutes, with repeated stirring at a temperature above 90°C. The mixture is covered and left to stand until cool.
3. **Macerates**: The comminuted drug is left to stand, with occasional stirring, for 30 minutes after the required quantity of water has been poured on to it at room temperature. The extract is then strained and made up to the prescribed weight with rinsings.
4. **Tinctures**: Tinctures are extracts from drug plants prepared with ethanol of varying concentration, ether or mixtures of these, perhaps with certain additives, in such a way that one part of drug is extracted with more than two parts, but at most ten parts, of extraction liquid.
5. **Fluid extracts**: Like tinctures, they are liquid preparations, the difference being that they are more concentrated.
6. **Dry extracts**: They are usually very hygroscopic and should therefore be ground and mixed under conditions which exclude moisture as much as possible. Intermediate and end product must also be stored under dry conditions.

The Indian system of herbal medicine and its plant drug caught the attention of the West since the beginning of the colonial days. Garcia da Orta, the personal physician of the then Portuguese Governor in India published his “Colloquies on the

Simples and Drugs of India in 1563; and this was published a 12 volume work by Rheed, (1678-1703), Other important contributions are: A catalogue of the Indian Medicinal Plants and Drugs (Fleming, 1810); Materia Medico of Hindoostan (Ainslie, 1813). Ethnobotanical investigation has led to the documentation of large number of wild plants used by the tribals for meeting their multifarious requirements) (Anonymous, 1990). In India, organized study of ethnobotany is of recent origin (middle of the century. Rao et al, (1989) mentioned a considerable manual literature in 'Methods and Techniques in Ethnobotanical study and Research: some Basic Consideration'.

Of the 2,50,000 higher plant species on earth, more than 80,000 are medicinal. Tropical countries are a treasure house of a wide variety of medicinal plants. Some species are found wild, while a number of species have been domesticated by the farmers. Many species have been grown in homesteads and become part of traditional home remedies. A limited number of species are commercially cultivated though a few more have potential for large-scale production. The important tropical and subtropical medicinal plants are discussed here highlighting the importance, medicinal and other uses, distribution, botany, agrotechnology, chemical constituents and activity. India is one of the world's 12 megadiversity centres with the presence of over 45,000 different plant species. India's diversity is unmatched due to the presence of 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and 426 biomes (habitats of specific species). Of these, about 15,000-20,000 plants have good medicinal value. However, only 7,000-7,500 species are used for their medicinal values by traditional communities. In India, drugs of herbal origin have been used in traditional systems of medicines such as *Unani* and *Ayurveda* since ancient times. The *Ayurveda* system of medicine uses about 700 species, *Unani* 700, *Siddha* 600, Amchi 600 and modern medicine around 30 species. The drugs are derived either from the whole plant or from

different organs, like leaves, stem, bark, root, flower, seed, Some drugs are prepared from excretory plant product such as gum, resins and latex. Even the allopathic system of medicine has adopted a number of plant-derived drugs which form an important segment of the modern pharmacopoeia. Some important chemical intermediates needed for manufacturing the modern drugs are also obtained from plants (e.g. diosgenin, solasodine, b-ionone). Not only, that plant-derived drug offers a stable market world wide, but also plants continue to be an important source for new drugs.

Medicinal plants constitute a resource, which has been used traditionally by Indians for the last two millennia. It is reported that in India, 4,635 ethnic communities, including over one million folk healers, use around 8,000 species of medicinal plants. They are also increasingly becoming economically important due to the growing demand for herbal products in the domestic and global market. Studies on ethno botany was initiated by the Janaki Ammal (1956) as an official programme in the Economic Botany section of Botanical Survey of India since its very inception in 1954 and published on paper on subsistence economy of India (Janaki Ammal, 1956). Jain (1960) started intensive field study among tribals of Central India (Jain, 1963 a-e; 1964 a-d; 1965 a-b). The publication from this group in early sixties triggered ethnobotanical activities in many other centres, particularly among botanists, anthropologists and ayurvedic medical practitioners. A comprehensive summery of ethno-botanical research carried out in different states and union territories of India, especially after the initiation of organized study and research in India ethnobotany in the middle of this century has been published by Jain, *et al.*, (1992) in an outline of ethnobotanical research in India. Searching ethnobotanical studies started since 1958 onwards. However, Lorrian (1940) mentioned a few traditional medicine used by the Lushais (Mizos). Lalramnghinglova and Jha reported the ethno- medicine including medical of plants and animals combined used by ethnic communities of Mizoram. A detailed account of 231 plants species of

ethno-botanical importance have been documented by Lalramnghinglova (1998; 2003). Some of the notable contributions in the state of Assam are Medical use among Karbi Anglong of Mikir hills (Borthakur, 1976); Folklore claims from the Brahmaputra valley (Boisya and Majumdar, 1980); Medical plants from Tezpur district (Puri, 1987). Ethno botanical information on plants associated with religio-cultural beliefs of the Tai Khampti race of the Assam and Arunachal Pradesh is reported by Gogoi and Borthakur (1991). The herbal remedy of the Nepalese of Assam is also reported by Borthakur *et al.* (1996). The importance of ethnobotanical work in North East India has already been emphasized but keeping the large number of tribes that exists in the region, very few tribes have been touched upon in relation to ethnobotanical studies in general. A comprehensive review on ethnobotanical studies reported from North East India and ethnobotanical studies in relation some indigenous/ethnic people of North East India respectively (Dutta and Dutta, 2005) and a comprehensive review on ethnobotany of India & NE India was reported by Lalramnghinglova, 1999. Saklam & Jain (1994) wrote a book on Cross-cultural Ethnobotany of North-East India.

Joseph and Kharkongor (1998) surveyed the Khasi and Jaintia tribes and recorded 100 plants species of ethno botanical importance. Ethnobotany of Khasi and Garo tribes was also studied by Rao and Neogi (1980). While ethno botanical uses of 33 plants employed by the Khasis, Jaintias and Garos for the Ichthyotoxi purpose are documented by Chhetry *et al.*, (1992) and Devi (1989, 1990) contributed ethno botanical studies of Manipur valley, Singh (1996) reported aphrodisiacal plants used by the Meitei community. Ethnobotanical folk practices and beliefs of the Ao Nagas have been reported by Sapu and Yogendra (1996). In 1997, Jamir reported the medical herbs utilized by the Naga tribes.

Most of the documentation and research on indigenous uses of medicinal plants is focused on the human aspect. Animal husbandry is a backbone of economy in the

Himalayan region and maintaining a healthy animal population will obviously benefit various ethnic and non-ethnic communities prevalent in the Himalaya. In North East Himalaya, possessing a large number of domestic animals is an indication of prosperity of their respective owners. Since there are many medicinal plant species used in curing various animal-related disorders and diseases, research should also be carried out and emphasized on the uses of medicinal plants for curing livestock diseases. Medicinal plants are an integral component of ethnoveterinary medicine. Farmers and pastoralists in several countries use medicinal plants in the maintenance and conservation of the healthcare of livestock. Intestinal disorders in cows, in Mexico, are treated with herbal extracts of *Polakowskia tacacco*. Dietary supplements such as vitamin A in poultry feeds in Uganda are supplied through enrichments of amaranth (*Amaranthus sp.*). It is estimated that medicinal plants, for several centuries, have been widely used as a primary source of prevention and control of livestock diseases. In fact, interest of such use in the veterinary sector has resulted primarily from the increasing cost of livestock maintenance and the introduction of new technology in the production of veterinary medicines and vaccines.

The steady use of medicinal plants as a subject of the national politics dates back to the late 30s of the last century (Stoyanov, 1939). The recently developed National Strategy (1994) and The National Plan for Biological Diversity Preservation (Hisler and Germer, 2000) stimulate data base creation and scientifically grounded management of medicinal plants resources. The World Health Organization estimates that some 80% of the developing world relies on traditional medicines and out of these, 85% people use plants or their extracts as the active substance (Sheldon *et al.* 1998). Many of those plants have become rare and endangered and some species are on the verge of extinction (Kala, 2000). Over 70% of the plants collected by the pharmaceutical industries involve destructive harvesting. These patterns of use possess

a definite threat to the genetic stock and to the diversity of medicinal plants. The first countries to seriously tackle these issues are China and India. Indeed, programmes dealing with medicinal plant conservation, cultivation, community involvement and sustainable development being initiated elsewhere, could benefit immensely from the Chinese and Indian experiences (World Bank, 1997).

Over 90% of the medicinal plants traded in India are harvested from the wild, most of them in an unsustainable manner. Due to an increasing demand for medicinal plants and a loss and fragmentation of natural habitats, close to 300 species of Indian medicinal plants have been so far assessed as under threat in the wild (based on International Union for Conservation of Nature (IUCN) Red List Criteria). Around 1,000 species are estimated to be facing various degrees of threat across different biogeographic regions in the country. In addition to the threat to medicinal plants, gradual erosion of traditional knowledge and health practices is leading to loss of conservation concern on the part of local communities. With the large number of India's medicinal plant species known to be distributed across diverse ecosystems, there is urgent need to initiate multifaceted action to achieve conservation, in all bio-geographic regions of the country. Unsustainable collection and of medicinal plants has been identified as one of the severe threats to medicinal plants population. Habitat alteration and specificity, narrow range of distribution, overstocking and over-grazing of areas by domestic animals are some of the threats endangering the existing populations of medicinal plants. Additionally, natural enemies such as pathogens, herbivores and seed predators could substantially limit the abundance of rare medicinal plant species in any given area. The Himalayan musk deer (*Moschus chrysogaster*) extensively grazes the flowers of 'Fenkamal' (*Saussurea gossypiphora*), an endangered high altitude medicinal plant species; hence this rare species has undergone reduction in species density and frequency. The Himalayan mouse hare or Pyka (*Ochotona roylei*),

locally known as 'Runda' in Uttarakhand Himalaya, also feeds on many medicinal plant species and their increasing population in high altitude areas has created an additional pressure on many medicinal plant populations. Mouse hares not only feed on these valuable medicinal plants but also destroy a sizeable quantity of medicinal plants in the high altitude areas (Dhayani and Kala, 2005).

In India, approximately 2,000 drugs are of plant origin (Dikshit 1999). Present rapid socio-economic changes and several years of unregulated collection of the valuable medicinal plant species have resulted in the depletion of their populations and habitats in nature. About 20–25% of existing plant species in India have become endangered (Laloo *et al.* 2006). Ours is an era of profound changes on the surface of earth, driven by an unprecedented level of human demands on the resources of our planet (Gadgil and Meher-Homji, 1986). Degree of threat to natural populations of medicinal plants has increased, because more than 90% of the medicinal plant raw materials of Indian and export herbal industries are drawn from natural habitats (Dhar *et al.* 2002). Threat assessment exercises as per latest IUCN guidelines for Southern and Northern India has already listed around 200 species of medicinal plants that are rare, endangered, and threatened. In India, forest cover is disappearing at an annual rate 1.5mha/yr. What is left at present is only 8% as against a mandatory 33% of the geographical area. Many valuable medicinal plants are under the verge of extinction. *The Red Data Book of India* has 427 entries of endangered species of which 28 are considered extinct, 124 endangered, 81 vulnerable, 100 rare and 34 insufficiently known species (Thomas, 1997).

Over the last decade, there has been a substantial increase in the quantity of medicinal plants sold in the market. In parts of Kulu district, 85% of families adjoining the Great Himalayan National Park (GHNP) meet 65–70% of their total annual cash income by medicinal plants trade (Singh 1999). About 61 kg of *Aconitum violaceum*

and 1,468 kg of *Picrorhiza kurrooa* were collected from the entire state in 1988–1989 (Sharma 1995), whereas a total of 5,100 kg of *A. violaceum* and 8,350 kg of *P. kurrooa* were collected only from GHNP for selling in the market by local communities in 1998–1999 (Singh, 1999). Nearly 25% of the estimated 25,000 species of vascular plants in the world may become extinct within the next 50 years (Raven 1987; Schemske *et al.* 1994). Red Lists of threatened plants are important tools for the conservation of threatened species (Berg *et al.* 1994).

Many plant species still have not been categorized and placed properly in the Red Data Book (RDB) of Indian plants and Conservation Assessment and Management Plan (CAMP) workshops because of inappropriate investigations, lack of ecological data, and subjective classification. Categorization of rare species in RDB has been based on herbarium collections rather than population estimation in the wild and assessment of rare species by few experts in CAMP are the major shortcomings of these documents. Moreover, in CAMP workshops, only few species are assessed, mainly those placed before experts and most species are still non-assessed. Aspects of policy and research concerning the cultivation of non-tropical and tropical medicinal plants and their genetic improvement; their conservation in botanical gardens; their storage in liquid nitrogen; their economic potential in international pharmaceutical trade; and their vulnerability to over-exploitation and extinction have been dealt with authoritatively (Akerle *et al.*, 1991; Chadwick and Marsh, 1994).

A pioneering medicinal plant conservation programme has been implemented by five state Forest Departments of peninsular India (Tamil Nadu, Kerala and Karnataka since 1993, and Andhra Pradesh and Maharashtra since 1999). This conservation initiative has resulted in the setting up of a network of 55 Medicinal Plant Conservation Areas (MPCA) across different forest types and altitude zones, conservation-with-community participation being a significant feature. The most

important purpose of this network of MPCAs is to conserve the plant resources in their natural environment. Especially, areas traditionally well known for medicinal plant wealth and with known high level of endemism were chosen.

Tissue culture is useful for multiplying and conserving the species, which are difficult to regenerate by conventional methods and save them from extinction. The production of secondary metabolites can be enhanced using bioreactors. The improved *in-vitro* plant cell culture systems have potential for commercial exploitation of secondary metabolites. Tissue culture protocols have been developed for several plants but there are many other species, which are over exploited in pharmaceutical industries and need conservation.

It is necessary to initiate systematic cultivation of medicinal plants in order to conserve biodiversity and protect endangered species. In the pharmaceutical industry, where the active medicinal principle cannot be synthesised economically, the product must be obtained from the cultivation of plants. Systematic conservation and large scale cultivation of the concerned medicinal plants are thus of great importance. Efforts are also required to suggest appropriate cropping patterns for the incorporation of these plants into the conventional agricultural and forestry cropping systems. Cultivation of this type of plants could only be promoted if there is a continuous demand for the raw materials. There are at least 35 major medicinal plants that can be cultivated in India and have established demand for their raw material or active principles in the international trade. It is also necessary to develop genetically superior planting material for assured uniformity and desired quality and resort to organised cultivation to ensure the supply of raw material at growers end. Hence, small scale processing units too have to be established in order that the farmer is assured of the sale of raw material. Thus, cultivation and processing should go hand in hand in rural areas. Taking into consideration the requirements of the plants selected, an agrotechnological package has

to be developed to suit the infrastructural facilities available. Research and development work has also to be carried out in the following areas (Silva, 1997).

1. Optimisation of agronomical conditions for cultivation
2. Training in safe fertiliser and pesticide use
3. Development of fast growing varieties with disease resistance
4. Determination of maturity and time of harvesting
5. No. of economically viable harvests
6. Methods of harvesting.

Decision on a limited scale of exploitation of medicinal plants from wild sources has to be based on accurate inventories about the kinds of plant resources, abundance and the feasibility of harvesting without damage to the ecosystem. In case potential candidates identified are not abundantly available, cultivation of them through agroforestry and community forestry programmes will have to be initiated. In this regard, development of industries based on medicinal plants can be included as a priority area as niche markets for these are already available.

The majority of current research programmes on medicinal plants conservation are being shifted from ecosystem to the species level. Although there are protected areas (PAs) across the Himalaya, except for a few Pas such as the Valley of Flowers in North West Himalaya and Tipi Orchid Sanctuary in North East Himalaya, most of the Pas have a focused attention on the preservation of faunal diversity. Not even a single PA is basically known for conservation of medicinal plants. Therefore, there is an urgent need for identification and notification of areas for conservation of medicinal plants on a priority basis (Dhayani and Kala, 2005).

2.3 Arunachal Pradesh Scenario

As mentioned in the introduction, Arunachal Pradesh with its rich vegetation and endowed with varied flora and fauna and has always been explorers and researchers

dreamland to explore to document the same but due to its unfriendly topography and multiethnic indigenous inhabitants along with improper road communication, it became less accessible. However, researchers and explorers took effort and has invaded it for better references for the next generation. Some of the important works and documentation related with ethnomedicinal plants are reviewed below:

Medicinal plants of Arunachal Pradesh (Hajra, 1977); medicinal plants of Tirap district (Tiwari et al., 1978); ethnobotanical study of plants used by the monpas tribes of Kameng District (Dam and Hajra, 1981); ethnobotanical survey of the tribals of subansari (Pal, 1984); There was a write up on Mishmi teeta (*Coptis teeta*) as rare medicinal plant by Hegde (1988) medicinal folklore of Tirap District (Nath and Bordoloi, 1989). Bhuyan in 1989 carried out PhD on Medicinal flora of Lohit district (undivided to Dibang & Anjaw districts) of Arunachal Pradesh with special Reference to Ethnobotany. Dam & Hajra (1997) published works on Observation on Ethnobotany of *Monpas* of Kameng district of Arunachal Pradesh. Ethnobiological information on 171 plant species used by the Nishis, the sulungs and the Apatanis of Lower Subansiri District (Gangwar and Ramakrishnan, 1990). Ethnobotany of wild edible plants (Haridasan et al., 1990) and ethnobotany of Nishis Karbis', Kacharis' and 'Chakma' (Maikhuri and Ramakrishnan, 1992), Tiwari & Tiwari (1996) contributed some of the important medicinal plant of tropical, sub tropical and temperate region of siang, Subansiri and Tirap districts. Das (1997) traced the ethnobotany of fern and fern-allies among Adis. Rawat & Chowdhury (1998) worked in the belt of Nishi & Apatani tribes from lower subansiry district of Arunachal Pradesh to bring out the Ethno-medico-botany. Field Manual for Propagation and Plantation of Medicinal Plants', a combined work (Haridasan et al, 2003), gives a handy information for cultivation of medicinal plants in order to conserve them. Ramashankar and Rawat (2004) brought out papers that dealt in Medico-Ethno-Botanical Observation of Changlang and Lohit Districts.

Ethnobotanical notes on the Hill Miri tribe of Arunachal Pradesh by Tag and Das (2004) described 28 species of plants which includes 5 medicinal plants, 11 food plants and remaining 12 are put through other ethno botanical use; Ethno medicinal of the Apatani in the Eastern Himalayan Region of India by Kala (2005) documents 158 medicinal plants species used by the Apatani for treating their various ailments. Ethnobotanical studies of Dihang-Dibang Biosphere Reserve of Arunachal Pradesh with special reference to Memba tribe was reported by Gajurel *et al*,(2006) where, they have enlisted 18 medicinal plant species from 88 useful plant species belonging to 47 family and 58 genera documented. The ethno botanical approach for various ethnic utilization by the people from the point of natural resources have always been a matter of concern. Ethno medicinal plants are just a fraction of that large chunk of natural resources and sustainable use and consumption is a concern for many naturalist and researchers.

There have been project works and individual research carried on with regards to improving and conserving the fragile and endangered and rare medicinal plants by various institute(Govt./ Semi. Govt./ NGOs). To name a few, SFRI, Chimpoo; BSI, Itanagar, Medicinal Board of Arunachal Pradesh; Forestry Dept. of NERIST, Nirjuli, Arunachal Pradesh; RGU, Doimukh, Arunachal Pradesh and almost every Forest Depts of the state do participate in it. Some of the research works carried out individually with the conservation of the medicinal plants are of Rao, Haridasan & Bisht.(1998), where they tried to propagate *Panax species* (Ginseng) vegetatively for conservation and commercialization. Bhuyan (2000) tried to produce some commercially important medicinal plants such as *Andrographis paniculata*, *Acorus calamus*, *Piper mullesia*, *Rauwolfia serpentine*, etc. Haridasan (2001), gave a status report on Ethnobotanical studies in Arunachal Pradesh, where he tried to study every possible accessible districts of the state to compile the report.

3.1 General information on Arunachal Pradesh

Arunachal Pradesh situated in the eastern most corner of North East India is a heterogeneous tribal state characterized by extra ordinary 26 major ethnic tribes and 100 sub tribes, all having diverse culture, religion and linguistic practices of their own. The predominantly hilly state with an area of 83,743 sq.km is the largest state among the north eastern states of country and it lies roughly between the altitude 26°28 N and 29° 30 N and longitudes 91° 0' E and 96°30E on the north-east extremely. Its forms a complex hilly system of Shivalik and Himalayan origin and is criss-crossed by numerous rivers and streams. The state share a total of 1630 Kms of international boundary with neighboring countries; 1030 kms with China, 160 Kms with Bhutan and 440 Kms with Myanmar. The McMohan line defines the international boundary between India and China. Administratively, the state is divided into 16 districts. The sparsely populated state has a very low density of 13 people per sq.km. The main occupation is agriculture.

The state comprises of Sixteen districts, namely- Anjaw, Lohit, Tirap, Changlang, East Kameng, West Kameng, East Siang, West Siang, Lower Subansiri, Upper Subansiri, Papum pare, Tawang, Khonsa, Lower Dibang Valley, Upper Dibang Valley and Kurung Kumey (**Fig 3.1- Arunachal Map showing the two districts**).

The total population of Arunachal Pradesh according to the census 2001 is 10,97,968 persons of which 5,79,941 are male and 5,18,027 are female. The schedule tribe population accounts for 64.22 percent of the total population. The literacy percentage is 54.34 (63.83 are male and 43.53 Female).(statistics collected by Economics & statistics Department, Government of Arunachal Pradesh).

The study area selected *i.e.* Lohit and Anjaw Districts were a single district (Lohit district) until 2003. Now, the Anjaw District is created bifurcating the Lohit

Vide Govt. notification No DAD-16/2002 dated 3rd December 2003.

3.2. General aspects of undivided Lohit District

Lohit district lies in the Eastern part of Arunachal Pradesh between 95° 15 and 97° 24' East longitude and 27° 33 and 29° 22 North latitude and its geographical area is approximately 11402sq.km. It is bounded by China along the Mc-Mohanline and part of Dibang Valley District in the North Changlang district to the South, China. Myanmar to the East and Assam state and part of Dibang Valley district to the west.

A chain of hills and mountains, the altitudes of which varies from 500 mts to 5000 mts approximately. The high mountainous region of the northern boundary is extremely cold as a result large tracts remain snow bound almost through out the year. The region at the foot hills are covered with dense tropical forests and interested by deep ravine and watercourses. The District is name after the principle river Lohit, which rises in the Eastern Tibet and enters our country at the plain of Parshuram Kund, a famous place of pilgrimage for the Hindus. River Kamlang and river Nao Dihing are the other main rivers, which flow across the southern part of the District. Numerous turbulent, streams, rivulets and water falls, which in turn joined the mighty Brahmaputra in Assam, feed these rivers. While following downhill these water bodies frequently change their courses, the turbulent and gushing crystal clear rivers causes deep soil erosions, which consequently pose serious challenge to the existing transport and communication system. During the Monsoon the land often gets disconnected with the rest of the country. The air communication also depends on the mercy of the weather.

The climate of the district varies from place to place. At the foot hills of the region such as Tezu, Chowkham, Namsai it is quite hot during summer and moderately cold during winter whereas circles at higher altitudes such as Kibithoo, Walong,

Chaglagam and Hawaii are pleasant during the summer but the winters are extremely cold. The rainfall of the district headquarter is 3478.5 mm for the year of 2003 and 2644.2 mm during the year of 2004. The other two sub divisions that is, Namsai and Hayuliang is 2485.3 mm and 2846.5 mm respectively.

3.2.i. Geology and Soil

Geologically, the soils are mostly alluvial, sandy mixer and clay. The underline rocks are sandstone and boulders. The aeromagnetic survey conducted by GSI found that the underline territory quaternaries are 5000 meters of sediments above the basement (Gazeteer of India, A.P.Lohit-2008).

3.2.ii. Physical Properties of Soil

The soil sample collected from agricultural field and forest floor of study sites were tested for its physical properties such as Moisture Content (MC), Hydrogen ion connection (pH) through various standers methods. MC ranges from 10 to 80 % during dry and rainy season measured with the help of Field Moisture and pH testing kit on the spot. The pH profile of the soil ranges from 5.4 to 6.99 which show characteristics of acidity but more proximately to basic characteristics.

3.2.iii. Climatic Conditions

The climate of the study area is largely influenced by nature of its terrain. At the foot hills of the region such as Tezu, Chowkham, Namsai it is quite hot during summer and moderately cold during winter whereas circles at higher altitudes such as Kibithoo, Walong, Chaglagam and Hawaii are pleasant during the summer but the winters are extremely cold. The rainfall of the district headquarter is 3478.5 mm for the year of 2003 and 2644.2 mm during the year of 2004. The other two sub division that is Namsai and Hayuliang is 2485.3 mm and 2846.5 mm respectively The area received heavy rainfall from both northeast and south-west monsoons. Maximum rainfalls of 750 mm to 800 mm were recorded during July and August when the relative humidity

rise up to 80-85%. The maximum and minimum winter temperatures were recorded to be 10° C and 25°C respectively.

The wind velocity is of normal occasionally, Cyclonic storms are experienced during the month of March and April which causes damage to the vegetation through branch desiccation and uprooting that were observed along river banks and road sides in particular. Dew is most common during the night throughout the year, which is beneficial to the seedling of tree crops during dry weather. The four major rivers namely: Lohit, Bereng, Tengapani and Nao Dihing serve as drainage sources flowing from east-west direction and simultaneously, serve as centre of fishing as well as irrigation and consumable water sources to local inhabitants.

The lowland areas such as Namsai, Lekang and Tezu circles are often flooded with rain water during monsoon period, found in stagnant form remain for 4-6 months till next monsoon season supports proliferation of aquatic biodiversity. The favorable climatic conditions like rainfall, temperature and high humidity in the area generally help the vegetation to acquire the general characteristics of the Tropical semi Evergreen Forest which is broadly classified as C I-Assam Valley semi evergreen forest after Champion and Seth's (1968) classification of the forest types of India distributed on alluvial plants along rivers and streams.

3.2.iv. Vegetation

The vegetation composition varies greatly with respect to the altitudinal differences within the two selected districts of Arunachal Pradesh. Lohit district at the lower limit mainly comprising of Tropical Evergreen forest type with patches of temperate evergreen forest. While the higher site comprises of Temperate forest type and some pockets of the Anjaw districts are filled up with Alpine forests (**Fig.3.2 a & 3.2 b,vegetation map**).

3.3. Lohit District

Lohit district stretch on area of 2802 sq. km. with a population of 125086 (Male-67150, Female-57936) as per 2001 census (District Socio Economic Review of Lohit & Anjaw District for the Year of 2004-05 published by District Statistical Office, Tezu). It is bound by lower Dibang valley district on the west, Anjaw District on the east, China on the north and Changlang district, Assam in the south. Tezu is the district head quarter established on 13th August, 1952 (**Fig.3.3, map of Lohit Dist**). The Khamptis and Singphos, Mishmis are the inhabitants of the district. The Khampti profess Hinayana sect of Buddhism and the institution of Chieftainship is prevailed in their society. They have their own Tai Script. All these tribes have their distinctive culture, custom and language of their own. They all are well connected with their natural environment. They are agrarians and traditional knowledge system prevails amongst them.

The vegetation in Lohit varies from tropical to temperate. But the majority forest is tropical to sub-tropical except for the higher limit of Wakro circle and the Kamlang Wild sanctuary, near the China and Myanmar boarder.

The luxuriant forest composed of beautiful large lofty trees forming the top structure. They are of immense use to the local indigenous tribes. They are used for domestic purposes and extraction of timber for construction of house pillars and rough bridges for transportation and communication within the villages. Some of the important medicinal trees used by the local inhabitants are *Aegel marmelos*, *Altingia excels*, *Artocarpus heterophylla*, *Aquilaria agalocha*, *Callcaripa arborea*, *Canarium bengalensis*, *Duabanga grandiflora*, *Dillenia indica*, *Emblica officinalis*, *Ficus semicordata*, *Oroxylum indicum*, *Gmelina arborea*, *Terminalia chebula*, *Terminalia bellirica*, *Terminalia arjuna*, etc.

Herbs, climbers and shrub having frequent distribution in all places mostly

dominate the ground level forest vegetation in Lohit District, in both open habitat and under forest floor. The medicinal value herbs and climbers are *Piper mullesua*, *Piper longum*, *Acorus calamus*, *Begonia*, *Mimosa pudica*, *Alocasia macrorhiza*, *Ageratum conyzoides*, *Mikania micrantha*, *Parabaeba sagittata*, *Paederia foetida*, *Cuscuta reflexa*, *Tinospora cordifolia*, *Tacca*, *Hediyotis*, *Tetrastigma lanceolarium*, While the commonly encountered medicinal shrubs are *Amomum subulatum*, *Alpina galanga*, *Calamus erectus*, *Curcuma longa*, *Cautleya gracile*, *Cassia hirsute*, *Chloranthus erectus*, *Desmodium laxiflora*, *Eupatorium odoratum*, *Hedychium densiflorum*, *H. gracile*, *H. spicatum*, *Lantana indica*, *Pogostemon plethranthoides* and *Uraria logopus*.

The forest plays an important role in the economy of the district. Few years back, Lohit District registered the second highest forest revenue earning district in the state. During that time there were 28 forest based industries which include 24 nos. sawmills, 5 nos. for saw and Veneer mills, 3 nos. ply wood factories. Local people in large numbers depended upon solely for their livelihood from these forests. The Government of Arunachal Pradesh collected a good number of amounts as revenue from these forest based industries. These Industries operated income till 1999. A ten year back, the Government of India banned the functioning of forest-based industries.

Lohit district has four Forest Divisions functioning in the district namely (1) Lohit forest Division, Tezu (2) Namsai Forest Division, Namsai (3) Southern Working Plan Forest Division Namsai and (4) Waste Land Forest Division Namsai. The southern working plan forest division Namsai is functional planning and not for carrying out the forest product.

3.4. Anjaw District

The Anjaw district has an area of 6190 sq km with a population of 18,441 (Male-10164, Female-8277). It is bounded by Lohit district on the west, Changlang

district on the south, China and Myanmar on the north and east (Anjaw District at a glance, 2007). The administrative centres are Hayuliang, Hawaii and Manchal. Mishmis and Meyor (Zekhrings) are the principal inhabitants. These people are animist and practice jhumming cultivation (**Fig. 3.4, map Anjaw District**).

The vegetation composition differs from Lohit as we move higher towards the Anjaw district. The tropical plants are succeeded by temperate and alpine plants. The tall vegetation mainly comprises trees like *Taxus bacata*, *Terminalia chebula* (Hayuliang), *Birch trees*, *Rhododendron spp.*, *Alnus nepaulensis* (Kibithoo, Walong), *Quercus spp.*, *Pinus spp.*, under herbs and shrubs plant species like the *Aconitum ferox*, *Coptis teeta*, *Berberis aristata*, *Panax sikkimensis*, *Paris polyphylla*, *Podophyllum hexandrum*, *Picrorrhiza ferox* (Chaglagam), *Piper spp.*, *Rheum spp.*, etc.

The Anjaw district has no forest division. The whole district falls under forest division of Lohit Forest Division, Tezu. In Lohit and Anjaw there are 14 nos. of Range offices, 12 nos. beat offices, among them 3 nos. are account beat offices. The forest area of both the district is 10442.8 sq. km. approx. The total reserve forest covers 4253.5 sq. km. and other purpose forest 2191.22 sq. km. Anchal Reserved Forest accounts for 678.9 sq. km., unclassified state forest accounts for 2691.48 sq. km and area closed to grazing is 7624 sq. km. The total area of the Lohit district and Anjaw district is 11402.8 sq. km accounting 91.5% of the area under the forest. The revenue earned during the year 2004-05 is Rs. 2,83,01,682, (**Table-3.4.1**). The forest department has great demand for the development of economics and commercials, and good source of revenue for over all and the area under forest is shown in (**Table-3.4.2**).

Table 3.4.1. Year-wise revenue and expenditure (2000-2005).

Year	Revenue Collected (in Lakhs)	Expenditure (in Rs.)
2000-2001	347.06	2,62,55,345.00
2001-2002	686.64	2,81,54,566.00
2002-2003	527.80	2,07,23,868.00
2003-2004	398.60	4,11,86,450.00
2004-2005	283.01	5,18,74,359.00

The total forest area in the district is about 10227 sq km. (**Statistical Hand Book of Lohit and Anjaw Districts for the year 2003 and 2004**).

Table 3.2. Area under forest

Sl.No.	Particulars	Area in percentage
1	Total forest area	80.50 %
2	Recorded forest area	61.555
3	Under reserve forest	20%
4	Under unclassified forest	61.05%
5	Wildlife sanctuary	18.49%
6	Protected forest	11.68%
7	Tiger reserve	3.39%
8	Biosphere Reserve	6.1%

3.5. The Communities

The study site is inhabited by a mixed ethno tribes, having their own ethno cultural and religio practices. However, the major tribes of the two districts are the Khamptis, the Mishmis and the Singphos. Other minor ethnic groups are the Khamyangs (Shyams), Chakmas, Tutsas, I-tons, Nepalese, Zakhrings (Meyors).

3.5.i. The Khamptis

The Khamptis are settled in the lower region drained by Tengapani and Nao Dihing rivers in Chongkham and Namsai area of Lohit valley. Originally, they are the descendent of Great Royal Tai family of Southeast Asia. They migrated from Thailand through Myanmar of their present homeland during the second half of the 18th century. However, prior to their arrival, the Tai prince Sukapha has established Ahom Rule at Kamjang in Assam in 1228 A.D. They have their own Tai script derived from the Shan. The word Khamptis is a composition of two words- 'khamp' means gold and 'ti' means place. In short, it is termed as land of Gold. The Khamptis has attained a high degree of civilization and culture while compared to its counterpart tribes in Lohit valley and rest of Arunachal Pradesh, with remarkable achievement in the field of art, culture and literature which is evident from their well organized traditional village council found in their society (Gazetteer of India, Arunachal Pradesh, Lohit District). The society of Khamptis is divided into classes having distinct social status. They have the Chieftain system in their social setup and follow patriarchal family norms. Their chief is known as '**Namchoom**' in Tai means King with influential quality. The priests who are second to the chief in rank are also very influential by nature. Below them, there are classes of freeman who form the bulk of the population. The slaves of the past are at the bottom of the social structure. Polygamy is socially recognized in Khamptis society. The first wife is usually enjoy higher status over others wives in the family.

The Khamptis speak Assamese, Hindi and English besides their own Tai Khampti language with well developed script called the **Tai** script. At least 56% out of their total population can read or write either in English or their own Tai language, whereas female literacy is low enough (20%) when compared with their male counterpart, which is 36%. Settled agriculture practices, fishing and hunting are their primary occupation. The logging and timber business were one of the lucrative business from 1978-1996. However, the 1996 verdict of the Supreme Court of India to stop timber operation in Arunachal Pradesh had a deep impact on Khampti's economy. An abrupt judicial order has not only halted the timber business but also forced many labourers and contractors in jobless state. Such development has led to socio-economic insecurity and many adolescent had fallen easy pray to drugs and smuggling activities. The Khamptis are Buddhist of the *Theraveda* School and believed that attainment of salvation of human soul can be achieved by following the Noble Eight folds *viz.*, abstaining from killing, abstaining from stealing, abstaining from non-celibacy, abstaining from lying, abstaining from liquor, alcoholic drinks, or intoxicants that cause heedlessness, abstaining from taking (soild) food after midday, abstaining from participating or witnessing dancing, singing, instrumental music performances and unseemly shows or sights and wearing garlands or unsing perfumes, cosmetics, embellishments, adornments and beautifying accessories, abstaining from using high and luxurious couches (furniture).

Khamptis are very sound among the tribes of Arunachal Pradesh and rated as most prosperous village of Asia during 1980 by the Planning Commission of India. They are also known for their efficiency in catching and training wild elephant which are still engaged in firewood collection and log dragging.

Their traditional house are constructed in a cluster of huts but raised at least 1.5 m above the ground to avoid flood water. The side wall and floor is chiefly made of

bamboo. The roof is usually design in circular-conical fashion which is covered with leaves of *Impereta cylidrica* and *Calamus erectus* while bases are supported by hardwood of *Morus laevigata*.

As per the traditional medicinal practices are concerned, Khamptese are known to be an inborn practitioners. Sen et al, 2008 studied traditional herbal knowledge of khamptis of Arunachal Pradesh. Almost all the houses grow medicinal plants within their herbal kitchen gardens for easy use.

3.5.ii. The Mishmis

The *Mishmis* are found in Wakro, Tezu, Sunpura Circles of Lohit and Anjaw districts of Arunachal Pradesh. They are animist in their belief and also show clan exogamy where father is the head of the family and enjoys polygamy as tradition in their matrimonial system since time immemorial. They are basically jhum cultivators and apart from *Jhum*, opium is extensively cultivated in open *Jhum* as alternative sources of income to sustain their children's education and to meet their socio-religious needs. The opium is used during their ritual ceremony which is integral part of their customs like tobacco and beverage made of millet (*Eleusine coracana*) as widely used by the Abo Tani tribes.

The Mishmis are divided under three sub -tribes, viz;

1. The Kmaan or the Miju Mishmis
2. The Digaroo or the Taroan Mishmis
3. The Idu or the Chulikata Mishmis

3.5.iii. The Singphos

The Singphos are settled in the lower regions of the Tengapani and Nao Dihing rivers. Their territory lies to the south of Lohit River continuous to the Patkai ranges of Tirap District comprising of the Manabhum Hills which may be divided into four different areas each claimed to have owned by the Clans such as Waket, Bsa, Ningru

and Lutha respectively. Each of the above areas comprising group of villages which are controlled in the judicial and societal matter by the Chief belonging to the clan in that particular area. The language spoken by this people is Singpho. Like Khamptis they also communicated in broken Assamese, Hindi and Nepali with different group of the people settled in the area. The tribe is headed by the chieftain system and follows patriarchal family norms. The Singpho society is divided into number of classes each under a chief. Their clan organization is based on lineage or sub lineage group which are all exogamous and patrilineal in character and the society is ruled by the clan exogamy. Each clan has their own forest land and timber operation other than for the collection of minor forest products such as wood, wild vegetable and medicinal herbs. The respectable Chiefs of the villages attired in shan or Burmese style of dressing. The men tie the hair in a knot on crown of the head, and wear a jacket of color cotton and chequered under garment of Burmese Pasto. They are also mostly followers of Buddhism, like the Khamptis. They are also expert in art and craft, where women usually are engaged in weaving dress for self and for family uses, besides weaving for the commercial purpose. Agriculture, fishing and hunting are their major occupation besides operating timber and logging for commercial scale.

3.5.iv. The Khamyangs (Shyams)

Khamyang, a small tribe, linguistically and culturally very similar to the Khampti tribe, are the followers of Lord Buddha and are inhabited in the lower parts of Lohit district in Arunachal Pradesh.

3.5.v. The Chakmas

The Chakmas were rehabilitated in Arunachal Pradesh in 1964 after displaced from Chitagong Hills Tracts, of the erstwhile East Pakistan (present Bangladesh). Sizeable number of Chakmas population residing in three villages namely Chakma Basti 1, 2 and 3 in Gunanagar area of the Chakma Circle. They claimed that their

present land was donated by Chowkuman Gohain, the local legislature and first Member of Parliament from Arunachal Pradesh. They have their own rich traditional herbal knowledge document in written form using their own script. They are also influence by the Buddhism philosophy of using herbs in healing processes. Their dialect is similar to Bangla of Chitagong Hill district of Bangladesh (Tag and Das, 2000).

3.5.vi. The Tutsas

The small group of people with distinct culture and vibrant custom has accommodated themselves in the Changlang district of Arunachal Pradesh. Agriculture is main occupation of Tutsas (both wet rice cultivation and common rice cultivation).

3.5.vii. The Nepalese

Most of them came as Tenants but now many of them own their own land. They are the follower of Hindu religion. The language spoken by this people is Nepali, Hindi, Assamese and Khampti. Agriculture is main occupation.

3.5.viii. The Zakhring/Meyors

The Zakhrings or Meyors are now known habitats the Walong and Kibithoo Circles of the Anjaw District. They are the Schedule tribe of the state are minor in numbers. They profess Mahayana/ Tibetan Buddhism.

3.6. Land use systems

Lohit and Anjaw districts have the lowest share of cultivated land in the State. The upper belt (Anjaw) is a district full of hilly chains. The mishmis and the Meyors (Zakhrings) are the main inhabitants and they practice shifting/ jhoom cultivation. However, the Mayors of Walong and Kibithoo circles also practice settled type of cultivation. The lower belt (Lohit) is plain and thus the khamptis, singphos, mishmis and deoris largely practices wet rice and terrace rice cultivation.

Agriculture is their major occupation, all the inhabitants of the study sites

cultivate maize, finger millet, legumes, *Colocasia*, tapioca and legumes, apart from cultivating rice in *Jhum* land for the food security. They grow spices such as chilly, Ginger, Onions, Black paper, Garlicks, etc. However, the major parts of their cultivable land is usually brought under Wet Rice Cultivation and earn substantial grain for trading in local market apart from self consumption

The land among the local inhabitants belongs to the community as a whole though private cultivable land is also prominent. There is no limit on ownership of cultivable land in most areas, except for the areas close to Assam. The Gaon Buras and Village Council made up of village heads and Chiefs distribute Land among the families according to their needs.

Jhum/ shifting cultivation, orchards, Horticulture cultivation plots, Herbal garden, Grooves, Wetland cultivation are some of the prominent land use system in the study area.

An analysis on land use data has shown a mark shift in the local workforce from the traditional agriculture to non-agriculture sectors, though the area is still remaining an agrarian economy, it has paved its way to wider horizon of land use activities and opens up new enterprises for sustenance. Few of the land use patterns are discussed below:-

3.6.i. Jhum/ Shifting cultivation

Jhum is a common ethnic practice for the low and high land tribes, such as the Khamptis, Mishmis and Singphos. But with the passes of the time this is reducing and permanent land cultivations are being practiced. However, in higher elevation this is a very common practice. Here, a patch of land is selected, it is then slashed off all vegetation using labour force or family members. After the dried slashed is put for fire, land sown with desired crops through broadcasting or dibbling. However, the commonly grown crops are maize, chilly, ginger and millets. The jhum fallow land was

fairly large ('more than 21 to 25 years.') in the past; however, at present it has come down drastically just to 3-5 years due to increased population pressure on available land.

3.6.ii. Orchards

Large area (private owned) of available land seems to have orchards of oranges. As we move to higher altitude, down from Namsai towards the hilly valley of the Mishmi hills, orchards of oranges along the roadside is a common sight. In fact, the major economic gains seem to flow from these oranges and many horticulture crops for the Mishmis are a ray of profit business.

3.6.iii. Horticulture gardens

This is one sector, which is gaining importance due to low returns from the traditional production system. The farmers are now opting for land extensive and capital-intensive mono cropping system such as orchards and tea plantation, cardamom plantation, etc.

The most preferred horticulture crops of Lohit and Anjaw district are oranges, cardamoms, ginger, pineapple, coconut, areca nut, piper, tapioca, etc. The local Government is extending various input, credits and material support at subsidies rates to bring up such farmers adopting it on large scale, which also get compounded due to take of well organized marketing facilities. Land tenure adjustment also is called for farmers opting for horticultural schemes.

3.6.iv. Home gardens

Home gardens or kitchen gardens are one of the common land use system prevalent in the study site. From a plot of 0.5 to 3 ha, located close to the habitation, the farmers obtain food products, firewoods, medicinal plants, vegetable species, and ornamentals. Home gardens meet a variety of requirements of the farmers all the year round. In fact they even performed social and aesthetic functions, serving as an

indicator of social status of the owner at the same time improving environmental quality around habitation some of the commonly grown home gardens plants amongst are the major tribes of Lohit and Anjaw district is shown in the **Table 3.3**.

3.6.v. Wetland Rice Cultivation

The study area, which comprises of two districts both distinctly separated from each other with natural landscape, topography and practice wetland rice cultivation. However, it is less common in Kibithoo and Walong region of the Anjaw district has an altitude of > 2250 msl. However, wet rice cultivation is practiced throughout hill terrain, both at low and high elevations, wet cultivation of rice could be seen as complementary to the Jhum system, and is done wherever the terrain permits, on available flat lands between hill slopes. The soil is fertile due to constant nutrient washout from the hill slopes, and does not need added fertilizers. It is sedentary farm of agriculture, and its main advantage lies in the land gives sustained yield year after year.

At lower elevation, often two crops are planted annually on the same land. Field preparation for the first crop is done in February-March. Seedlings are raised in nursery beds in the month of March, transplanted at the beginning of April and the crop is harvested by the end of July or early August. Immediately after the first harvest, the fields are again prepared with harvesting of rice completed by November or early December. Subsequently, the land is fallowed between December and March. Unlike at lower elevation, only one crop is raised at higher elevation. Sowing and broadcasting on the prepared land is done in June after the first showers. Crops are harvested in November, after which land is kept to fallowed until the following May or June. In all situation, all operations such as transplanting, weeding, harvesting and threshing are done by the family members. However, the planting is mainly done by the males of the house but in an uncommon state. The females of Deori community are also seen to do the planting of the field with great enthusiasm. The average size of land under wet

rice cultivation for family deffers among the tribals residing in the two districts based on availability of land. However, the Khamptis and Singphos enjoys a large hectares of land under WRC (>4-5 of land family) and the Mishmi and others (not more ha-2 hectares). More than 25%- 30% of land cultivated land area could be under this form of land use.

Table 3.3. Home garden (Cash crops)

Crops	Area (ha)	Khamptis	Singphos	Mishmis	Zakhrings
Arecanuts (<i>Betelnut</i>)	0.75 ha	+	+	-	-
Betel leaf (<i>Piperbetel</i>)		+	+	-	-
Golmirch (<i>Piper nigrans</i>)	1-2 ha	+	-	+	-
Banana	1-1.5 ha	+	+	+	-
Orange	1-5 ha	+	+	+	+
Sweet potato	-		+	+	+
Pineapple	2.5 ha	-	-	+	-
Jackfruits	-	+	+	+	+
Mustard	>5 ha	+	+	-	-
Opium	.2-5 ha	+	+	+	-

*Data collected by Sheelawati Monlai, .+(present), -(absent) based on house hold survey.

Chapter 4

Methodology

The Fieldvisits was selected according to the growth and collection season of plants in the region starting from First week of December 2006 - December 2009. The plants of ethnobotanical importance were collected and classified on the basis of their use in the study area. Local people including plant collectors and others on an age group basis were interviewed for ethnobotanical information of the area. Population size and its distribution, history of settlement, major social groups or classes, productive activities, subsistence crops, were also explored during the field work from the selected villages from the two districts(Lohit &Anjaw).

4.1 Interview

Successful ethnopharmacological research is dependent upon gaining entrée and establishing rapport with an indigenous group (Lipp, 1989). Interview was the main method to gather ethno–medicobotanical information of the indigenous tribes residing there in. The multiple-choice task questionnaires sheets were designed with scope for the incorporation and analysis. The study areas were surveyed and the demographic data, the socio-economic importance of the medicinal plants used by the local people were assessed. To analyze the total raw data (both participants and total plants used) in bulk quantity collected from the field during entire research period which encompasses total participants involved during interview from selected 200 villages from each circles of the two districts, information extraction was based on age group, sex ratio, literacy rate, occupational nature, economic and social status of the population under study and the exact number of taxa used to cure particular group of ailments along with associated parameters.

For data collection a semistructured questionnaire was used where the details about the medicinal plants collected, their traditional usage, parts used for treating various ailments, sources of collection and the ethnomedicinal preparation were recorded. Additional data were also gathered on the market potential of medicinal plants.

There was also informal interaction with local people, field experts, forest personals, traditional healers in regarding ethnomedicinal plant use and their identifications for easy assessment of the plants so that ultimate results with regards to compile the plants as per the Red Data Book of the Indian Plants (Nayar and Shastry, 1987) Analysis and Presentation of Flora data and Statistical Analysis

The floristic and ethnobotanical data gathered from the herbal practitioners are mentioned at the end of systematic notes. The data of ailments are mentioned in phrases and total ailments were calculated out using questionnaire formats. Statistical analysis have been made on all parameters such as diseases, plant part used, number of genera and species used in curing particular ailments. The data were analyzed using Microsoft Excel and STATISTICA computer software.

Finally, a list of 154 potential plants was selected and a “use value index” (UVI) for each species through Philips et al (1994) methods and the UVI has been presented without unit to assess the magnitude of utility and ecological status of the plants they used and following was the formula used:

$$UV = \sum RMxC/N, \quad \text{where}$$

UV = Use Value Index

\sum = Summation

RM = Total number of body parts extracted from plants

C= Number of times which a particular plants has been reported to be utilized

N= Total number of informants questioned

4.2. Socio economic Survey

Socio-economic study was conducted in the selected 70 villages from each circles i.e. 14 circles of both the districts in and around the study area. The method of Participatory Rural Appraisal (PRA) were conducted in selected villages of both the Anjaw and Lohit districts. Informations were gathered from the selected villages through personal/ group interviewing from the people of different categories like Traditional Healer, Gaon Burahs, Govt. employees and personal communications with the local people. It can be seen in **Table 6.1**.

4.3. Herbarium Methodology

The herbarium methodology includes collection of voucher specimen from the field to preparation of herbarium, identification, nomenclature and systematic position of the taxa by consulting herbaria, published standard Indian and world floras and current electronic literatures and journals. It also encompasses screening and presentation of flora statistics of the overall exact family, genera and species used by the local inhabitants as ethnomedicines.

4.3.i. Collection voucher specimens

Identification of plants is easier if the specimen is complete. Jain and Rao (1997) methods were followed during field collection for voucher specimen. At least two voucher specimens of each plant were collected along with additional reproductive structures (twig, leaves, flowers, cones, etc.); sometimes, extra vegetative parts, such as roots incase of herbaceous specimens. Extra reproductive parts are particularly valuable in the initial identification process and for later research were taken care off. Therefore, these parts were attached to the herbarium sheets and stored in small envelopes called fragment packets.

For herbaceous plants, the entire plant were collected including roots, stems, leaves, flowers, and fruits, make sure that all of these parts were present. Soils on the

roots were removed. Only flowering twig and barks were collected from cumbersome and large tree and only representative parts were collected and pressed under newspapers. The original plant height was recorded on the label. Senescent specimens were avoided because they deteriorate during and after the mounting process. For woody plants, representative parts were chosen as follows: tips of a terminal branch (about 30-35 cm, 12-14 in) showing leaf arrangement; flowering/fruitlet material; and other morphological structures unique to species. The collected specimens were brought to camp and dipped into 95% ethyl alcohol to remove microflora (microbes) and pests and later placed in a newspaper to sock the moisture content before transferred to perforated metal herbarium press.

For succulent specimens, the extra inner tissues were scoped out from one side and were subjected to artificial heat through ironing under the paper thickness maintained at 0.1mm to avoid discoloration of the samples. For small seeded plants, the seeds were separated out from fruits and kept in small pocket labeled with same specimen and collection number. For large fruitlet specimens, the fruit were collected separately and kept in a container of 70% formalin solution for museum specimen. For herbarium specimen, only fruit whose inner parts removed were given artificial heat.

4.3.ii.Preparation of voucher specimens

For permanent preservation, vouchers specimens were pressed and dried in a plant press suggested. Fresh plant material once pressed makes better voucher specimens than material that is partially dried before pressing. The press prevents the plant from losing its original integrity by ensuring against shrinking, wrinkling, and shattering of the specimen. The 95% ethyl alcohol treated materials were than placed inside newspaper and placed like sandwich between two cardboard and some specimens in metal herbarium press size of 16" x 18" inch size and tightened. The herbarium press was untied after 12-24 hours and news paper were changed to prevent

growth of fungus and pest. Secondly, wet specimens, like those dried too slowly, which are more likely to produce a discolored, spotted, and deteriorated specimen were taken extra care by adopting both artificial dry and sun dry methods. The excess water from wet specimens prior to pressing was kept inside handmade tissue paper to absorb excess moisture. The tissue papers were changed 3-5 times till complete dry of the plant samples and then kept under herbarium press for better shape.

4.3.iii. Mounting of pressed specimens

The well dried specimens were mounted on handmade paper herbarium sheet 16" x 18" inch size using Glue (with Copper sulphate crystal) which is resistant to pest and microbes. The seeds were packed in small pockets and pasted atop in right margin of herbarium sheet. Irregular stems are tight with cotton threads. For tree species with large fruit, the flowering twigs were pasted on herbarium sheet. The barks and fruits were tight with cotton thread to avoid dislocation. For large stem and succulents including aroids were pasted with Glue. It is tied with cotton threads to withstand accidental rough handling which were kept ready for data labeling.

4.3.iv. Data labeling of voucher specimens

Identification of the dried herbarium sample is considered much easier, when all sorts of possible characters are inserted in labeling format. Here, new format has been designed out keeping in mind the possible lapses encountered on collection of vital information of taxa during sample collection in previously used format. Present labeling specimen is a slightly modified version of Jain and Rao (1997) field and herbarium methods which is being used for present ethnomedicobotanical collection. Against each Vital Indices considered, all possible information (characters) considered were inserted in each labeled herbarium sheets.

4.3.v. Identification of herbarium specimens

Finally the mounted and labeled herbarium sheets were treated with naphthaline powder and kept in fumigation rack for 24 hours. The specimens were firstly identified described with Standard Indian Floras and finally examined at Herbaria and authority on regional flora like BSI, Itanagar, SFRI, Chimpoo, BSI Eastern Circle, Shillong, Flora of Assam (Volume I – V) and International Plant Nomenclatural Index (IPNI) with most up to date and best reference reflecting recent nomenclatural changes were consulted. The well labeled herbarium specimens were deposited in Herbarium of Department of Forestry, NERIST and herbarium of Mizoram University, Aizwal for the future reference.

4.4. Identification and preservation

The collected plant species were identified by referring to various taxonomic literatures such as Flora of Assam Vol 1-5(Kanjilal, Kanjilal et al.,1991), Flora of British India Vol 1-7), Regional manuals, several botanical journals, monographs. The doubtful unidentified plant species were again taken to herbaria of BSI Shillong, Itanagar, SFRI (Itanagar), Rajiv Gandhi University (RGU), NERIST for identification and the respective scientists helped identified and confirmed the doubtful specimens.

Botanical nomenclature is based on Latinized names for plant taxa and follows rules established by the International Code of Botanical Nomenclature (Greuter *et al.*, 2000) . The purpose of the Code is to regulate and maintain the usage of scientific plant names and promote nomenclatural stability. Each taxon has only one correct scientific name. This name consists of three or four parts: the genus, the specific epithet, and the full or abbreviated name of the author (s) who originally described the plant or who later made changes in the plant's classification. The genus and specific epithet together constitute the scientific name; both parts are italicized. The first letter of the genus is uppercase, but the specific epithet is entirely lowercase.

Principle of priority was strictly followed as per recent ICBN rules in case of more than one scientific name encountered and available published literature sources on particular taxa were consulted to prove the author who emended the name and synonyms are provided after name in current use (NCU). An author's name placed in parentheses represents the original author. The name following the parentheses is the person(s) who changed the taxon's classification [e.g., *Castanea pumila* (L.) P. Miller].

Scientific names change for many reasons, but mainly because a taxon has been reclassified or an older, validly published name is rediscovered. However, the best sources of nomenclatural changes followed are recent ICBN Saint Louis Code edited by Greuter *et al.*, (2000). The well known authors name were written in abbreviated form while the name of recent author were written in full form which are in accordance with ICBN St. Louis. Family arrangement and systematic position of genus is as per Bentham & Hooker's *Genera Plantarum* (1862) *Natural System of Classification* with slight modification done by Hutchinson [1884,1934 &1962], Cronquist (1968), Takhtajan (1967, 1969); *Index Kewensis* (1960-2000).

Further, we have tried to collect every possible piece of medicinal plant products used to cure various diseases. Some of the collected materials are in the form of powdered of two to three plant parts, tablets, liquids, seeds, barks, roots, leaves, buds, rhizomes, fruits

4.5. Ecological analysis for ethno medicinal plants

The ecological methods involves the quantitative assessment which allows ethnobotanists to analyze the ecological context within which people interact with the plants. These methods go beyond the traditional ethnobotanical plant collection, plant identification and use documentation and take into account the fact that things happen when people use plants.

4.5.i. Quantitative assessment of species density

This method measures the number of individuals per unit area, informing the researcher about how much of a given plant resource is available for exploitation and where the greatest abundance of this resource is located. It offers the possibility of estimating the long term sustainability of plant resource exploitation too. The study requires systematic or random plots or transects, which will vary in size in dependence of the selected plant species. The ethnobotanical data obtained was checked and compared with existing literature (Kanjilal *et al.* 1934; Haridasan *et al.*, 2003) and was analyzed both quantitatively and qualitatively. Hence the indigenous knowledge about plant resources, religious and cultural aspects such as population diversity was also documented.

4.5.i.a. Quadrature method

Stratified random sampling using **Quadrat method** (Misra 1968) was employed to collect the information on ecological and plant species diversity. Number of quadrats was determined with the help of species area curve (Misra 1968). Data were collected from 10 m x 10 m quadrates were used for sampling trees (GBH>30 cm) in all the 14 circles of the two districts. Within the same quadrat, saplings (10-30 cm GBH/collar circumference) were also sampled. 1m x 1m quadrates were used for vegetation analysis of the herbaceous species in all the stands. Relative frequency, relative basal area and relative density were calculated (Phillips, 1959) and the sum of these three represented importance value index (IVI) for various species (Curtis, 1959). For shrubs and herbs, the IVI was calculated by summing up relative frequency, relative density and relative abundance (Misra, 1968).

Phytosociological parameters such as density, frequency, basal area and importance value index (IVI) of individual species were determined in randomly placed quadrats of different sizes.

The relative value were measured by the following formulae.

$$\text{a) Relative frequency} = \frac{\text{No of quadrats of a species}}{\text{Total number of quadrats of occurrence of all species}} \times 100$$

$$\text{b) Relative density} = \frac{\text{No. of individual of a species}}{\text{No. of individual of all species}} \times 100$$

$$\text{c) Relative dominance} = \frac{\text{Total basal area of a species}}{\text{Total basal area of all species}} \times 100$$

$$\text{d) Basal cover} = \frac{\text{cbh}}{4n}$$

$$\text{Mean basal cover} = \text{Stand basal cover/density}$$

$$\text{IVI} = \text{Relative Frequency} + \text{Relative Density} + \text{Relative Dominance.}$$

To convert the values of the diameter (cm) at breast height (1.5 m above the ground) to basal area (sq.cm) through the following relation:

$$\text{Average basal area} = \pi r^2$$

Where r = average diameter

4.5.i.b. Biodiversity Indices

Species richness was determined as the total number of species recorded in the sampling plots in each study sites. The data on presence and absence of plant species in the sampling plots were analyzed for estimation of frequency whereas numerical strength of species was computed in terms of density following Misra (1968). Shannon diversity index (H'), which is based on the assumption that individuals are randomly sampled from an infinitely large population, The Shannon's species diversity index (Shannon and Wiener, 1963) was computed from the IVI values using the formula given by Magurran (1988) as,

$$H' = -\sum \{(n_i/N) \ln (n_i/N)\},$$

Where H' = Shannon's index of general diversity, n_i = importance value index of species

i , N = importance value index in the community.

The species dominance index (Simpson, 1949) was calculated as,

$$Cd = \sum \{(n_i/N)^2\},$$

Where, C = index of dominance: n_i and N being the same as in the Shannon index of general diversity.

Evenness of species was calculated using Shannon diversity index. It was worked out as follows:

$$\text{Evenness} = H' / \ln S$$

where, H' is the value of Shannon diversity

and $\ln S$ is the total number of species.

The ratio of abundance to frequency is a relative measure of degree of contagiousness of the distribution of species (Whitford, 1949). The ratio below 0.025 would indicate regular distribution; between 0.025-0.05 indicate random distribution and more than 0.05 contagious distributions (Curtis and Cottam, 1956).

4.6. Ethnomedicinal knowledge of different tribes

Ethnomedicinal information on wild plants was collected through interviewing Local inhabitants from within the selected 70 village communities from each circles of the two districts informants during January 2007 to December 2009. A structured questionnaire(as shown in the annexure II) was used to collect data on local plant names, uses, parts used, and modes of preparation and administration. Samples of recorded herbs, twigs of shrubs and trees were identified in the field with the help of local guides and previous works (Haridasan *et al*,2003; Ramashankar and Rawat,2004; Tag, Das and Kalita, 2005:). Unidentified botanical specimens were subsequently identified from various research institutes as mentioned in **4.4**

The ethnic tribes residing within the study area has vast knowledge with regard to herbal treatment. However, the use and utilization of these indigenous medicinal

plants was most common among the khampti and Singphos as compared to the mishmis residing in the higher limits of the topography. When interviewed amongst the indigenous people, many participated willingly. They had the zeal to express their piece of knowledge and we were in need of information for the same. The participating informants belonged from all the ages (teenager- adult) and from all the section of the society. Many of the young informants shared their views in regards to the subject. Some of the major discussion was on the purity of the ethnomedicinal knowledge and their inheritance. The practioner too gave their in-depth knowledge on medicinal plants and medicine preparation.

Five key informants such as 3 reknowned traditional herbalists from the two districts elders (both males/female), were consulted to verify the information obtained from the household level. In addition to this, several informal discussions with village residents and observer/participant techniques were also employed, wherever possible, to corroborate the survey data and to gather additional information to help relate to give a proper insight about the local traditional medicinal practices and their association with there native environment.

4.7. Assessment of Rare, Threatened and Endemic Species

The status of rare, threatened and endemic species were determined on the basis of Red Data of Plants by Sastry, Camp process, 1997, Assessment of rare and threatened plants of India by Jain & Rao, 1989, IUCN 2004/2006/2009 and field observation.

Chapter 5

Taxonomical Enumeration of Ethno Medicinal Plants

The present systematic treatment of ethno medicinal plants amongst the residing tribes include 272 taxa (Dicots – 210; Monocots – 52; Gymnosperm-1 and Pteridophytes – 9) Pteridophyte group has been kept at the end. Family arrangement followed is as per Bentham and Hooker, (1862). Natural System with slight modification done by Hutchinson, (1969). The following abbreviation are used below: ES = Ecological Status; H = Herb; Sr = Shrub; Cl = Climber; Tr = Tree; TG = Tall Grass; T = Tropical; ST = Subtropical; Tm = Temperate; Alp = Alpine; AqH = Aquatic herb; Ep = Epiphytic; F = Frequency; C = Common; R = Rare; En = Endangered; Thr = Threatened; HS = Harvesting Sources; PPU = Plant Parts Used; TME = Traditional Method of Extraction ; FF = Flowering and Fruiting seasons; Ver. = Vernacular; Kha. = Khampti; Sing. = Singpho; Mishmi = Mis; Zakhring = Zak; Ass. = Assamese; Sans. = Sanskrit; Hind. = Hindi; Eng. = English.

RANUNCULACEAE

1. *Aconitum ferox* Wall.

Ver. Name: Kha.: Bhisā; Ass./ Hind.: Bhish; Sans.: Visha; Eng.: Indian Aconite

Specimen Examined: Sheelawati Monlai, Mishmi Hills, Anjaw. SMZU 1125

Plate No. 1.a

Herb, roots biennial, paired, tuberous, daughter tuber ovoid oblong, ca 2.4 – 4 cm long, 1 – 1.5 cm thick, few filiform hairs, external dark brown, fracture scarcely ferruginous, yellowish, taste strong tingling sensation; stem ca 80 – 100 cm long, erect, emits numerous fine roots; leaves ca 10 – 15 cm long, rounded or oval, palmately 5 lobed; flower terminal raceme, tomentose, dense, short sharp beak, testa plaited; follicles densely villous.

FF: Jun – Jul.

Distribution: In the higher elevation of Hyuliang, Don and Anjaw region in Mishmi Hills, Siang, Subansiri, and Kameng Districts of Arunachal Pradesh. Roots are highly poisonous.

ES: H/Alp/Tm/R/E

HS: Wild

PPU: Dried root

Ethnomedicinal use: Dried roots are shaved and a pinch of few microgram of powder is mixed with lemon juice which is applied in joint to cure rheumatic swelling. A few microgram of powder is diluted in water and applied to cured snake and scorpion bite.

2. *Aconitum palmatum* D. Don.

Ver. Name: Kha./Ass.: Bhisā; Hind.: Bhishawa

Specimen Examined: Sheelawati Monlai, Mishmi Hills, Anjaw. SMZU 1098

Stem sub-erect, 60 – 80 cm long, roots biennial, paired, tuberous, daughter roots shortly conic, irregularly shaped, 4 – 10 cm long, sometime flexous twisted; leaves 10 – 14 cm in length, glabrous, sinus shallow, reniform, deeply 5 – lobed, sharply cut; panicles few flowered, helmet testa plaited, greenish blue, pedicel long.

FF: Jun – Jul.

Distribution: Mostly in higher elevation of Hyayuliang, Don and Anjaw region of Mishmi Hills, Siang, Subansiri, Kameng Districts of Arunachal Pradesh. Often grow along with *A. ferox*.

ES: H/Alp/Tm/R/E

HS: Wild

PPU: Dried root

Ethnomedicinal use: Dried roots are shaved and a pinch of few ml gram of powder is mixed with lemon juice which is applied to cured snake and scorpion bite. Alkaloid

contents in roots is slightly lesser than *A. ferox*, hence less poisonous.

3. *Coptis teeta* Wall.

Ver. Name: Kha.: Mishmi teeta; Ass.: Mishmi Tita

Specimen Examined: Sheelawati Monlai, Chaglagam, Anjaw. SMZU 1121

Plate No.: 1.b

Small perennial herb upto 20 cm high with basal leaves in shade; rootstocks horizontal, rhizomes bright yellow when cut, leaf petiole long, pinnatifid, three lobed, leaflet ovate lanceolate, serrate, green, shining; flowers 1 – 3, small greenish or yellowish; follicles 6 – 8, stalked.

FF: Feb - May

Distribution: In the middle temperate region of Hyuliang in Mishmi Hills, Dibang valley, Siang and Kurung Kame District of Arunachal Pradesh. Prefer moist humus rich loose soil in forest floor or sometime on rock and tree trunks. Harvesting of roots is done from 3rd year onward in month of October-November.

ES: H/Tm/R/En

HS: Wild

PPU: Dried root

Ethnomedicinal use: Mecerated particles from underground roots are highly bitter. It is mixed with lukewarm water and consumed during malarial fever, dysentery, stomach pain. It is also taken as tonic during debility and dyspepsia.

DILLENACEAE

4. *Dillenia indica* L.

Vern. Name: Kha.: Makshann; Ass.: Oh tenga; Hind.: Chalita; Sans.: Bhavya

Specimen Examined: Sheelawati Monlai, Namsai, Lohit Valley. SMZU 333

Medium size tree, evergreen, height upto 30 m, trunk pale colour, highly branched; leaves simple, petiole 3.5 cm long, whorled, ca 18 – 20 x 10 – 11 cm,

oblanceolate, acute, serrated, venation prominent, parallel, gregarious; inflorescence terminal, solitary, 9 – 12 cm, fleshy persistent, twisted, acresent calyx, large, petal white; stamen numerous, carpel 20, pseudocarps yellowish green, globose, acresent green calyx, seeds many.

FF: Jan – Dec.

Distribution: The plant is found throughout upto 700 m in Lohit Valley and adjacent state Assam which seems strictly tropical and subtropical.

ES: Tr/T/ST/C

HS: Wild

PPU: Sundried pseudocarp, raw leaf.

Ethnomedicinal use: The fleshy acresent calyx is cut into thin slice. It is then sundried and ground to powder, mixed with glass of water and administered during Piles and Indigestion. Leaf is pounded to paste and taken to cure dysentery. Jelly like extract from pulp is used in curing dandruff. Dry powder of fruit, dried pulp of *Embllica officinalis* and powdered leaves of *Stachytarpheta indica* are formulated into polyherbal drug and given to sexually debilitated male.

MENISPERMACEAE

5. *Cissampelos pareira* L.

Ver. Name: Kha.: Tonabi; Ass.: Tabukilota; Hind.: Harjori; Sans.: Ambasta

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 332

A dextrose climbers grow annually from perennial rootstock, stem cylindrical, tough, glabrous green; leaves simple petiolate, ca 11 – 12 x 18 – 20 cm, orbicular peltate, mucronate, light pubescent, dark green above, middle pinna broad; flower greenish yellow, male flower cymose, sepal 4 - 6, petal 4, conate into cup; female flower racemed, crowded in axil pseudobract, sepal 2, petal 0; drupes 4 - 6 mm across,

globose, deep red.

FF: Apr – Jun.

Distribution: Mostly in secondary forest, also grow under dense floor, throughout Lohit Valley.

ESC: Cl/ T/ST/Tm/C

HS: Wild

PPU: Root/Leaf

Ethnomedicinal use: The sundried root powder is used as abortifacient. Decoction of raw leaf and powder of sliced stem is used as antimalarial drug, cough and cool.

6. *Stephania glandulifera* Miers.

Ver. Name: Kha.: Bhimraj; Ass.: Tubukilota; Hind.: Akanadi; Sans: Vanatiktika; Eng.: Tape vine.

Specimen Examined: Sheelawati Monlai, Lathao,Lohit. SMZU 336

They are perennial climbers; stem cylindrical, tough, glabrous, twining, mature stem upto 2.5 cm in diameter, grey in colour; tuber large, often dotted, irregular in shape up to 20 cm in diameter, shade brownish or grey in colour; leaves simple, petiolate, ca 12 – 14 x 9 – 10 cm, ovate, hastate, acuminate, nearly glabrous, upper dark green, lower pale, middle pinna broad, venation reticulate.

FF: Apr - May

Distribution: In secondary forest, often cultivated near backyard. Grow under dense canopy coverage in both tropical and temperate zone at an altitude of 100 – 3500 m in Lohit and entire Northeast India.

ES: Cl/T/ST/Tm/R

HS: Wild

PPU: Tuber, leaf

Ethnomedicinal uses: Powdered tuber is consumed during malarial fever, skin

inflammation, liver complain, stomachache and general body pain. It is mixed with leaf powder of *Plumbago rosea* and consumed during general debility. Fresh leaf extracts are taken to relieve high heart beat, and use as cardiogenic.

7. *Parabaena sagittata* Miers.

Vern. Name: Kha: Panangsai

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU 466

Plate No.: 1.c

Small climber with milky juice; stem twisted, ridge prominent, glabrous, upto 0.2 cm diameter, green to grey; leaves ca 10 – 12 x 5 – 8 cm, glabrous, base cuneate, sagittate, oblong lanceolate, distantly serrated, acute apex, light green above, lightly pubescent; flower supra-axillary solitary, peduncle 3 cm long; sepal 6, petal often lobed, dull white; stamens of male and female flower – 6, carpel 3; style recurved; drupe globose, saffron when matured.

FF: May – Nov.

Distribution: Very rare, often found as climber in secondary forest, disturbed site coupled with *Lantana* and *Eupatorium* species. Frequent in study site.

ES: CI/T/ST/R

HS: Wild

PPU: Stem/Leaf

Ethnomedicinal uses: Milky juice of stem and pounded leaf paste is applied on cut wound. Stem is cut into thin slice and sunried. It is then pounded to powder which is used in chest inflammation, skin allergy and throat infection.

8. *Tinospora cordifolia* Willd.

Vern. Name: Kha.: Hak yungha; Ass.: Sagunilota; Hind.: Gulancha; Sans.: Guduchi;

Eng.: Tinospra

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 1167

Plate No.:1.d

Large twining climber; stem dotted, cylindrical, bark often blisters at maturity, upto 3 cm in diameter, young stem light green, glabrous; leaves alternate, ca 9 – 13 x 8 – 12 cm across, petiolate, ca 1.5 2 cm long, pinna cordate, broad, acuminate, entire, deciduous; inflorescence short spikes, raceme umbellate, yellow, appears when plant is leafless, male flower clusters, female solitary, petal cuneate, stamen free; drupe globose glossy red.

FF: Apr – Aug.

Distribution: As deciduous climber in secondary and virgin forest under canopy coverage occur at altitude of 400 – 1500 msl from camp towards Hayuliang, Wakro and upper part of Tezu.

ES: CI/T/ST/Tm/C

HS: Wild

PPU: Stem, Leaf

Ethnomedicinal uses: Aerial stem is cut into thin slice. It is sundried to remove moisture content. The dried material is pounded to powder which is used during cough, debility, fever, urine trouble, joint inflammation and liver complaint. It is also used during dysentery, diarrhoea, and abnormal heart palpitation.

PAPAVERACEAE

9. *Papaver somniferum* L.

Vern. Name: Kha.: Kani; Hind.: Khaskhas; Sans.: Chosa; Eng.: Opium poppy

Specimen Examined: Sheelawati Monlai, Kheram, Lohit. SMZU 287

Annual herb upto 40 – 100 cm, branched tap roots; stem cauliramous, fistular

latex; leave simple, ca 12 – 17 x 10 – 13 cm across, alternate, sheathing base, lobed, distantly dentate, bright green, glabrous; flower solitary terminal spikes often bent; ca 6 - 9 cm long, pedicel upto 2 cm, calyx 2, pubescent, corolla 4, orange yellow to red; stamen and carpel many, ovules many in each locules, stigma discoid; fruits capsule subglobose.

FF: Apr – Jul.

Distribution: Plant is exotic, often widely cultivated in upper and middle zone of Lohit, Changlang and Tirap District on commercial scale.

ES: H/T/ST/Tm/C.

HS: Cult.

PPU: Young flower bud

Ethnomedicinal uses: Dried young flower bud and leaves are used as antidepressant and stomach pain reliever. Milky juice of young flower buds is used by Mishmi and Khamti as anticough. It is highly sedative drug agent used during socio-religious ceremony among the Mishmi.

FLACOURTIACEAE

10. *Gynocardia odorata* R. Brown

Vern. Name: Kha.: Makampo; Ass.: Bonsha

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 495

Medium size tree, deciduous, ca 10 - 30 m tall, glabrous; leaves ca 10 – 32 x 3.6 – 10.5 cm, alternate, entire, oblong or obovate oblong, cuneate at base, acute, cm across, dark green above, paler beneath, glabrous; berry globose, ca 8 – 12 cm, pericarb thick, hard, rugose, greyish; seeds numerous, ellipsoid, irregularly compressed, ca 2.5 – 3 x 1.8 – 2.2 cm, testa rough, endosperm oily, cotyledons fleshy and flat.

FF: Dec - Jan.

Distribution: Widely distributed under canopy coverage and secondary forest, throughout Lohit Valley.

ES: Tr/T/ST/Tm/C

HS: Wild

PPU: Pericarp Seeds/Bark

Ethnomedicinal uses: Powder of sundered pericarp is used to cure gonorrhoea, chest distension but cause tooth fall when juice of young pericarp applied on canin. The fresh bark extract is also used to skin allergy, cuts and wound.

CARYOPHYLLACEAE

11. *Arenaria orbiculata* Royle

Vern. Name: Kha.: Lajaibori

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 496

Perennial herbs, shoot sterile or many flowered, branches decumbent or prostrate, pubescent; leaves ca 2 – 2.5 x 1 – 1.3 cm, subsessile, orbicular or elliptic, obtuse, acute or apiculate, 2 - 7 mm long, 1 nerves; petioles upto 2 mm long, ciliate; flowers solitary or in few flowered cymes; sepal ovate lanceolate, ca 3 – 4 x 1.5 mm, glabrous, 1 nerved; petals ovate – lanceolate, 3 x 1 mm; styles 3, capsule 6 –valved; seeds many, 0.7 mm in diameter, smooth and dark brown.

FF: May – Oct.

Distribution: In secondary forest and wasteland, along the roadside and agriculture fields as weeds in Lohit and rest of Arunachal Pradesh. Often cultivated in home backyard for medicinal uses.

ES: H/T/ST/C

HS: Wild

PPU: Leaves, Stem, Inflorescence

Ethnomedicinal uses: Whole plant is pounded to paste with leaves of *Euphorbia hirta*. The paste is rolled into spherical shaped pills and sundry for 7 – 10 hours. Two pills are given twice a day to cure general weakness and low vitality.

12. *Drymaria diandra* Blume,

Vern. Name: Kha./Ass.: Lajabori bon

Specimen Examined: Sheelawati Monlai, Latho, Lohit. SMZU 485

Prostrate or suberect annual herb, rooting at nodes, stem slender, smooth green; leaves ca 0.5 – 2.5 x 0.4 – 1.6 cm ovate, cordate, glabrous, elliptic or orbicular, mucronate, lower half sparsely pubescent, dull green, across; stipules bristly; flowers white, ca 0.6 cm long, axillary or terminal peduncle cymes; sepal pubescent outside, petals 0.35 cm, 2 partite, deeply lobed; stamen 5, capsule trigonous, ovoid.

FF: Mar – Oct.

Distribution: Commonly grow in open places, along the forest margin and abandoned jhum field in study area and entire NE region.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Whole plants

Ethnomedicinal uses: The juice extract of whole plant is mixed with root powder of *Mimosa pudica* and applied during scorpion and snake bites. The paste of leaves are applied in cuts and wound. It is also applied during skin inflammation and swelling caused by insect bite, and by the touch of hot water and fire.

PORTULACACEAE

13. *Portulaca oleracea* L.

Vern. Name: Kha.: Yayinu; Ass.: Noniya; Hind.: Khursa; Sans.: Brihaloni; Eng.:

Comon purslane.

Specimen Examined: Sheelawati Monlai, Manmaow, Lohit. SMZU 643

Erect or decumbent herbs, upto 45 cm high; stem fleshy, purplish to dark green; leaves ca 2 – 4 x 1.5 – 15 mm fleshy, spirally arranged, subopposite, spatulate, subconspicuous 1 mm long axillary hairs; flower 2 - 30 arranged in capituli with 2 involucral leaves, surrounded by bracteoles and hairs; sepal carinate, ca 7 x 8 mm, petals 5 yellow, broadly obovate; stamen 7 – 10; styles upto 5 mm, 3 – 4 arms; capsules ovoid, straw yellow; seeds reniform, numerous, glabrous and black, testa cells stellulate, tubercles.

FF: Jun - Oct.

Distribution: In the area of high moisture content and paddy field in the plain of Chongkam and Namsai, Wakro and Mahadevpur circles, mostly tropical and subtropical, often cultivated in kitchen garden for ornamental and vegetable purpose.

ESC: H/T/ST/C

HS: Wild/Cult.

PPU: Whole Plant

Ethnomedicinal uses: Fresh paste is applied in burnt skin. The whole plant is cooked and is consumed to relieve high blood pressure, insomnia, constipation and indigestion. Paste is mixed with powdered fruits of *Amla* and rolled into small pills. It is consumed to improve appetite and physical weakness.

14. *Portulaca tuberosa* Roxb.

Vern. Name: Kha.: Yayinu on

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 601

Perennial herbs, decumbent or suberect, upto 6 cm long, stem fleshy, root thick, tuberous; leaves ca 4 – 26 x 0.6 – 4 mm, cauline, spiral, oblong, obtuse, rounded at apex, axillary hairs 1 – 6 cm long; flowers solitary, 2 – 4 in capituli, subtended by an

involucre of 3 – 7 cauline leaves; sepals ecarinate, 2 – 5 x 1 – 3 mm; petals 4 – 6, bright yellow, ca 2.5 – 11 x 1.6 – 10 mm, obovate, spreading; stamen 10 – 25; filaments 1 – 5 mm long; styles 3 – 5 arms; capsules globose.

FF: Jan – May.

Distribution: Plant is grow well in tropical and subtropical zone. It is found to be cultivated in flower pot for medicinal as well as ornamental purposes by the Khamti villagers in Momong village of Chomgkam Circle.

ES: H/T/ST/C

HS: Wild/Cult.

PPU: Whole plant

Ethnomedicinal uses: Fresh paste is applied in burnt skin. The juice extract is used during sensational urination and hotness in abdomen region of the body.

CLUSIACEAE

15. *Garcinia anomala* Planchton

Vern. Name: Kha.: Manang neng, Ass.:Thechu

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 604

Small tree upto 9 m high, bark grey or brwn, rough, gum yellowish; leaves ca 7 – 12 cm x 4-6cm, elliptic oblong, or oblong lanceolate, shortly blunt acuminate, coriaceous, quite glabrous, upper surface dark green, lateral nerves of 10 – 16 in either side, base cuneate, sub-acute or rounded; petiole chennelled; flowers 3 in axillary cymes, supported by opposite leafy bract; petals dull white, twisted; staminiodes yellow at tips; fruit one celled, 2-6cm in diameter.

FF: Dec - Feb.

Distribution: Often found rare in plan part and foothills near Parsuram Kund of Wakro circle, 58 km east of Chongkam.

ES: Tr/T/ST/Tm/R

HS: Wild/Cult.

PPU: Leaf/Flower

Ethnomedicinal uses: Fresh leaf paste is consumed along with rice to cure indigestion.

Flower is anthelmintic and used for curing skin infection and allergy.

16. *Garcinia pedunculata* Roxburgh.

Vern. Name: Kha.: Mahaw.

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 607

Tree upto 20 m tall. Bark thick, corky; brwn, leaf blade oblong, obovate, or oblong-lanceolate, (12-) 15-25(-28) x 7-12, dark green, lateral nerves of 10 – 16 in either side, base cuneate, sub-acute or rounded; petiole chanelled; flowers 3 in axillary cymes, supported by opposite leafy bract; petals dull white, twisted; staminiodes yellow at tips; fruit yellow, large, oblate, concave on both ends when matured, fruiting pedicel 5-6 cm, seeds 8-10, reniform.

FF: Aug-Dec.

Distribution: Found in the forests of Parsuram kundh and hayuliang.

ES: Tr/T/ST/Tm/R

HS: Wild

PPU: fruit

Ethnomedicinal uses: the dried fruit is consumed along with luke warm water to cure indigestion.

17. *Mesua ferrea* L.

Vern. Name: Kha.: Kamko; Ass.: Nahor; Hind.: Nagkesar; Eng.: Indian Roses

Chesnut

Specimen Examined:- Sheelawati Monlai, Namsai, Lohit. SMZU-116

Medium size evergreen, ca 20 – 30 m high, trunk grey, upto 3 meter girth, wood oleoresin, aromatic; leaves ca 7 – 8 x 3 – 3.5 cm, opposite, oblong lanceolate, acuminate, dark green above, white beneath; inflorescence solitary, flower white, sepals 4 in 5 pairs 12 – 20 mm long, inner much longer; petal white, purplish veins, 2 – 5 cm long; stamen numerous, globose yellow mass, 4 - 5 mm long; ovary bilocular, 2 ovules in each locule; fruit ca 1.5 – 2.5 x 4 – 5 cm across; seeds dark brown, 3 faceted, shining.

FF: Feb – May.

Distribution: The plant is mostly grow in tropical and subtropical under canopy coverage or in open; widely cultivated as avenue tree in Chongkam and Namsai circle introduced by the Forest Department near roadside.

ES: Tr/T/ST/Tm/C

HS: Cult.

PPU: Bark, Leaf, Seed

Ethnomedicinal uses: Pounded raw leaves and powdered barks are used to cure piles, skin irritation, and rheumatic pain in joint and ankle. Pounded raw seed is taken with hot water during abdominal and chest pain.

MALVACEAE

18. *Hibiscus rosa-sinensis* L.

Vern. Name: Kha: Nognang tibi; Ass: Jaba; Hind: Jasum; Eng: Chinese hibiscus

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 114

Erect or suberect, evergreen shrub upto 10m high, bushy appearance; leaves simple, ca 8 - 10 x 6 – 8 cm across, ovate-lanceolate, serrate, acuminate, dark green; flower solitary, pedicel upto 10 cm long; epicalyx 5 – 7, calyx - 5, corolla 5, dark red,

twisted, decurved lip; stamen numerous, monadelphous, united with carpel, anthers yellow; carpel 5, style upto 12 cm long; stigma rounded; fruit loculicidal capsule.

FF: Jan. – Dec.

Distribution: Mostly planted as fencing tree, ornamental near home backyards. Flowers are also offer during worship to god.

ES: Sr/T/ST/C

HS: Cult.

PPU: Flower bud, Root

Ethnomedicinal use: Fresh paste of red petal is administered orally with glass of goat milk or lukewarm water in early morning for one week to cure irregular mense cycle. It is also used as laxative during constipation. Fresh paste of roots are applied on burnt and allergic skin.

19. *Hibiscus syriacus* L.

Ver Name: Kha: Nongnang tibe, Hind: Jasum, Sans: Arkapriya, Eng: Rose of Sharon

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 105

Erect evergreen shrub upto 6 m high, stem grey; leaves ca 6 – 12 x 4 – 6 cm, ovate-lanceolate, distantly serrate, glabrous, acuminate, dark green; flower solitary, large, pink, pedicel 5 cm, epicalyx 4 – 5 below calyx, calyx 5, pointed, corolla 5, adnate to staminal tube, twisted, lip erect; stamen numerous, monadelphous, anther reniform; carpel 5, style 10 – 12 cm, stigma rounded; fruit capsule.

FF: Jan. – Dec.

Distribution: Cultivated near backyard as medicinal and ornamental purposes, throughout Lohit Valley, Thailand and Yunnan Province of China and Japan, mostly an Asiatic.

ES: Sr/T/ST/C

HS: Cult./W

PPU: Flower bud, Leaf

Ethnomedicinal use: Paste of flower bud is used in irregular mense cycle, constipation and bodyache. Fresh paste of leaf and lower buds are used in skin inflammation, mild fever, ulcer and in constipation.

20. *Sida acuta* Burm.f.

Vern. Name: Kha.: Pairangi

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 610

Annual, erect, herb, 0.5 – 2 m high, stem pubescent; leaves ca 1 – 8 x 0.5 – 2.5 cm, elliptic oblanceolate, acute, coarsely serrate, 3 nerved at based, petiole 2 - 6 mm long, pubescent, stipules ca 6 – 12 x 1 – 1.5 mm; flower axillary, solitary, 2 – 7 in clusters; calyx 5, campanulate, slightly acresent, glabrous outside; corolla 5, yellow, hairs glandular, antheriferous towards apex; ovary ovoid; 1 seeded, glabrous, dark brown.

FF: Sep - Oct.

Distribution: Throughout plain and foothill region of Lohit District along roadside and wasteland in both shady and open habitat.

ES: H/T/ST/C

HS: W

PPU: Leaf, Bark, Seed

Ethnomedicinal uses: The sundried leaf and bark is pounded to power and taken during Pneumonia and mild fever. Powered seeds are consumed as laxative agent during constipation.

21. *Urena lobata* L.

Vern. Name: Kha.: Nong ente; Ass.: Athamuga; Hind.: Bachita; Eng.: – Candillo

Specimen Examined: Sheelawati Monlai, Hawaii, Anjaw. SMZU 1110

Under shrub, upto 2 m high, hair stellate, leaves ca 6 – 8 x 5 – 7 cm,

pubescent, variable, upper ones small, elliptic, oblong-ovate, serrate, acute; lower one larger, orbicular, 3 – 5 lobed; flower pink, axillary, solitary, epicalyx adnate at the base, calyx hairy; corolla, pinkish, slippery on crush; fruits globular, ornamented with pointed hook.

FF: Oct – Apr.

Distribution: Common along the roadside and open places in all the villages of Namsai forest area, throughout India.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Flower, Bark, and Seed

Ethnomedicinal uses: Fresh root paste is applied in dog bite skin. Orally taken during dysentery and constipation. Flower paste is applied in allergic, burn, boils and sores. Juice extract of leaves are consumed during mild fever and malaria.

22. Abelmoschus esculentus L.

Vern. Name: Kha./Ass.: Bendi; Hind.: Bhindi; Sans.: Bhenda; Eng.: Lady's Finger

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 615

Annual herb, upto 2.5 m high, stem erect, lightly pubescent, bark reticulate, usually unbranched; leaves alternate, palmate, 3 - 5 lobed, variable flower solitary, large yellow tinged with purplish spot at centre, fruit long, 4 angled, green, upto 15 cm long, pubescent, apex pointed, internal tissue with viscous fluid; seeds white, fleshy at young, grey at maturity.

FF: Oct – Apr.

Distribution: Cultivated throughout India as one of the common vegetable crop; preferably grow in well aerated soil with pH ranges from 5.5 – 6.8, mostly in tropical and subtropical region.

ES: H/T/ST/Tm/C

HS: Cult.

PPU: Stem, Flower, and Seed

Ethnomedicinal uses: Sundried stem is pounded to powder and mixed with powder of *Zingiber zerumbet* and used to cure diabetes/liver disorder. Paste of fresh flower and fresh bark is used as anti-inflammatory, burn and boil eruption. Cooked fruits are consumed to relieve constipation, taken by pregnant mother for the easy delivery of child.

STERCULIACEAE

23. *Sterculia villosa* Roxb.

Specimen Examined: Sheelawati Monlai, Tiding, Anjaw. SMZU 378

Plate No. 1.e.

Medium size tree, tall upto 20 m high, bark grey, young part rusty tomentose; leaves palmate, 5 – 7 lobed, cordate, tomentose beneath, lobes ovate oblong, acuminate, petiole 15 – 22 cm; flowers yellow, polygamous, calyx tomentose, 1 cm long, campanulate; follicles 2 - 7, sessile, outer surface brownish tomentose.

FF: Mar - Jun.

Distribution: In secondary forest and often mixed with other vegetation in dense forest, along the roadside in study area.

ES: Tr/T/ST/C

HS: Wild

PPU: Stem/Root Bark

Ethnomedicinal uses: Sundried root bark is shaved into powder and mixed with honey which is applied in cuts and wounds, taken orally to cure liver disorder. The fresh stem bark is pounded to paste and applied in burnt and inflamed skin.

24. *Pterospermum acerifolium* L.

Vern. Name: Kha.: Nungra gach

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 418

Large evergreen tree upto 30 m high; petiole 15 – 25 cm, leaves large, ca 15 – 40 x 12 – 23 cm, cordate or peltate, often lobed, glabrous above, grey tomentose beneath; flower white fragrant, ca 13 – 15 cm long, axillary on short thick panicles; calyx tomentose outside, petal 10 cm long, cuneate; ovary brown tomentose, seeds winged.

FF: Mar - Jul.

Distribtuion: Found in dense forest of Lohit Valley and entire Arunachal Pradesh, throughout NE region.

ES: Tr/T/ST/Tm/C

HS: Wild

PPU: Floral part/Root

Ethnomedicinal uses: Sliced root is sundried and pounded to powder, then mixed with pinch of salt in glass of boiled water and consumed during cough and gastritis trouble. Calyx and petal is pounded to paste and applied in wound and muscle swelling.

TILIACEAE

25. *Corchorus olitorius* L.

Vern. Name: Kha.: Chbang; Ass.: Marasag; Hind.: Changas; Eng.: Tossa jute

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 621

Herbs, annual or biannual, stout, erect upto 1.8 m high, glabrous; leaves ca 3.5 – 14 x 3 – 4 cm, oblanceolate, rounded at base, serrated, acute; flowers 1 – 2, leaf opposed, shortly pedunculate cyme, 10 – 14 mm across, bract 4 – 5 mm, subulate;

sepals 5 – 7 mm, apiculate; petals yellow 5 – 7 mm long, oblong spatulate; stamens many; carpel 5, ovary cylindric, style short, stigma 5 - lobed, papillate, capsule 1-2, 10-ribbed, glabrous; seeds trigonous, 2 x 1.4 mm, black.

FF: Jul - Jan.

Distribution: Often cultivated in garden as vegetable crop, throughout plain part of Lohit valley and Assam.

ES: H/T/ST/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Raw leaf is collected in bunch and cooked with pinch of salt and consumed during constipation. Similar amount is consumed with rice by expectant mother for from 8 – 9 month of pregnancy to ensure easy and safe delivery. The dried leaf powder is consumed during diarrhea and dysentery.

26. *Triumfetta rhomboidea* L.

Vern. Name: Kha.: Agara bon; Ass.: Bon agora; Hind.: Chikti; Eng.: Burbush

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 625

Bushy pubescent herb, stem sparsely hairy, often tinged purplish at some point; leaves ca 7 – 10 x 5 – 6 cm, highly variable, pubescent, often tri-lobed, rhomboid, orbicular-ovate, cordate, acuminate, nerves 3 – 7 pairs at base, irregularly serrated; flower yellow, dense in lateral, terminal cymes; sepal oblong, petal 5, hairy, stamens 8 – 15; fruits globose capsule, spiny hooked.

FF: Aug – Dec.

Distribution: In open places, along the roadsides and forest margin in entire Lohit Valley and NE region.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Seed

Ethnomedicinal uses: Sun dried matured seeds are pounded to powder and mixed with glass of boiled water. It is consumed during constipation and sensational urination. Powdered root bark is used as anti-fertility or sub fertility agent.

BALSAMINACEAE

27. *Impatiens pulchra* Hook.

Vern. Name: Kha.: Namhu

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 622

Plate No. 1.f.

Fleshy erect herb, 20 – 30 cm high, sparsly branched; leaves ca 2 – 10 x 1.8 – 4 cm, alternate, oblong to elliptic lanceolate, attenuate at base, acuminate apex, margin crenate, dark green above, petiole 1 – 3 cm long, lateral nerves 1 – 12 paires; flower rose straw to pink, peduncles 1 – 2 flowers, bracts above peduncle, pedicel 2 cm long, lateral sepal 2, ovate, lip funnel shaped, spur abruptly constricted, filiform, curved, 1.3 – 2.5 cm long; standard suborbicular, acutely crested on back, wings broad, basal lobe elliptic, distil lobe narrowly elliptic, capsule turgid in middle, narrow at both end, shining; pollen grain cylindrical, reticulate, pollen tube prominat.

FF: Dec – Jan.

Distribution: Abundantly grow in foot hill and higher elevation of Lohit, throughout NE region.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Fresh Leaf/Stem

Ethnomedicinal uses: Juice extract of fresh leaf is applied in pus, skin eruption. The sundried leaf powder is mixed with dry powder of *Diplazium esculentum*, *Cuscuta reflexa* and rolled into small pills. 5 - 6 pills are taken for 7 - 8 days during jaundice.

28. *Impatiens balsamina* L.

Vern. Name: Kha.: Namhun; Hind.: Gulmendi; Sans.: Duspatrijati; Eng.: Balsam

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 628

Annual, erect 30 – 70 cm high, stem fleshy, glabrous, branches few; leaves ca 8– 12 x 4 – 6 cm, alternate, lanceolate, serrated, acute, glabrous, decurrent into a glandular petiole; flower rose or pink, pedicel 1 – 3 cm, axillary, slender, pubescent; sepals minutes, ovate; standard orbicular, retuse, horned, wings broad, lateral lobes rounded, terminal sessile, large; lip small, boatshaped, spur incurved; capsule tomentose, seeds reticulate.

FF: Dec – Jan.

Distribution: The plant seems exotic and found in Garden for medicinal and ornamental purpose.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: Paste is applied in swelling and inflammation. Powdered leaf is mixed with leaf paste of *Sida acuta* and consumed in small quantity during low vitality.

OXALIDACEAE

29. *Oxalis griffithii* Edgew

Vern. Name: Kha.: Yasomp; Hind: Al kathmith; Sans.: Rakta changeri.

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 631

A perennial herbs, stem weak, pubescent, upto 23 cm long, leaves trifoliate, leaflets broadly subcordate with narrow sinus, green, slightly pubescent; flower pink, regular, sepal 5, green, imbricate, pubescent, petal 5, stamen 10, (5 shorter), anthers yellow; carpel 5, tetralocular ovary, one ovules in each locule; fruit loculicidal capsule,

globose, hairy, triangular, pointed, seed dehisces by longitudinal splitting.

FF: May - Jul.

Distribution: Plant is growing in wild in secondary forest, open habitat, often raising in garden for vegetable.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Fresh leaf is consumed as digestive and stimulant. Juice extract is taken during cough and chest congestion. The raw leaf is taken as salad during diabetes and liver disorder.

RUTACEAE

30. *Citrus limon* L.

Vern. Name: Kha.: Hattal; Hind.: Baranimbu; Ass.: Goranambu; Eng.: Lemon

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 629

Shrub or small tree, upto 3 m high, spinous, branchlet glabrous; bark grey green; leaves ca 5.5 – 11 x 2 – 5 cm; unifoliate, purplish in young, narrowly winged, articulate apex, blade at base, blades ovate or elliptic-oblong, base obtuse, glandular serrulate, spikes condense racemes, 5 – 7 flowers, calyx 5, urceolate; corolla 5, white, ovate – oblong obtuse, ca 15 – 20 x 3 – 5 mm; stamen 30 – 40, free above, anthers apiculate, 4 – 6 mm long, greenish yellow; ovary subcylindric, style thick; fruit ovoid, 8 – 12 locular, seeds ovoid, white nutlet.

FF: Apr - May.

Distribution: In both cultivated and wild condition in Lohit, entire Arunachal Pradesh

ES: S/T/ST/Tm/C

HS: Wild/Cult.

PPU: Fruit/Flower

Ethnomedicinal uses: Fruit juice is collected in vessel and paralysis portion of hand or leg is immersed inside and remain kept for ½ an hour to 1 hour. Same juice is used for joint pain and body swelling. The flower is eaten during cough. Seeds and flower buds is pounded to paste and applied on forehead during headache and common cold.

31. *Murraya paniculata* L.

Verna. Name: Kha.: Mutang karil; Ass.: Jongli kari; Hind.: Kamini

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 634

Shrubs, upto 10 m high, branchlet slender, glabrous, puberulent, bark pale, lenticellate; leaves ca 3.5 – 7 x 2 – 3.5 cm, glabrous, leaflet alternate, 3 or 5, very rarely 1 foliate, minutely pubescent below, ovate elliptic, cuneate at base, margin crenulate; inflorescence terminal, few flower, ca 10 – 15 mm long, pedicel 10 mm, glabrous; calyx 5, acute, petal 5, acute, white; stamen 10, ovary ellipsoid, 2 – 3 locule, 1 ovule in each locule, fruite ovoid, reddish in maturity; seeds ellipsoid, brownish, pubescent.

FF: Feb – Jul.

Distribution: In moist deciduous forest of Namsai forest division, Lohit range and Namdhapa.

ES: Sr/T/ST/Tm/C

HS: Wild/Cult.

PPU: Fruit/Leaf

Ethnomedicinal uses: The sundried fruit pulp is pounded to powder and mixed with Zinger in red tea which is taken as herbal tea during low BP and constipation. Leaf paste is applied during joint pain and skin irritation. Leaf is also taken as salad with rice.

32. *Murraya koenigii* L.

Vern. Name: Kha.:Hom; Ass.: Narsingha/Kari Patta

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 635

Strongly scented shrub, deciduous, stem glandular, shining; leaves imparipinnate, leaflets 9 – 25, alternate, ca 0.5 – 4.2 x 0.2 – 1.5 cm, ovate lanceolate, oblique at base, glabrous above, slightly pubescent beneath; flowers terminal corymbose, ca 1.2 cm long, white, calyx 5 segments, small, corolla 5; stamen 10; stigma capitate; berries ovoid.

FF: Feb – Jul.

Distribution: Along the forest margin and under secondary forest in study area. Often cultivated at backyards for medicinal purposes.

ES: S/T/ST/Tm/C

HS: Wild/Cult.

PPU: Fruit/Leaf

Ethnomedicinal uses: Leaf paste is applied in cuts and wound. The cooked leaves are consumed during diarrhea and chest pain. The juice is taken during jaundice and diabetes.

33. *Zanthoxylum acanthopodium* Wall.

Vern. Name: Kha.: Mezenga; Ass.: Tejmure; Hind.: Damar

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 641

Plate No. 1.g.

Shrub or scandent small tree, high upto 6 m, branchlet armed with pseudostipular or rarely scattered, incurved or straight, prickles, bark grey brownish, leaves trifoliate, rachis ca 15 – 25 cm long, leaflet 3 – 15, ca 8 – 10 x 3 – 4 cm, glandular, green, quite glabrous, acute, lanceolate, serrated; inflorescence axillary panicle, 2 cm long, male flower 3 mm long, pubescent; anther 4 - 6, reddish; female flower 2 mm long, perianth disk shaped as in male, ovary 2 – 5 carpellate, glandular punctate, follicle 2 – 5, reddish, seeds glabrous black.

FF: Mar – Sep.

Distribution: Under canopy coverage in forest of Namsai and at higher elevation, throughout Arunachal Pradesh.

ES: Sr/T/ST/Tm/R

HS: Wild

PPU: Bark/Leaf

Ethnomedicinal uses: The fresh bark and leaf is crushed and consume during indigestion and loss motion. Sun dry leaf and seeds are pounded to powder and consumed with hot water as stimulant during body pain and sleeping sickness. Seeds are burnt and smokes are inhale during nausea and viral fever.

34. *Zanthoxylum nitidum* Roxb.

Vern. Name: Kha.: Mezenga; Ass.: Tejamul; Nishi: Honior.

Specimen Examined: Sheelawati Monlai, Tiding, Anjaw. SMZU 1132

Scandent or climbing shrub, evergreen, branchlet armed with few velvety tomentose, 3 – 5 mm long prickles; leaves trifoliate to imparipinnate, rachis grooved, ca 30 – 40 cm long, prickly beneath, velvety tomentose to glabrous, leaflet 3 – 9, ca 12 – 16 cm x 3 – 6 cm, lateral one opposite, broadly ovate elliptic oblong, obtuse to cuneate at base, abruptly acuminate apex, glandular, crenate margin, nerves 5 – 15 pairs; inflorescence axillary, fascicle 3 – 14 cm long, male flower 1 – 5 mm, pubescent, petal 4, elliptic, stamen 4, female flower 2 – 3 mm long, ovary 4 carpellary; fruits 1 – 4, globose, seeds spherical, smooth black.

FF: May - Oct.

Distribution: In dense forest floor of Namsai forest division, in the higher elevation of Tezu and Hayuliang circle of Lohit.

ES: S/T/ST/Tm/R

HS: Wild.

PPU: Bark/Leaf/Fruit

Ethnomedicinal uses: Paste of fresh bark is consume during indigestion, applied in allergic skin. Fresh leaf is consumed as vegetable. Boiled soup is consumed during high BP and insomnia. Pounded dried fruit is used as stimulant. Use to kill infected worms in Buffalo and Cow wound.

35. *Zanthoxylum armatum* Wall.

Vern. Name: Kha.: Makat; Ass.: Tejmure; Hind.: Damar

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 644

Small spiny aromatic tree commonly distributed in high elevation. Branch armed. The leaves are imparipinnate or trifoliate often with flattened prickles, leaves upto 5 pairs, opposite, ovate to lanceolate, entire to glandular-crenate, acute to obtusely acuminate. Flower green to yellow in dense terminal and occasionally axillary sparse panicle, follicles generally reddish.

FF: Mar – Sep.

Distribution:

ES: T/ST/Tm/C

HS: Wild

PPU: Fruits and Seeds

Ethnomedicinal uses: Directly taken raw, dried and powder form or in the form of chatuny. Fruits are chewed as a remedy for stomach ache and indigestion. Fruits are also powdered and given for liver complain.

BURSERACEAE

36. *Canarium strictum* Roxb.

Vern. Name: Kha.: Dhuna, Ass.: Duna; Hind.: Kala damar; Eng.: Black dammar tree.

Specimen Examined: Sheelawati Monlai, Hailiong, Anjaw. SMZU 378

Tall tree, high upto 50 m, buttressed, resin brown and cranked, young branchlet

ferruginously woolly; leaves ca 7 – 21 x 4 – 10 cm, 3 – 6 paires, rarely 7 – jugate, rachis tomentose, leaflet ovate – elliptic, acute, lanceolate, brownish pubescent, serrulate margin; inflorescence pseudoterminal, tomentose; male flower 15 – 20 cm, bisexual, calyx campanulate, lobes 3, corolla densely pubescent; stamin 6 – 8 mm, connate; anther reduced; drupes oblong, dark blue.

FF: Jan – Dec.

Distribution: Rare in subtropical and temperate forest of Arunachal Pradesh, Walong and Kibito area of Lohit and higher elevation.

ES: Tr/T/ST/Tm/R

HS: Wild.

PPU: Bark/Leaf/Fruit

Ethnomedicinal uses: Melted resin is applied on skin to cure the irritation caused by the hairs of poisonous insect larvae. It is also applied during eye irritation and redness.

MELIACEAE

37. *Azadirachta indica* Juss.

Vern. Name: Kha.: Neem; Hind.: Neem; Eng.: Neem tree

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 653

Tall deciduous tree, 20 m high, bark dark grey, furrowed, scattered tubercles, height 5 – 15 m; leaves imparipinnate, ca 4 – 6 x 1 – 1.5, alternate, exstipulate, 8 – 10 cm, leaflet 9 – 19, coarsely serrated, along margin, acuminate apex, often aborted; spike compound, solitary panicles, white, fragrant; sepals 5, petal 5, free, oblong, 5 mm long, spreading, ciliate, pubescent, ovary globose, style terete, stigma light colour rim at

base; drupes 1.5 – 2 cm long, smooth yellow, seed enclosed by thin fleshy sweet pulp.

FF: Mar – Sept

Distribution: Cultivated in open fallow land and near village area in Namsia forest Division.

ES: Tr/T/ST/C

HS: Wild./Cult

PPU: Bark/Leaf/Fruit

Ethnomedicinal uses: Paste of leaves and seeds are applied to cure rheumatism and skin diseases. Sun dry powder is taken during gastritis, diabetes and jaundice. Powder of root bark is used as purgative.

RHAMNACEAE

38. *Rhamnus nepalensis* Wall.

Vern. Name: Kha.: Pokopii

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 648

Small tree or undershrubs, bark blackish brown, smooth, upto 10 m high, branches spreading; leaves ca 7 – 17 x 3 – 6 cm, oblanceolate, elliptic lanceolate, acuminate, base narrow, sharply serrulate, sparsely pubescent, nearly glabrous shining; panicles 6 – 25 cm across, flowers white, 0.2 cm, subsessile; calyx persistent, acresent; drupe 0.5 – 0.6 cm across, dark red.

FF: Aug – Nov.

Distribution: Grow near roadside and secondary forest in the part of Lohit valley and Mishmi Hills.

ES: Sr/T/ST/C

CH: Wild.

PPU: Leaf/Fruit

Ethnomedicinal uses: Paste of fresh leaf and fruits in glass of raw milk are taken twice

a day for 2 weeks during jaundice and malarial fever. Powder of root bark is use in chest pain and difficult breathing.

39. *Ziziphus oenoplia* L.

Vern. Name: Kha.: Mokho on, Ass: Jun Bogori

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 651

Thorny shrubs, upto 10 m high, branches irregular, zigzag; long torn arised from base of petiole; leaf ca 2.5 – 6 x 1.5 – 3.5 cm, ovate lanceolate, acuminate, base slightly oblique, softly pilose beneath nerves 3 – 4 from base, margin serrated, spines recurved or straight; cymes axillary, upto 2 cm across; petals shorter than sepals; drupes 0.5 – 0.8 cm across, ovoid globose, black in maturity.

FF: Aug - Feb.

Distribution: Occurs at lower elevation of Namsai Forest division, mostly in wasteland and secondary forest.

ES: Sr/T/ST/C

HS: Wild

PPU: Root/Fruit pulp/Leaf;

Ethnomedicinal uses: Dried fruits pulp is pounded to powder form and mixed with fresh paste of onion and rolled to pills. The 1 – 2 pills are taken twice a day during aneamia, indigestion and sore throat. Decoction of root powder is taken for dysentery and diarrhea. Fresh leaf decoction is applied to cure gum bleeding.

40. *Zizyphus mauritiana* Lamk.

Vern. Name: Kha.: Mokho; Ass.: Bagori

Specimen Examined: Sheelawati Monlai, Chongkam, SMZU 652

Small tree, armed, branches tomentose, prickly at some point, angled; leaves ca 3 – 5 x 2 – 3.7 cm across, ovate oblong or orbicular, acute or obtuse, entire or crenate, green above, pale beneath, lower surface pubescent, nerves 3 at base, stipules

modified into spin; flowers greenish yellow, axillary fascicles cymes; calyx glabrous within; petal clawed; disc 10 lobed; fruits globose, green at young, brownish red at ripen; pulp sour, seeds rough, dull white.

FF: Aug - Feb.

Distribtuion: In open habitat and along the roadside. Often cultivated in garden for the fruits.

ES: Sr/T/ST/C

HS: Wild/ Cult

PPU: Root/Fruits pulp;

Ethnomedicinal uses: Sundried pulp is gound to powder and mixed with fruit pulp of *Embilica officinalis*. The mixed crude drug is rolled into pills and sundried. 2 - 3 pills are consumed per day during low vitality, indigestion and leack appetite.

VITACEAE

41. *Vitis barbata* Wall.

Vern. Name: Kha. Angoor thon;Chakma: Songra murich

Specimen Examined: Sheelawati Monlai, Chongkham, Lohit. SMZU 256

A large climber with stout hollow branches, glandular hairs on young shoot, petioles and peduncles; leaves ca 8 – 17 cm x 7 – 12 cm, ovate, cordate, acute or acuminate, faintly lobed, distantly dentate, membranous, glabrate above, dense brown hair beneath; inflorescence paniculate cymes, laxly ovate, 4 – 10 cm long, flattened glandular hairy, petiole 2 – 6cm, flower sessile, 5 merous; fruit elliptic 4 – 7 cm long, pedicel short stout, 1- seeded, seed compressed, fissured radiate to margin.

FF: Jul – Sep.

Distribution: In secondary forest in plain region of Chongkam - Namsai forest.

ES: Cl/T/ST/R

HS: Wild.

PPU: Leaf/ Stem bark

Ethnomedicinal uses: The paste of fresh leaf is used as component in healing fractured bone. Powdered bark is mixed with leaf paste of *Ficus hispida* and taken with lukewarm water twice a day in Diabetic and Liver pain.

42. *Cissus repens* Hamk.

Vern. Name: Kha.: Panangsai

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 109

Trailing glabrous limbers, stem rounded, succulent, red covered with whitish bloom, pruinose; pleasantly acrid; leaves simple, ca 4 – 10 x 2 – 7 cm, ovate, acute, base reniform, repand serrate; repand pale green, membranous, glabrous, lateral vein 3 – 4, arch above, peduncles 4 – 10 cm long, stipules small, tendrils 8 – 120 cm, forked; flowers greenish red, compound umbellate, 0.4 cm across; calyx truncate, 4 lips, petal 4, triangular, ovate, style conspicuous; fruit globose, ca 0.5 – 0.9 cm diameter, red but turn black when rippen.

FF: Aug – Jan.

Distribution: At middle elevation of Mishmi Hills, frequent in wasteland and secondary forest of Chongkam - Namsai.

ES: Cl/T/ST/Tm/C

HS: Wild.

PPU: Leaf/Stem

Ethnomedicinal uses: The fresh paste of leaf and stem are used as one of the basic ingredient during preparation of medicines for healing fractured bone. Leaf paste is used to cure boil, inflammation, and vomiting tendency.

43. *Tetrastigma serrulatum* Roxb.

Vern. Name: Kha.: Ya enka

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 145

Glabrous climbers, often trailing on ground, stem slender, rooting at nodes, tendrils with adhesive disc; petiole 1 – 6 cm long, leaf pedately 5 – foliate, leaflets ca 2 – 12 x 1 – 5 cm, rhomboid to obovate or lanceolate, cuspidate, acuminate, serrate, membranous or chartaceous, base obliquely 0.4 – 0.6 cm across, green, tendril slender; inflorescence compound umbellate cyme, flower axillary or terminal, greenish, petal 4, pedicel slender, style nil, stigma flat, spreading, 4 – lobed, fruit obovoid, ca 0.7 – 0.9 cm long, reddish brown.

FF: Jan – Dec.

Distribution: In secondary and degraded forest in plain region of Namsai and Mishmi Hills.

ES: CI/T/ST/C

HS: Wild.

Ethnomedicinal uses: Fresh leaf paste is used as one of the medicines components for curing fractured bone. The same is also applied on freshly cut wound and wound.

44. Tetrastigma lanceolarium Roxb.

Vern. Name: Kha.: Swaramiya

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 659

A heavy climber with flattish woody stem, raised transverse bars at intervals; bark rough, brown, muricte, corky warts; leaves 3 – 5 foliate, ca 12 – 20 x 8 – 9 cm, common petiole 10 – 14 cm long; stipules 3 cm, oblong lanceolate, pubescent, deciduous; terminal leaflet largest, outermost pair oblique, elliptic, distantly cuspidate serrate, ovate, acuminate, somewhat fleshy; flower yellowish, 3 cm long, axillary corymbose, female cyme few, male cyme longer, petal pubescent, corniculate apex, stigma shortly 4 lobed; fruit globose, smooth, seeds wrinkled.

FF: Feb - Aug.

Distribution: In dense and secondary forest of Namsai and Mishmi Hills, throughout Arunahal Pradesh.

ES: Cl/T/ST/Tm/C

HS: Wild.

Ethnomedicinal uses: The fresh leaf paste is applied in swelling scrotum. The juice extracts of same is applied in boiled skin and joint inflammation. The stem powder is applied on wound to prevent infection and further occurrence of skin itch and irritation.

LEEACEAE

45. *Leea crispa* L.

Vern. Name: Kha: Ton pichi

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 653

Photo: Plate 1.h.

A gregarious undershrub, 6 – 10 m high, annual, crimps wings on branches and leaflet rachis, the last two wings sulcate; pubescent at young; leaves pinnately 3 – 5 foliate, petiole short, stout; leaflet ca 4 – 15 x 3 – 5 cm, elliptic, obovate, oblong lanceolate, acute, coarsely serrated, coriaceous, subglabrous, turning red in maturity; inflorescence corymb, shortly peduncle, flower greenish white or pale yellow, pedicel short, bract small, persistent; anther prominent, fruit grey in maturity, seeds 5 – 6, minutes.

FF: Jun – Dec.

Distribution: In secondary and wasteland, near streams in Lohit Valley, throughout subtropical and temperate Arunachal.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Young leaf/ Root bark

Ethnomedicinal uses: Powdered root bark is mixed with flower buds of *Nyctentis*

arbor-tristis and taken during malarial fever. The young fresh leaf is consumed in case of chest suffocation and throat pain. Powdered leaf and stem bark is used to cure low vitality.

SAPINDACEAE

46. *Cardiospermum halicacabum* L.

Vern. Name: Kha.: Makhawkong; Ass.: Kapalphuta

Specimen Examined: Sheelawati Monlai, Gunanagar, SMZU 662

A thin climber herb, sulcate branches; leaves alternate, biternate, 4 – 6 cm long, deltoid; leaflets 2 – 3 cm, lobed or coarsely dentate, acuminate, membranous, less pubescent; flower small, white, umbellate cymes; peduncles 6 – 8 cm long, slender, modified to tendrils; sepal 4, unequal pairs, scale above in each sepals, petal 4; ovary 4 celled, capsule 3 celled, pyriform, inflated loculicidal; seeds about 1.6 mm diameter, globose, arillate at base.

FF: Aug – Nov.

Distribution: Found in cultivated form but very rare in natural condition in Lohit valley and Indo - Burma border.

ES: CI/T/ST/R

HS: Wild/Cult

Ethnomedicinal uses: Paste is used to cure skin inflammation. Juice extract is mixed with *Allium cepa* and applied during mescles, chicken pox and viral fever.

47. *Aesculus assamica* Griffith.

Vern. Name: Kha.: Mahamling; Ass.: Raman bih; Abor: Raman assign

Specimen Examined: Sheelawati Monlai, Piyong, Lohit. SMZU 354

Plate No.1.i.

Middle size tree, handsome, subglobose crown, deciduous, upto 15 m high, exudates watershaped when cut; leaves ca 18 – 23 x 4 – 6 cm, digitate, common petiole

ca 18 – 25 cm, ter et, glabrescent; leaflet upto 7, oblanceolate, acuminate, finely serrulate, glabrous, panicles 30 – 75 cm, conical, erect; flowers white, yellow throat; calyx - 4, recurved, petal 4 or 5, unequal, clawed, stamen – 7, 2 - 3 cm long, ovary 3 – celled, style elongated, fruit brownish leathery rugose, seeds one in each cell, cotyledone white thick. **FF:** Jan - Aug.

Distribution: Mostly pantropical and temperate region, throughout Arunachal Pradesh, Assam, restricted to Indo – Malaya region.

ES: Tr/T/ST/Tm/R

HS: Wild.

Ethnomedicinal uses: The paste of fresh bark and leaf is used as fish poison in small River. Pinch of sundried powder of leaf is mixed with honey and used as purgative during constipation. The person is advised to use the powder at lowest concentration.

48. *Sapindus mukorosi* Gaertn.

Vern. Name: Kha.: Mak sak

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 661

A deciduous tree up to 20 m tall. Leaves pinnate, 15-35 cm long, glabrous; leaflets sub-sessile, 4-8 pairs, opposite to sub-opposite, lanceolate to oblong, 6-15 cm long, 3-5 cm broad, entire, acute to acuminate, oblique. Flowers sub-sessile, greenish-yellow in terminal, pubescent panicle up to 4 mm in fruit; bract 1 mm long, subulate, margin glandular. Sepals unequal, .2 mm long, elliptic-oblong to ovate, margin ciliate, glandular at the tip. Petals 3-5mm long, lanceolate – ovate, clawed, ciliate with 2 wooly scales on the claw. Disc 5-ridged, glabrous. Stamen 8 and free; filament 0.3 mm long, lower half pubescent; anthers 0.5mm long, oblong, non-functional in the female. Berry globose, 1.5 -2.5 cm long, hard or coriaceous when dry, yellowish-brown, 1-seeded, 2 underdeveloped cocci at the base. Seed 1.4 cm in diameter, black to dark brown.

FF: May - Aug.

Distribution: Fairly common in Kamlang WLS of Lohit District and Anjaw district.

ES: Tr/T/ST/Tm/C

HS: Wild.

PPU: Leaves, Fruit, Seed

Ethnomedicinal uses: Leaf juice is used in baths for body pains. Fruits are expectorant, emetic and are used for epilepsy and salivation. The powdered seeds are insecticidal and is also used in case of hair growth, expectorant and detergent.

SABIACEAE

49. *Meliosma simplicifolia* Roxb.

Vern. Name: Kha.: Akobang; Ass.: Sankonara

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 668

Middle size tree upto 14 m high, crown dense, compact, bark grey; leaves ca 9 – 30 x 5 – 15 cm, obovate, serrulate, lanceolate, abruptly acuminate, base narrowed, tapering towards petiole, glabrous above, pubescent in nerve axils beneath; panicles terminal, upto 35 cm long, pyramidal flower 0.3 cm, dull white, turning into yellow, minute, shortly pedicelled; sepals orbicular – ovate, petals sub-valvate; drupe globose, about 1mm across, reddish in maturity.

FF: May - Aug.

Distribution: Very rare in secondary forest, seen along the roadside but fairly common in Kamlang WLS of Lohit District.

ES: Tr/T/ST/Tm/C

HS: Wild.

PPU: Leaves, Bark

Ethnomedicinal uses: Paste of fresh bark is consumed during urine sensation. The powdered roots and bark is taken with leaves of *Hedyotis scandens* during asthma.

ANACARDIACEAE

50. *Rhus javanica* L.

Vern. Name: Kha.: Nargach tenga; Ass.: Nag tenga.

Specimen Examined: Sheelawati Monlai, Hailuyang, Anjaw. SMZU 669

Deciduous tree upto 15 m high, dark grey and pubescent, warty, dull greenish white inside; leaves imparipinnate, petiole common, leaflet 4 – 6 pairs, opposite, sessile, ca 6 – 10 x 2 – 3 cm, elliptic ovate, acuminate, crenate, glabrous above, tomentose beneath; panicles terminal, 10 – 20 cm long, conical, densely flowered; flower pale white, pedicels minute, sepal small, pubescent, ovate, petal oblong ciliate, much exceeding the sepals; drupes compressed, pink orange, latex white, corrosive.

FF: Apr – Sep.

Distribution: Fairly common in higher and middle elevation of Lohit and rest of Arunachal Pradesh.

ES: Tr/T/ST/Tm/C

HS: Wild.

PPU: White latex/Seed

Ethnomedicinal uses: White latex of fresh bark and fruit is applied in boil and skin eruption. The sunny drupes are pounded to powder and mixed with salt. It is then consumed with boiled water during indigestion.

51. *Spondias pinnata* L.

Vern. Name: Kha.: Mokog; Ass.: Amra

Specimen Examined: Sheelawati Monlai, Chongkam, SMZU 670

Middle size deciduous tree, bark thick, soft inside, aromatic; leaves ca 10 – 18 x 2 – 3 cm, elliptic oblong, entire, acuminate, yellow in maturity, nerves straight; flowers polygamous, 1.5 cm long, scented, panicle terminals, calyx lobes 5 – 6, acute; petals 6 lobes, glabrous, greenish white, ovate oblong, fleshy; stamen 12; capel 4 – 6, free

above; fruit 2 – 3 cm long, pulp soft, acrid and aromatic, yellow; stone semi-woody, fibrous with cavities; seeds white, albuminous, 5 – 6 embedded in cavities.

FF: May - Oct.

Distribution: In secondary forest of Chongkam, Namsai and in dense forest area of Kamlang WLS, foothill region of Tezu.

ES: Tr/T/ST/Tm/C

HS: Wild

PPU: Bark/ fruit pulp

Ethnomedicinal uses: The pulp of fresh fruit juice is mixed with honey and taken as digestive syrup and during throat pain. Acrid pulps are sundried and pounded to powder which is then use to cure Asthma. Paste of stem bark is applied in skin inflammation and joint pain.

MORINGACEAE

52. Moringa oleifera L.

Vern. Name: Kha./Ass.: Sajona; Hind.: Sajna; Sans.: Sigri; Eng.: Drumstick

Specimen Examined: Sheelawati Monlai, Chongkam, SMZU 671

Plate No.: 2.a.

Medium size tree, bark corky; leaves deciduous, 3 pinnate long long rachis, pinna opposite, ca 2 – 3 x 1.5 – 2.5 cm, elliptic obovate, entire, dull green above, paler beneath; flowers greenish white, ca 3 cm long, arranged in pubescent panicles; calyx lobes 5; corolla 5, ca 1.3 cm long, spatulate; stamen inserted on the edge on the edge of disk; fruits pendulose, ca 40 – 50 cm long, cylindrical, 8-9 ribbed, green, shortly pubescent; seeds winged.

FF: Mar - May.

Distribution: Throughout India extending to the Plain of Assam and entire plain part of

Lohit. Mostly a cultivated species.

ES: Tr/T/ST/C

HS: Wild/Cult.

Ethnomedicinal uses: Young fruit is taken in raw during diarrhea, diabetes, hypertension and jaundice. The paste is applied on cuts and wound, rheumatism, skin inflammation and mouth ulcer. Cooked fruit is taken as vegetable to relieve asthma and indigestion.

LEGUMINACEA

53. *Abrus precatorius* L.

Vern. Name: Kha.: Mekhek phag; Ass.:Ranga; Hind: Gudachi; Sans.: Gunju; Eng.:

Indian liquorice

Specimen Examined: Sheelawati Monlai, Namsai, SMZU 663

Plate No. 2.b.

A cupiously climber, branches slender; leaves ca 1 – 1.5 x .4 mm, leaflet 20 – 40, decidous, thinly silky; flower dense raceme on auxillary peduncles; calyx campanulate; corolla reddish or white, exerted, acute, adhering below to the staminal tube, wing narrow; kel arcuate, stamen, 9, united in tube slit above, the tenth absent; pod 1 – 1.5 cm long, oblong, or linear oblong, flat or turgid, moderately firm, thinly septates, pubescent; seed bright scarlet, black and white patches as large pea.

FF: Jul - Feb.

Distribution: Throughout India in open and dry habitat in Lohit Valley, Assam and warmer part of Arunachal Pradesh.

ES: Cl/T/ST/C

HS: Wild.

PPU: Bark/ Fruit

Ethnomedicinal uses: Powdered seeds are used as anti-venom during snake and

scorpion bite. The same powder is mixed with fresh juice of *Centella asiatica* and taken during vomiting due to food poison.

54. *Mastersia assamica* Benth.

Vern. Name: Kha.: Pichi khah.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 664

A woody climber, stem firm, terete, branches glabrous; leaves ca 10 – 15 x 9 – 12 cm, trifoliate, distinctly petioled; leaflet subcoriaceous, stipellate, pubescent, one obovate cuspidate, 5 – 12 cm long; flower racemed, terminal paniced, 15 – 25 cm long, calyx tube 1 cm, teeth long; corolla 5, bluish white, keel obtuse, straight, stamen 2 adelphous; pod 5 – 8 cm, strap shaped, brownish pubescent, dorsal suture bordered by sharp wing, seed oblong, black quite glabrous, 15 – 20.

FF: Nov - Jan.

Distribution: Climber in secondary forest of Lohit, and throughout NE region.

ES: CI/T/ST/Tm/C

HS: Wild.

Ethnomedicinal uses: Fresh leaf paste is use in cholera and skin infection. Root paste is applied on forehead to cure viral fever. The same is use during urine sensation. Stem fibre is use as roof.

55. *Uraria lagopus* DC.

Vern. Name: Kha.: Pgun; Ass.:Tita kachi

Specimen Examined: Sheelawati Monlai ,2008, Mahadevpur ,Lohit. SMZU 672

Erect pubescent undershrub; leaves trifoliate, ca 3 – 7 x 1.5 – 3 cm, oval elliptic obtuse, thickly membranous, acuminate broad at base, pubescent beneath; petiole 1.5 – 2 cm; inflorescence axillary romboid terminal, 8 – 12 cm, densely pubescent; flower arranged in compound, purplish, 0.4 – 0.6 cm, cylindrical, terminal racemes, bract ovate, acuminate, ciliate; calyx 3 mm long, plumose, corolla 4 mm long,

purplish white; pods pubescent, 2 – 6, jointed. **FF:** Nov - Jan.

Distribution: In open meadow and degraded forest, often associated with grass in Mahadevpur circle in the plain of Namsai.

ES:Sr/T/ST/Tm/C

HS: Wild.

PPU: Bark/Leaf

Ethnomedicinal uses: Leaf is bitter and used during malarial fever in powder form; Powder mixed with goat milk is used to induce abortion. Fresh leaf paste is applied during scorpion and insect bite, bone healing, inflammation and skin irritation. The powder is added in hot tea to cure stomach indigestion and chest suffocation.

56. Vigna mungo L.

Vern. Name: Kha.: Tho nin; Ass.: Kala dal; Eng.: Black gram

Specimen Examined: Sheelawati Monlai, Lathaw, Lohit. SMZU 666

Stem long, trailing suberect herb, 30 – 60 cm high, copiously branched from base, brownish silky hairy; leaflets trifoliate, larger, subobtusate, deltoid rather rounded at base, membranous, reddish brownish pubescent, roundish acute, appressed hairy; flower yellow, half dozen, short peduncles, cloth like stem, brownish silky hairy; pods subcylindrical, recurved, calyx 4 – 6 mm, lower tooth deltoid, corolla 4 – 11 mm, pods subcylindrical, slightly recurved, spreading silky hairy, 10 – 15 seeded, dark brown.

FF: Jul – Aug.

Distribution: Found to have run wild in some places and also cultivated in backyard in Chongkam, and Namsai area.

ES:Sr/T/ST/C

HS: Wild/ Cult.

PPU: whole plant part

Ethnomedicinal uses: Paste of bark and leaf is applied in rheumatic pain, skin ulcer,

throat inflammation. Powdered seeds are taken to cure chest pain, indigestion, low blood pressure and sexual debility. They are eaten as cereals.

CAESALPINIACEAE

57. *Cassia occidentalis* L.

Vern. Name: Kha. Pichi cho /Singhpo: Tarungnang; Ass.: Hant-thenga

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 673

Plate No. 2.c.

A fetid soft woody undershrub, annual, height ca 6 – 8 m., stem weak, ridged, pubescent; leaves obliquely cordate acuminate, caduceus; leaflets, 4 – 5 pairs, ca 3 – 10 x 0.9 – 1.5 cm, ovate to oblong lanceolate, pubescent; flowers yellow, 1 – 2 cm, few short axillary, corymbose raceme, bract white; calyx 5, hairy, petal 5, yellow; stamen 10, upper 3 reduced to staminodes, lower three longer; pods 10 – 15 cm long, cylindrical, subfalcate, hairy, compressed, suture thickened; seeds 2 – 30 compressed, pale brown.

FF: Dec - May.

Distribution: In the plain of Assam and Lohit, Siang Distt., and foot hill region of Arunachal Pradesh.

ES: Sr/T/ST/C

HS: Wild.

Ethnomedicinal uses: Leaf paste used is applied externally on throat during tonsillities. The powder of seeds and leaf is used during chest pain and liver complain, chronic malaria fever.

58. *Cassia alata* L.

Vern. Name: Kha.: Hakboo; Ass.: Daudpata

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 674

A soft woody shrub, thick pendent branches; leaf rachis 60 – 80 cm long,

margin ridges; leaflets 10 – 12 pairs, ca 6 – 12 x 3 – 4 cm, oblong, obtuse, subcoriaceous, slightly hairy beneath; inflorescence raceme, ca 20 – 25 cm long, spiciform, stout, pedicels short; bracts enveloping the buds; calyx segments 1.5 – 1.8 cm; petals bright yellow, 1.8 – 3 cm long, clawed; stamen 7, fertile 2 longer than others; pod 7 – 12 cm long, compressed, membranous, crenulated wing broad along the middle of each valve.

FF: Aug – Nov.

Distribution: In the plain of Chongkam and Namsai, entire plain of Assam, seen along the road side and wasteland.

ES: Scl/T/ST/C

HS: Wild.

Ethnomedicinal uses: Juice extract of fresh bark is taken during seasonal urine. The juice extract of leaf is applied on allergic skin, and in ringworm, swelling in joint and skin inflammation.

59. Cassia fistula L.

Vern Name: Kha.: Kungu; Ass.: Honaru; Hind.: Amaltas; Eng.: Indian Laburnum

Specimen Examined: Sheelawati Monlai, Chongkham, Lohit. SMZU 665.

Medium size tree, deciduous, height 20 m; leaves compound, spirally arranged, paripinnate, opposite, entire margin, leaflet 4 – 8 pairs, ca 10 – 12 x 5 – 6 cm, ovate, lanceolate, acuminate; inflorescence drooping raceme; flower yellow, acropetal, calyx short, corolla-5, yellow, shortly clawed, obovate; stamen 10, 3 longest with curved filaments, pod cylindrical, succulent at young, woody in maturity, 30 to 50 cm long, seeds 40-100 in pod; seed dark brown separated by transverse septa of pulp.

FF: Dec - May.

Distribution: It is found throughout India in warmer region. Grow within reserve forest in Chongkam and Namsai area.

ES: Tr/T/ST/C

HS: Wild/Cult.

PPU: Leaf/ Pod/ Bark

Ethnomedicinal uses: Fresh paste of bark is used in leprosy. Juice extract from leaf is consumed with milk during jaundice. Powder of bark is mixed with a powdered leaf of *Cassia aungustifolia* and used in syphilis and cardiac ailments. Powder of matured pod is used as digestive, anti-inflammatory agent.

60. *Mezonevron cucullatum* Roxb.

Vern. Name: Kha.: Hakboo; Ass.: Baghasora

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 676

A large struggling scrambling shrub; branches glabrous, blackish hooked prickles with thick corky base in old stems; leaf rachis and branches armed with prickles, pinnae 8 – 14 cm long, leaflet 2 – 4 pairs, ca 5 – 7 x 3.5 – 4 cm, obovate – oblong, bluntly acuminate, base rounded, glabrous, glaucous beneath; inflorescence terminal axillary; calyx deeply divided, 1.6 cm long, lowest lobe much hooded; petal 2 – 3 cm long, bright yellow, purplish, deeply 2 lobed; stamen 6, one longer than the rest, pod ca 5 – 10 x 2 – 2.5 cm, reddish brown including the papary wing, 1 seeded.

FF: Nov - Apr.

Distribution: Throughout Arunachal Pradesh, seen mostly in open and dense forest in study area.

ES: Scl/T/ST/C

HS: Wild.

Ethnomedicinal use: Sundry wood is cut into thin slice and pounded to powder. The powder is mixed with the powdered roots of *Abroma augusta* and consumed during sensational urination.

61. *Bauhinia purpurea* L.

Vern. Name: Kha.: Sekang; Ass.: Boga Kanchan

Specimen Examined: Sheelawati Monlai, Chongkam. Lohit. SMZU 677

Medium size tree, 10 – 15 m high; leaves imarginate, ca 4 – 6 x 4.5 – 5 cm, base cordate; flower pinkish purple to deep violet, red streak, terminal; calyx 5, spathaceous tomentose, deltoid; petal 1.5 – 2 cm long, long clawed, stamen 3, shorter than petals, staminodes unequal, ovary long stipe, dawning; pod compressed, ca 6 – 10 x 1.6 – 2 cm, falcate, flat, greenish purplish sutures; seeds 12 – 15, flattened, smooth brownish.

FF: Apr - May.

Distribution: Through Namsai forest, foothill area of Lohit and entire Arunachal Pradesh, mostly in secondary forest.

ES: Tr/T/ST/C

HS: Wild.

Ethnomedicinal uses: Cooked young leaf is consumed during breathlessness, chest congestion, liver complaint, diabetes, lack appetite and high blood pressure. Fresh flower is applied in cuts and wound, skin inflammation. Bark powder is taken to expel excessive gas from the stomach.

62. *Tamarindus indica* L.

Vern. Name: Kha.: Mekeng; Ass.: Tetuli; Hind.: Imlī; Eng.: Tamarind

Specimen Examined: Sheelawati Monlai, Kheram, Lohit. SMZU 678

Evergreen tree, height 30 – 35 m, spreading crown; leaves abruptly pinnate, linear lanceolate, ca 0.8 – 1.5 x 0.7 – 1 cm, leaflet 10 – 20 pairs, slightly imarginate apex; flower raceme, tinted calyx, petal yellow, streaked with red, 3 developed, lower reduced to scales, stamen 7, monadelphous, short, only 3 perfect and fertile, rest reduced to 3 - 4 setaceous staminodes; filaments anthers purple; pod curved, indehiscent, multi-seeded, pericarp crustaceous, dark shining brown.

FF: Apr – Sep.

Distribution: In warmer part of India. Common along reserve forest area of Chongkam.

ES: Tr/T/ST/C

HS: Wild.

Ethnomedicinal uses: The riben pods are sour and use during breathlessness, chest congestion, indigestion, low vitality, and lack appetite, as stimulant. The powder of dry seeds is used in liver pain and diabetes, alcohol de-addiction.

MIMOSACEAE

63. *Acacia caesia* L.

Vern. Name: Kha.: Yakrung lota; Ass.: Kuchai; Hind.: Aila

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 306

A large prickly climbing shrub, stem stout, 5 angled, twig circinate, pubescent, prickles recurved; leaf rachis 12 – 20 cm, lightly pubescent, aculeate, base with swollen gland, leaflet 8 – 15 paires, pinnae 6 – 8 paires, ca 0.7 – 0.9 x 0.3 – 0.4 cm, shining, obliquely oblong, mucornate, setaceous above the petiole; panicles axillary terminal, 45 cm long, 20 – 30 flowers; flower white at clayx tip, corolla yellowish head, bract ciliate, calyx 2 mm, corolla 2.5 – 3 mm; pods thicken sutures, dark brown 10 – 15 cm, seeds 1, oval flat, dark, shining.

FF: Oct - Nov.

Distribution: Middle and lower elevation of Lohit and rest of Arunachal Pradesh and Assam in both dens and open forest area.

ES: H/T/ST/C

HS: Wild.

Ethnomedicinal uses: Stem powder is used as components during preparation of

diabetic medicines. Root powder is applied on part of nerve pain. The young tender leaf is consumed during general body pain.

64. *Entada phaseoloides* L.

Vern. Name: Kha.: Ghila lota, Ass.: Bor gila

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 608

Woody climber, 60 – 140 m long, stem angular, twisted, fibrous, dark brown, hosted on tall tree, leaves bipinnate, terminal pinnae modified into tendrils, pinnae 2 pairs, 3 – 5 cm long; leaflet 2 – 4 pairs, ca 4 – 5 x 2 – 3 cm, obovate, oblong elliptic bluntly acuminate, imarginate at tip, glabrous shining; flowers pale yellow; calyx 5, green, tomentose; corolla 5, stamen 10, exserted; ovary many ovules, pod woody, largest, 1.2 m x 6 cm across, tick sutures, stipe stout, valve adpressed, jointed between seeds, seeds discoid, ca 3 – 4 x 3 – 5 cm across, dark brown.

FF: Oct - Nov.

Distribution: As large climber on lofty trees in Lohit and throughout Eastern Himalaya.

ES: CI/T/ST/C

HS: Wild.

PPU: Stem/Seed

Ethnomedicinal uses: Powdered kernel is applied on joint with hot water to relieve pain and swelling. Pinch of same powder is mixed with wine and consumed to relieve hypertension and constipation. Thinly sliced sundried stem is pounded to powder and used during constipation and abdominal distension.

65. *Albizia procera* Roxb.

Vern. Name: Kha.: Sagur enka; Ass.: Koro

Specimen Examined: Sheelawati Monlai, Parsuram Kund, Lohit. SMZU 609

Tall deciduous tree, branches spreading, bark light brownish; gland dotted in leaf rachis, leaflets 4 – 6 pairs, ca 2 – 3 x 0.6 – 1.4 cm across, obliquely oblong, obtuse,

appressed pubescent beneath; pale yellow, large head, lax terminal; calyx tubular, minutely toothed, acute, corolla lobes lanceolate, outer pubescent; pods ca 5 – 15 x 1.5 – 2.4 cm, shortly stalked, reddish brown; seed 8 – 12.

FF: Oct - Nov.

Distribution: In secondary forest in Parsuram Kund area, middle elevation of Lohit and entire Arunachal Pradesh.

ES: Tr/T/ST/Tm/C

HS: Wild.

PPU: Stem bark

Ethnomedicinal uses: Sundried and powdered stem bark is taken during skin allergic and chest pain. Brown resin of bark is applied on eyes during conjunctivities. It is also applied on inflamed skin caused by the touch of fire and hot water, cuts and wound.

66. *Mimosa pudica* L.

Vern. Name: Kha.: Lajoiboon; Ass.: Lajula patta; Hind.: Laja; Sans.: Varah Kranti

Specimen Examined: Sheelawati Monlai, 2nd mile, Lohit. SMZU 305

A struggling spreading deciduous herb; stem and branches prickly and clothed with bristles; leaves sensitive on touch; pinnae 4, digitately arranged, 1 – 3.5 in long, common petiole beset with ascending bristles; stipules linear lanceolate with bristly edges; leaflets 12 – 20 pairs, undersurface adpressed bristly, 0.7 – 1 cm long, covered with spreading bristles; flowers pink, globose head, stamen 4, much exserted; pod with weak prickles on the sutures, 3 – 5 cm long; joints 3 – 5, hairy all over.

FF: May – Aug, Nov – Dec.

Distribution: In wasteland, seen along the roadside and open field in study area, mostly in tropical and subtropical Asia.

ES: H/T/ST/C

HS: Wild.

Ethnomedicinal uses: Root powder is bitter and use as antidote in snake bite, skin inflammation, piles and chest congestion. The leaf paste is applied in freshly cut wound, sores and boils eruption.

CRASSULACEAE

67. *Kalanchoe pinnata* Kurz.

Vern. Name: Kha.: Yamong; Ass.: Dupar tenga

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 307

Plate No.: 2.d.

Succulent glabrous herb, upto 1. 4 m high, stem obtusely angled, light colored, younger reddish brown; leaves variable, occasionally compound, 5 – 7 foliate, ca 10 – 13 x 5 – 7 cm, petiole long, united at base, leaf ovate elliptic, crenate, young leaf buds germinate from old margins; inflorescence spreading panicles, flower pendent, light brown tinged with reddish vein; calyx 2 – 3 cm, striated reddish green, angular teeth, corolla reddish purple, lobes triangular, constricted at middle lobe; filaments green at base, pinkish below anther, style green; ovary persistent, enclosed in papary calyx; seeds smooth, oblong ellipsoid.

FF: Feb - Jun.

Distribution: In open places, wasteland, near stream and river valley in study area. Cultivated in backyard or found wild.

ES: H/T/ST/Tm/C

HS: Wild.

EthnoMedicinal uses: The paste and juice of fresh stem and leaves are applied during skin burnt, cuts and wound, headache. The raw juice extract is taken orally during sensational urination.

COMBRETACEAE

68. *Terminalia arjuna* Roxb.

Vern. Name: Kha.: Arjun gose; Ass.: Arjuna; Eng.: Arjun tree

Specimen Examined: Sheelawati Monlai, Namsai, Lohit.SMZU 301

A large evergreen tree, height 25 – 30 m, trunk buttressed, bark smooth light green, branches spreading, pendant; leaves ca 10 – 13 x 6 – 7.5 cm, simple, sub-opposite, oblong-elliptic, coriaceous, crenulate, dark green above pale green beneath, reticulate; inflorescence panicle spikes, white; calyx nearly glabrous, young ovary covered with crisp hairs, fruit ovoid, oblong with 5 – 7 short hard wings, oblique, curving upward.

FF: Aug – Oct.

Distribution: Through out India and in Arunachal Pradesh along streams and river; common in study area.

ES: Tr/T/ST//C

HS: Wild/Cult.

Ethnomedicinal uses: Powdered bark is used in asthma, liver pain, malaria, heart pain, urinary trouble, diabetes, anaemia, bronchitis, tumours and anti-dysentery. Fresh paste is used as anti-inflammatory agent for freshly cut wound.

69. *Terminalia bellerica* (Gaertn.) Roxb.

Vern. Name: Kha./ Ass.: Sili, Bhoira; Hind.: Bahera; Eng.: Chebulic myrobalan.

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 310

Tall deciduous tree, height 35 m, girth 2.5 – 3 m; bark ashy grey with fine longitudinal crack; leaves ca 9 – 12 x 4 – 6 cm, petiolate, obovate, entire, glabrous, pale yellowish in maturity; inflorescence solitary spikes, axillary; flower bisexual, sessile, male shortly pedicellate, greenish white; fruit drupe, obscurely angled, fleshy grayish silky pericarp; dried fruit irregular shape.

FF: Feb - Jun.

Distribution: A deciduous tree, commonly distributed in study, Assam and throughout

subtropical India.

ES: Tr/T/ST//C

HS: Wild/Cult.

PPU: Stem Bark/Fruit

Ethnomedicinal uses: The honey like scented bark is used in prolonged cough, asthma, indigestion, diarrhea, dropsy and laprosy. Sundried fruit is used during brain dumpness, low vitality and severe gastritis.

70. Terminalia chebula Retz.

Vern. Name: Kha. Manaa, Ass. Hillica, Hind. Hara

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 411

Medium to large size deciduous tree, hight 30 – 40 m, trunk clean with round expanding crown, bark brown, longitudinally fissured; leaves ca 8 – 10 x 5 – 6 cm, dark green, petiole short, nearly opposite, ovate oblong, obtuse cordite at base entire, clothed with glossy silky hairs at young; inflorescence spike terminal; flower small, white; fruit is drube oval, glabrous and irregularly and darkly grooved with five edges.

FF: Feb - Jun; Aug – Nov.

Distribution: In moist forest of Arunachal Pradesh, Assam and throughout India.

ES: Tr/T/ST//C

HS: Wild/Cult.

PPU: Stem Bark/Leaf/Fruit

Ethnomedicinal uses: Unripened dried fruit is used in constipation, lack appetite and low stamina; Bark and leaf is used in infant diarrhea, skin ulcer and lack clear vision.

71. Quisqualis indica L.

Vern. Name: Kha.: Suangjaik; Ass.: Malati; Hind.: Rangoon-ki bel; Sans.: Shantlota; Eng.: Rangoon creeper; Chinese: Shijunji.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU- 675

A scandent climbing shrub, much spreading, stem cylindrical, pubescent in entire shoots; leaves ca 6 – 8 x 4 – 5 cm, pubescent, opposite, oblong, acute or acuminate, base rounded, petiole short, ca 0.5 – 0.8 cm; inflorescence corymbose, large aggregate, flowers tubular, drooping, tube ca 10 – 12 cm long, 0.8 – 1 cm in diameter, in cluster; calyx 5 lobed, ovate, acute; petal 5, 2 cm long, valvate, white or reddish pink, showy; fruit ellipsoid, 5 longitudinal ridges, occasionally 4 – 9; 2.5 – 4 cm long, 2 cm in diameter, dull dark brown to purplish black, smooth, slightly lustrous, top end narrow pointed; seeds oblong, spindle shaped, fragrant, slightly sweet.

FF: March – Dec.

Distribution: Along the forest margin and open forest, sometime under forest floor as climbers in Namsai forest and found to be grown as ornamental vine plants.

ES: CI/T/ST/R

HS: Wild/Cult.

PPU: leaf

Ethnomedicinal uses: Powder sundried fruit is used to cure ringworm, foot swelling and infection. Leaf paste is used to cure skin diseases, burn and infection.

MYRTACEAE

72. *Psidium guajava* L.

Vern. Name: Kha.: Mantaka; Ass.: Madhuras; Hind.: Amraut; Eng.: Guava

Specimen Examined: Sheelawati Monlai, Kheram, Lohit. SMZU 679

A small evergreen tree, subdeciduous; leaves ca 10 – 13 x 5 – 6 cm, opposite, elliptic oblong, entire, glabrous above, pubescent beneath, faintly aromatic; inflorescence axillary peduncle, flower 2 – 3, white, calyx urceolate, lower half adnate

to ovary, upper free, lobed, petal free; berry globose or pyriform, yellow at maturity, shining, variable size, seeds numerous, immersed in pleasantly sweet pulp.

FF: Jan - Aug – Nov.

Distribution: Mostly, a cultivated species in Indian garden for its fruit; common in study area.

ES: Tr/T/ST//C

HS: Wild/Cult.

PPU: Tender leaf/Fruit

Ethnomedicinal uses: Tender leaves are crushed and juice extract is taken during diarrhea and chronic blood dysentery; fruit pulp is consumed during chronic constipation and indigestion.

73. *Syzygium cumini* L.

Vern. Name: Kha.: Jamuk; Ass.: Barjamuk; Hindi.: Jamun; Sans.: Jambava; Eng.:

Myrtle

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU- 680

Small middle sized evergreen tree, height 10 – 12 m, bark light green, tough, leaves ca 6 – 7.5 x 4 – 5 cm, elliptic oblong to ovate, acuminate, smooth, shining above, abruptly acuminate, base rounded to cuneate; inflorescence large terminal axillary panicle, ; flower white to greenish white, pedicellate, fragrant in panicles of compound cymes; calyx obovate, petal 4 – 5, calyptrate, white, berry red, purplish black, juicy, oblong.

FF: Jun - Nov.

Distribution: This fruit tree grows wildy and are also cultivated. The species was seen to grow in Parsuramkund region and Namsai forest division, often rare in occurrence.

ES: Tr/T/ST/Tm/R

HS: Wild/Cult.

PPU: Flower bud/Fruit

Ethnomedicinal uses: Fruit pulp is taken during cough, asthma and constipation.

Pastes of flower buds are applied in skin inflammation.

LYTHRACEAE

74. *Lagerstroemia indica* L.

Vern. Name: Kha.: Safed ajar

Specimen Examined: Sheelawati Monlai, Dusuk, Lohit. SMZU-145

Small trees up to 10 m high, usually branching from base; bark white or grayish white, peeling off in long strips; leaves ca 2.5 – 6 x 2 – 4 cm, obovate, obovate orbicular, rounded, subobtusate or often notched; base narrow, cuneate, entire, glabrous when mature except along midrib; inflorescence corymbs 10 – 20 cm across, flower pink or white, 2 – 3 cm across; petals 1-1.5 cm long, claw slender, fruit upto 1 cm across, obconic.

FF: May – Aug.

Distribution: In Indo - Burma border and plain part of Namsai forest. Often rare in forest floor, cultivated in some places of Chongkam and Namsai.

ES: Sr/T/ST/Cult/C

HS: Wild.

PPU: Bark/Leaf

Ethnomedicinal uses: The bark is removed from trunk and sundried. It is cut into thin slice and pounded to powder which is used during chest complaint and sensational urination. Combined paste of leaf and bark is used as purgative and stimulant.

75. *Lagerstroemia reginae* Roxb.

Vern. Name: Kha: Ajar; Ass.: Ajar gach

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU- 146

Middle size tree, 10 – 15 m high, bark peeling off in irregular flakes; leaves ca 10 – 15 x 4 – 7 cm, oblong elliptic, oblong lanceolate, often falcate, acuminate, base rounded or truncate, entire, glabrous, nerves prominent beneath; panicles upto 30 cm long; flowers 5 – 7 cm across, calyx grayish-brown, tomentose; capsules 2 – 3 cm across, subglobose; seeds including the wing 1.3 – 3 cm long.

FF: Jun – Dec.

Distribution: Fairly common in Indo-Burma border; cultivated as avenue tree in study area and grow wild in Hawaii and Manchal circle of Anjaw district of Arunachal Pradesh.

ES: Tr/T/ST/Cult/C

HS: Wild.

PPU: Bark/Root

Ethnomedicinal uses: Powdered bark is used as components in preparation of medicines for the asthma and chest suffocation, difficult breathing. Bark powder is taken during excessive gas formation, and during constipation. Root is used as stimulant

MELASTOMACEAE

76. *Melastoma malabathricum* L.

Vern. Name: Kha./Chakma: Mohapatta; Ass.: Ranga phutuka; Hind.: Phutki; Eng.:

Indian Rhododendron

Specimen Examined: Sheelawati Monlai, Maidu, Lohit. SMZU - 146

Plate No.2.e.

Small bushy shrub, upto 1.5 m high, younger part densely pubescent, branches rusty scaly; leaves ca 8 – 12 x 5 – 6 cm, ovate oblong, softly strigilose, densely appressed hairy or shaggy; flower terminal condensed panicles, large pink purple or rosy; bracts broadly ovate; fruit purplish, rusty brown scaly, berry sweet.

FF: Marh – Aug.

Distribution: Distributed in open forest in plain of Lohit and throughout of Arunachal Pradesh.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Fruit/Leaf

Ethnomedicinal uses: Flower buds are used in constipation; fruits as dye and used to cure liver pain and emetic tendency. Leaf paste are used in cuts and wounds.

***77. Osbekia nepalensis* Hook.**

Vern. Name: Kha.: Onkuk; Ass.: Boga phutkola

Specimen Examined: Sheelawati Monlai, Darsuk, Lohit. SMZU - 137

Shrubs upto 2 m high, stem obscurely quadrangular, scabrous; leaves ca 6 – 12 x 1.4 – 3 cm, broadly ovate lanceolate, acute, sub acute, base cordate, subsessile, pilose, adpressed hairy along nerves; panicle upto 25 cm long, flower 2.4 – 3.8 cm across, white, densely adpressed scaly; bracts equaling the calyx lobes, lanceolate; capsules campanulate, truncate, 1 – 1.5 cm long, densely scaly.

FF: Aug - Feb.

Distribution: Along the roadside, wasteland and forest margin, often rare in study area.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Fruit/Leaf

Ethnomedicinal uses: The seeds are consumed in raw to expel excess gas formation and pain in stomach, lack appetite, chronic indigestion. Flower juice is applied to cures sores in infant's mouth.

PUNICACEAE

***78. Punica granatum* L.**

Vern. Name: Kha. Dalim, Chakma: Dulom patta; Ass.: Dalim; Hind.: Anar; Eng.:

Pomegranate

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU - 139

A deciduous shrub or small tree, bark grey, thin, often armed with axillary thorns; leaves opposite, 2.4 – 6.5 x 1 – 1.5 cm, oblong lanceolate, elliptic, acuminate, glabrous, entire, shining above, bright green beneath, flower solitary, 3.6 – 5 cm long; calyx campanulate, 5 – 7 lobes; corolla 5 – 7, scarlet, wrinkled, inserted in calyx lobes; stamen numerous, carpel coalescing; fruit 3.8 – 7.5 cm across, globose, coriaceous woody, carpel containing numerous seeds, seed with watery coat, pink juice, inner coat horny.

FF: May – Aug.

Distribution: Cultivated in backyard for fruits and medicines in Gunanagar area.

ES: Sr/T/ST/C

HS: Cult.

PPU: Fruit /Leaf

Ethnomedicinal uses: Leaf paste is applied in viral fever and headache. The fruit juice is used to cure anaemia.

PASSIFLORACEAE

79. *Adenia trilobata* (Roxb.)

Vern. Name: Kha.: Kaung lota

Specimen Examined: Sheelawati Monlai, Parsuramkund, Lohit. SMZU – 178

A large glabrous twining climbers, branches teret, sulcate; leaves entire, pinnatifid, 6 – 17 x 7 – 14 cm, broadly obovate, 3 lobed, base cordate, 5 nerved, lobes acuminate, glaucous beneath; peduncle divided near tip, basal branches often hooked, flower unisexual, calyx campanulate, 5 lobed, petals legulate, pistiloid united to form cup, fruit 6 – 7 cm long, ellipsoid, scarlet when ripe, seed reticulate testa.

FF: Aug – Nov.

Distribution: In dense forest in study area, throughout Arunachal Pradesh.

ES: CI/T/ST/R

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: The leaf paste is applied to cure insect and snake bite, cuts and wounds.

CARICACEAE

80. Carica papaya L.

Vern. Name: Kha.: Mak sangpho; Ass.: Popita; Hind.: Papita; Sans.: Chirbita

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU – 367

Small to medium shrubs, slender often unbranched, 10 - 12 m high; leaves ca 25 – 30 x 24 – 38 cm, arranged in apical crown, palmately lobed, petioles long, palminerves leaves 30 – 60 cm long, cylindrical; flower axillary panicles, fragrant, deciduous, male flowers green or yellow, female greenish white, clustered; ovary 1 celled, stigma 5 lobed, fruit large, subglobose, succulent, yellowish to orange on ripening, immature seeds white, matures black enclosed in sweet mucous pulp adhere to arillus, testa thick, brittle.

FF: May – Aug.

Distribution: Cultivated throughout India, a tropical and subtropical fruits.

ES: Sr/T/ST/C

HS: Cult.

PPU: Fruit /Leaf

Ethnomedicinal uses: Fruit is taken as appetizer and digestive during constipation. The white juice is applied in allergic skin, bleeding, piles and given to women to cause abortion. Leaf paste is taken in small quantity to relieve gas trouble.

CUCURBITACEAE

81. *Momordica dioica* Roxb

Vern. Name: Kha. Makhaie khea long Ass.: Bhaat Karela

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 361

Dioecous perennial twinner with tuberous roots; stem slender, tendril simple, elongate, striate, glabrous; leaves broadly ovate in outline, size variable, ca 3.8 – 10 x 3.2 – 8 cm, cordate at base, minutely pubescent or glabrous, minutely punctuate, entire, sometime 3 – 5 deeply lobed, distantly denticulate; male flower solitary, white; calyx lobed, distant, petal 1.3 – 2.5 cm, woolly yellow, oblong lanceolate; female as long as male with small bract; fruit ellipsoid, shortly beaked, densely echinete with soft spines; seeds many.

FF: May – Dec.

Distribution: Cultivated in home garden as vegetable crop in study, throughout India.

ES: CI/T/ST/C

HS: Cult/Wild.

PPU: Fruit/Root

Ethnomedicinal uses: Sundried fruit powder is used in diarrhea, diabetic, fever, bronchial asthma, skin ulcer. Root paste is mixed with glass of raw milk and taken during jaundice. Decoction of root powder is mixed with tubers of *Curcuma aromatica* and applied during snake bite.

82. *Momordica charantia* L.

Vern. Name: Kha. Makhaie Khum; Ass.: Karela, Eng.: Bitter guard

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU - 362

Annual, stem climber, branched, angled, pubescent; young part villous; tendril slender; leaves orbiculate in outline, ca 5 – 12.5 cm in diameter, pubescent, deeply divided into 5 – 7 lobes, acute, dentate; petiole 2.5 – 5 cm, channeled; flower monocous, male

flower solitary, yellow, ca 5 – 10 cm long, pubescent, reniform bract at base; calyx lobed; corolla irregular, yellow, segment emerginate, ca 1.6 – 2 cm long; staminoid of female flower - 3, fruit bright orange, ca 5 – 15 cm long; pendulous fusiform, beaked, ribbed, seed black, compressed. **FF:** May – Dec.

Distribution: Cultivated in backyard, throughout India for its bitter fruit.

ES: CI/T/ST/C

HS: Cult/Wild.

PPU: Fruit/Leaf

Ethnomedicinal uses: Fruit is bitter and acrid, and taken during stomach pain. Leaf juice is used in dysentery, diarrhea, diabetic, hypertension, chest pain, jaundice, piles, skin ulcers and urine sensation. Paste is applied in skin inflammation, joint pain and traumatic swelling.

83. *Momordica cochinchinensis* (Lour.) Spreng.

Vern. Name: Kha. Makhaie khea on, Ass.: Bhat Karela

Specimen Examined: Sheelawati Monlai, Lathao. SMZU - 363

Plant dioecious, stem ribbed, bract near to the top of male peduncle, leaves ca 10 – 12.5 cm diameter, cordate, usually 3 - lobed, nearly pubescent, little dentate, male peduncle 5 – 15 cm, bract often pubescent, embracing in expanded flower; petal white, tinged with yellow; female peduncle 2 – 5cm; fruit ca 10 – 13 cm, fruit muricated, pointed bright orange red, hard or slightly fleshy, without ribs, conical points nearly 0.5 cm high; seeds large, thick, many, horizontal, irregular, ovate, compressed, black when ripened.

FF: May – Oct.

Distribution: Found in subtropical belt of entire Arunachal Pradesh, often cultivated and sometime found escaped.

ES: CI/T/ST/C

HS: Cult/Wild.

PPU: Fruit/Leaf

Ethnomedicinal uses: The dried fruit is taken during liver complaint, stomach pain, hypertension and insomnia. Fruit is often sold in market as vegetable. Juice extract of fresh leaf is used to cure boils and sores.

84. *Cucumis sativa* L.

Vern. Name: Kha.: Teng; Ass.: Tiyo; Hind.: Kira; Eng.: Cucumber

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU - 364

Stem angled, a hispidly hairy climber with memebrous; leaf deeply cordate, 3 – 5 lobed, 11. 5 cm diameter, hispid hair, denticulate, terminal lobe lanceolate, petiole 5 – 9 cm long; flower yellow; male cluster, hypanthium campanulate, white hairs, sepal linear, spreading; female flower solitary, hypanthium urceolate, soft spines; fruite with harse hair, elongate, cylindric, fleshy, dull yellow, seeds compressd, pointed and white.

FF: July – Oct.

Distribution: Commonly cultivated in jhum field in entire Arunachal Pradesh and Assam.

ES: CI/T/ST/C

HS: Cult/Wild.

PPU: Fruit /Leaf

Ethnomedicinal uses: Juice extract of fruits near pedicel is bitter and acrid which is used to cure stomach pain, external joint imflamation, cuts and wound.

85. *Cucurbita maxima* Duchesne. ex Lamk.

Vern. Name: Kha.: Umpakham; Ass.: Ronga lao; Hind.: Mita Kadu; Eng.: Pumpkin

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU - 366

Trailing annual herbs, stem long upto 200 m, prickly hairy stem, cylindric, leaves ca 20 – 28 x 20 – 27 cm, orbicular, reniform, 5 lobes, deep sinus at base, flower

solitary, large, calyx green, hispid, acuminate, corolla, orange yellow, fleshy, crinkly hanging lobes, peduncle short, spongy, nearly cylindrical; fruit large, smooth, often appearance of slightly ridged surface, yellow or light orange; seeds many, compressed, smooth shining.

FF: Jul – Oct.

Distribution: Cultivated as famine food and vegetable source in different part of Arunachal Pradesh.

ES: TH/T/ST/C

HS: Cult.

PPU: Fruit/Leaf/Seed

Ethnomedicinal uses: Flower and fruit is bruised and juice extracts is applied during scorpion bite. Raw juice of fruit is given in stomach pain and applied externally to relieve muscle pain and swelling. Seeds are roasted and consumed as food to increase weight and low vitality.

BEGONIACEAE

86. *Begonia arborensis* Dunn

Vern. Name: Kha.: Siyankam

Specimen Examined: Sheelawati Monlai, Wakro, Lohit. SMZU - 365

Rhizomatous, small herbs, petiole with stinging hairs; leaves large, shining, many white lines, stinging hairs prominent, often variegated, obliquely ovate cordate; flower numerous, pale pink, rosy or whitish; fruits globose, reddish brown, pubescent.

FF: Jan - Jun.

Distribution: Rarely encountered in dense forest floor in study area; throughout Arunachal Pradesh.

ES: H/T/ST/C

HS: Wild.

PPU: Petiole, Leaf

Ethnomedicinal uses: The stem and leaf juice is applied in swelling and joint pain.

The petiole is used as toothbrush to clean bad mouth odour.

87. *Begonia roxburghii* (Miq.) DC

Vern Name: Kha.: Siltetoi

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU -368

Plate No.2.f.

Perennial erect, succulent herbs upto 1 m high, pubescent, petiole long, light red, roots fibrous; leaves ca 20 – 30 x 20 – 25 cm, broadly ovate, pubescent sinuate, margin serrated; inflorescence axillary, dichotomously branched, short cyme, flower solitary, few, pink red to light; fruit subpyramidal, pendent, 4 small horns, irregular.

FF: Mar - Nov.

Distribution: In foothill area and lowland, towards higher elevation, near the sides of stream and shady places.

ES: H/T/ST/C

HS: Wild.

PPU: Petiole, Leaf

Ethnomedicinal uses: Juice extract of petiole is applied during toothache and gum swelling. The same is consumed during stomach pain, and chronic indigestion and excessive gas formation.

APIACEAE

88. *Centella asiatica* (L.) Urban

Vern. Name: Kha.: Panang; Ass.: Mani Muni; Hind./Sans.: Brahmi; Eng.: Indian

Pennyworth

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU - 369

A slender herbaceous, stem long, prostrate, leaf axil arise from horizontal

rootstocks, filiform, often reddish, internodes long upto 20 cm; leaves, ca 1.3 – 6.4 cm. diameter, petiole elongated, 2 – 4 cm in whorl, orbicular, reniform, shallowly crenate, glabrous, deeply cordate at base; flower fascicle umbels, 3 – 4 flowers in each umbel, pink to grey, sessile; calyx teeth 0, petal minute; fruit 1 mm long, hard, thicken pericarp, reticulate-rugose, crown by persistent petals, ridge distinct.

FF: Jun – Sept.

Distribution: In open place and jhum land throughout Arunachal Pradesh, NE region, allover India.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Whole plant

Ethnomedicinal uses: The paste of whole plant is taken during general body pain, sleeping sickness and mental tiredness. Leaf extract is used in debility.

89. Hydrocotyle sibthorpioides Lamk.

Vern. Name: Kha.:Panang on; Ass.: Saru manimani; Hind.: Khulkuni.

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU – 371

Prostrate diffuse herb, rooting at nodes, stem thin, small; leaves small, 2 – 6 mm diametre, orbicular, cordate, lobed, subentire, crenate, hispid, petiole upto 1 cm; flower sessile, many umbel, stipules ovate, rounded; calyx teeth minute, petals red, valvate, lanceolate, acute, valvate; fruit orbicular, rounded brown, secondary ridge of fruit nil.

FF: Apr - May.

Distribution: In both open and secondary forest, often pioneer vegetation in denuded land.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Whole plant

Ethnomedicinal uses: The paste of whole plant is mixed with a glass of cow milk and consumed during chest pain and general debility, fever and stomach complain.

90. *Oenanthe javanica* (Blume) DC.

Vern. Name: Kha.: Rukbang.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU - 372

Perennial aromatic herb, upto 30 cm high, sometime stoloniferous, stem teret, cylinder and slightly ridge green; leaves pinnate, pinnae lanceolate, serrate, ultimate segment linear, lightly pubescent, lower surface grey, upper dark green; inflorescence umbellate, terminal opposed to leaflet, white, dense; mericarps compressed, subquadrangle, green.

FF: Oct – Nov.

Distribtuion: In shade and marshy habitat, often common near streams throughout Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Whole plant

Ethnomedicinal uses: The leaf extract is used in cuts and wound, in swelling and arthritis; It is taken in raw as vegetable during insomnia and hypertension.

ARALIACEAE

91. *Schefflera venulosa* Wight and Arn.

Vern. Name: Kha.: Hotoihok; Ass.: Dhovalota

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU - 377

Plate No. 2.g.

Large scandent shrub leaves 5 – 7 foliate; leaflets ca 15 – 20 x 7 – 8 cm, oblanceolate, elliptic, acuminate, base rounded, cuneate, obscurely 3 nerved, coriaceous, glabrous, young leaf purplish tomentose; petiolules swollen at both ends; inflorescence

deciduously tomentose, flower yellowish green to white; calyx truncate; obscurely lobed, petal free or connate; fruit fleshy, 4 – 5 mm across, yellow.

FF: Oct – Feb.

Distribution: Found as epiphytic or independent shrub in study area and throughout Arunachal Pradesh.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Stem/Leaf /Seed

Ethnomedicinal uses: The paste mixture of seed, bark and leaf are used in jaundice and malarial fever. Seeds are sweet and slightly acid which is taken during chest inflammation and hotness.

92. *Trevesia palmata* Roxb.

Vern. Name: Kha./Chakma: Katta pul; Ass.: Bhotola

Specimen Examined: Sheelawati Monlai, Piyong, Lohit. SMZU 433

Plate No.2.h

Small unbranched trees, armed with small prickles particularly at top; leaves clustered, ca 25 – 40 cm across, orbicular reniform, deeply 7 – 9 lobed, base cordate, lobe oblong elliptic, acuminate, serrate, 5 – 9 nerved from base; petiole 18 – 40 cm long; panicles 50 cm long, brown tomentose, branches sub-dichotomous, peduncles 5 – 8 cm long; pedicels 2 – 3 cm, flower greenish or yellowish white; petals 8 – 12, thick, ovate, 0.5 – 0.7 cm long; disc flat, reddish-yellow.

FF: Feb - Jun.

Distribution: Throughout NE India; fairly common in dense forest floor and degraded forest in study area.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Stem/Leaf /Seed

Ethnomedicinal uses: The paste of bark and leaves are made to small pills and 2 pills are consumed at a time twice a day during morning and evening to cure appendix and chronic gastritis.

CAPRIFOLIACEAE

93. *Sambucus hookeri* Rehder.

Vern. Name: Kha.: Pynaprum; Ass.: Haklati

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 111

A struggling shrub, leaflet free, stipules usually small or 0; leaves unequally pinnate, leaflet 5 – 9 , ca 6 – 10 cm long, lanceolate, puberulous or nearly glabrous, serrate or laciniate; corymb usually leafy at base, puberulose or almost villous; bracteole minutes, ovate, calyx limb 3 – 5 toothed; corolla 0.9 cm long; rotate, broadly campanulate, 3 – 5 partite, regular, white or pink; stigma 3 – 5, sessile, style short, 3 lobed; berry globose, dark, compressed.

FF: Jun – Dec.

Distribution: Along stream and roadside in Namsai and Chomgkam in Lohit Valley, throughout NE India.

ES: Sr/T/ST/Tm/C

HS: Wild.

Ethnomedicinal uses: Paste of stem and leaves are used as components in healing fractured bone. The patient is asked to refrain from sour food during treatment.

RUBIACEAE

94. *Hedyotis scandens* Roxb.

Vern. Name: Kha.: Kanjaua; Ass.: Bonjaluk

Specimen Examined: Sheelawati Monlai, Walong, Anjaw. SMZU 384

Plate No. 2.i.

Scandent herb, stem glabrous; leaves elliptic-oblong lanceolate, ca 4 – 9 x 1.6 – 2.8 cm, acuminate, dark green above, pale beneath, quite glabrous, stipules connate into bicuspidate cup, ciliolate; flowers white, terminal subumbellate or trichotomous cymes; calyx lobe scabrid; corolla oblong; style hairy; capsule ovoid.

FF: Mar – Nov.

Distribution: In open forest, under forest floor in study area, and entire Arunachal Pradesh.

ES: Cl/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: Leaf paste is applied in cuts and wound. The same is applied in knee joint to cure rheumatic pain and swelling. It is also applied in old wound to prevent microbial infection.

***95. Mussaenda roxburghii* Hook.f.**

Vern. Name: Kha.: Minohang

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU 176

Pubescent shrub, upto 6 m high; leaves ovate to oblanceolate, ca 4 – 17 x 2 – 6 cm, dark green above, pale beneath, pubescent in both the surface; stipules ovate lanceolate; flower spongy yellow, in terminal dense subcapitate cymes; calyx with white pataloid sepal; corolla tube ca 2 – 3 cm long, silky, pubescent outside; stamen 5, included; berries globose, crown by the calyx lobes, pubescent.

FF: Feb – Oct.

Distribution: Under forest floor and partially exposed habitat in study area; entire Arunachal Pradesh.

ES: Sr/T/ST/Tm/C

HS: Wild.

PPU: Stem bark/Leaf

Ethnomedicinal uses: Paste of stem bark is applied in cuts and wound. A paste mixture of leaves, stem bark and rhizome of Zinger is applied in fractured bone, traumatic swelling and joint pain.

96. *Paederia scandens* Lour.

Vern. Name: Kha.: Sankar; Ass.: Bhedai lata; Hind.: Gandhali; Sans.: Prasarini

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 132

Scandent climber or rambling in ground, stem dark grey, somewhat soft and ribbed, foetid smell; leaves ca 2 – 12 x 5 – 8 cm, ovate, ovate elliptic, ovate lanceolate or orbicular, acute or acuminate, base rounded, truncate or obtuse, glabrous or glabrescent beneath; flowers 0.5 – 1.5 cm long, purplish red, foetid; corolla grayish-tomentose, limb spreading; fruits 0.4 – 1.3 cm long, globose or ellipsoid.

FF: Jul - Jan.

Distribution: In secondary and disturbed forest in Chomgkam and Namsai area, Plain of Tezu and middle foot hill tract.

ES: CI/T/ST/Tm/C

HS: Wild.

PPU: Stem/Leaf

Ethnomedicinal uses: Leaf juice is consumed during blood dysentery and mild diarrhea, cooked leaves are consumed to cure stomach pain, hypertension and insomnia. The paste is used in inflammation, cuts and wounds. Stem powder is used to cure chest pain, gastritis and fever.

ASTERACEAE

97. *Ageratum conyzoides* L.

Vern. Name:- Kha.: Manpung; Ass./Hind.: Uchanti

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 165

Annual herbs, pubescent, upto 40 cm high; leaves simple, pubescent, ca 5 – 6 cm x 3 – 4 cm, opposite below, acute, cuneate to subcordate, crenate; inflorescence head or capitulum; calyx as 5 scaly pappus, white or pale blue; corolla 5 cleft, united, stamen 5, syngenesious; ovary bicarpellary, inferior, syncarpous, style long, bifid; achenes black, cysela.

FF: Jan - Dec.

Distribution: Cosmopolitan, an abnoxious weeds of many countries in both tropical and temperate zone. About 16 species are reported worldwide, JD Hooker (1882).

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: The leaf juice is applied in freshly cut wound, skin ulcers. Paste is applied in joint and foot swelling.

98. Eupatorium odoratum L.

Vern. Name:- Kha.: Mikam; Ass.:

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 166

Erect or struggling undershrubs or shrubs upto 5m high; leaves ca 5 – 12 x 2.5 – 6 cm, ovate, ovate lanceolate or triangular, acute or acuminate, base cuneate, irregularly dentate-serrate or entire, pubescent along nerves beneath; heads 0.6 – 1.5 cm long, terminal axillary corymbose, involucre bracts ovate lanceolate, achenes angular, 0.5 cm long, blackish; pappus hairs stiff, white.

FF: Nov - Mar.

Distribution: Common along roadside and open places in tropical part of Arunachal Pradesh and throughout NE region.

ES: Cl/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: Leaf paste is applied in cut and wound to stop bleeding. The juice is applied on blistered skin and used as anti-inflammatory agent. The same is applied on forehead to cure severe headache and cough.

99. *Mikania micrantha* Kunth.

Vern. Name: Kha.: Ya congret; Ass.: German pula

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 138

Shrub or climbing glabrous, or twinning perennial herbs, leaves ca 3 – 12 x 1 – 6 cm, opposite, petiole long, ovate, acute, or acuminate, base rounded cordate or truncate, crenate, villous beneath, head 4 - flowered, corymbose, bracts 4; corolla regular, tubular; limb campanulate, 5 fid; style arms long, acute; achenes glabrous, truncate, glandular, puppus hairs numerous.

FF: Oct – Feb.

Distribution: C.B Clarke in 1882 reported the plant from Eastern Assam, Dafla Hills, Burma, Malaya Peninsula, Singapore and Thailand and Philippines Island, about 60 species, all American and one of them cosmopolitan, common throughout NE region.

ES: Cl/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: Fresh leaf paste is consumed to cure mild stomach pain, diarrhea, dysentery and applied in freshly cut wound to prevent bleeding.

100. *Dichrocephala integerifolia* Kuntz.

Vern. Name: Kha.: Pukumi

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 229

Plate No. 3.a.

Annual herb, erect, or spreading, 1.5 – 2 m high, pubescent or villous, leaves

ca 6 – 8 x 4 – 5 cm, variable, oblanceolate, entire pinnatifid or lyrate, terminal lobe broadly ovate, coarsely toothed, head heterogamous on slender divaricating peduncles, yellow or purplish, globose, ray flower filiform, curved, toothed; corolla of the female slender, sometime green, persistent; anther bases truncate, style arms of ray floret short, flattened, tips lanceolate; achenes smooth.

FF: Dec - Jan.

Distribution: In open places, disturbed site in entire Lohit Valley, throughout Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: Juice extract of leaves are uses as antiseptic in newly cut wound. It is applied near anus to cure piles. Paste is applied to cure skin eruption, boils and sores.

101. *Blumea fistulosa* Roxb.

Vern. Name: Kha: Ya nang hak

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 226

Erect pubescent herbs, stem tomentose woolly, corymbosely branched above, leaves ca 10 – 18 x 12 – 15 cm, coriaceous elliptic or oblong lanceolate usually silky above, serrate, sometime pinnatifid narrow into a usually auricled short petiole; head 2 – 5 cm, sessile, or peduncle in rounded clusters on the stout branches of a large spreading or pyramidal panicle, involucre bracts tomentose, receptacle glabrous, ovary hypogynous; achenes 10 ribed, silky, pappus red.

FF: Dec - Jan.

Distribution: In Mishmi Hills, Kamlang WLS, throughout Arunachal Pradesh at higher elevation.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: Leaf powder is used to cure liver pain, jaundice and lack of appetite, feeling of uneasiness due to excess consumption of sugar.

102. *Blumea myriocephala* DC.

Vern. Name: Kha./Chakma: Jarbobisak

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 260

Shrub upto 1.8 m high, stem as thick as the forefinger, very membranous nerves in recurved, branches stout, puberulose; leaves, pubescent, teeth small, acuminate, narrow into appendage, petiole serrulate, nerves coriceous; inflorescence head or capitulum, 3 – 5 mm, sessile, or cluster, tomentose, erect panicle, bracts tomentose; receptacle villose or glabrate, corolla lobes glabrous or glandular, achenes 10 ribed, hairy.

FF: Oct - Feb.

Distribution: In wasteland and abandoned Jhumland in Mishmi Hills and entire Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf

Ethnomedicinal uses: The leaf paste and juice extracts are applied in cut wound. It is also smear in forehead to cure severe headache and running nose.

103. *Xanthium indicum* L.

Vern. Name: Kha.: Hungphai; Ass. Agora; Hind.: Chohta

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 419

Annual herbs, stem coarsely rough, somewhat fleshy, spines 3 fid; leaves ca 10 – 13 x 8 – 11 cm, alternate, petiole scabrid, leaf blade lobed, triangular cordate, scabrid; inflorescence heads, axillary racemes, monocious, female 2 fid, fertile; fruiting involucre ovoid-oblong, beak erect or diversing, clothed with hook bristles, filaments monadelphous; achene closed in hard involucre cells, ovoid, thick, pappus nil.

FF: Oct - Jan.

Distribution: In open habitat and sometime in roadside and secondary forest, throughout Arunachal Pradesh, Assam and North India.

ES: H/T/ST/Tm/C

HS: Wild. `

PPU: Leaf and Stem

Ethnomedicinal uses: The stem and leaf paste and juice extracts are applied in burnt skin caused by the touch of fire and hot water to reduce inflammation.

104. *Ecliptica prostrata* L.

Vern. Name: Kha.: Kanraj; Ass.: Kehraj

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 223

Hirsute annual herb, leaves ca 10 – 12 x 2 – 2.5 cm, opposite, oblong lanceolate, subentire, narrow at both the end, peduncle 1 - 2 axillary long slender, involucre bracts equaling exceeding flowers; flower head small, terminal, entire or 2 toothed, white, rarely yellow disk floret fertile, limb 4 - 5 fid; involucre campanulate, bracts outer large, receptacle flat or nearly so, pales enclosing several flowers, inner narrow; achenes ray triquetrous often empty, laterally compressed.

FF: Mar - Jun.

Distribution: In open habitat, marshy land, near ditches and pond, sometime near small stream in Lohit, throughout India.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Stem/Leaf

Ethnomedicinal uses: The leaves are bitter. The paste and juice extracts are taken during throath inflammation and constipation, abdominal pain; applied externally during skin burn, swelling and inflammation.

105. *Spilanthes paniculata* Wall.

Vern. Name: Kha.:Ya kheo mong; Eng.: Paracress grass

Specimen Examined: Sheelawati Monlai, Darsuk, Lohit. SMZU 271

Stem more robust, cylindrical, succulent, prostrate; leaves ca 2 – 6 x 2 – 4 cm, larger, oblanceolate, acute apex, distantly crenate, dark green; head larger, purplish yellow, peduncles subsolitary, terminal, ray floret 5 fid, limb tubular; involucre of bracts ovoid, receptacle convex, elongate, pales enclosing the flowers often connate with the ovary into a stalk; achenes of ray triquetrous, dorsally compressed, margin ciliate, pappus 2 - 3 bristles.

FF: Jan – Dec.

Distribution: In marshyland, roadside, near ponds and ditches in study area throughout Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Whole plant.

Ethnomedicinal Uses: Leaf and flower buds are applied during gum swelling. It is also consumed as salad and taken during chronic constipation, stomach worm.

106. *Bidens pilosa* L.

Vern. Name: Kha.: Mutkein

Specimen Examined: Sheelawati Monlai, Chogkam, Lohit. SMZU 186

Plate No. 3.b.

Annual herb, erect, 60 – 100 cm high, slightly hairy, stem ridged; leaf trifoliate, opposite, 1 - 2 pinnatifid, serrated, acute apex, head long peduncles, campanulate, with or without yellow rays, involucre bracts broad, scarious margins; style arms hairy above; achenes 4 - gonous, dorsally compressed, black, long, slender, much exceeding the involucre, with 2 - 4 short, stout spinnescent awnes covered with recurved hooks; pappus 2-4 rigid, retorsely hispid bristles.

FF: Jan – Nov.

Distribution: Mostly in middle and lower elevation of Lohit valley and rest of Arunachal Pradesh, an aggressive weeds.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf/Stem.

Ethnomedicinal uses: Leaf juice is pour into ear hole and nostril during infection and ache. Leaves are cooked and consumed to cure high blood pressure and insomnia. Stem powder is taken with hot water to cure asthma and jaundice.

107. *Artimisia nilagirica* Cl.

Vern. Name: Kha.: Mitanka

Specimen Examined: Sheelawati Monlai, Maidu, Lohit. SMZU 217

Tall shrubs, 4 – 8m high, aromatic, hoary pubescent, or tomentose, stem leafy panicultely branched, leaves large ovate, narrow lanceolate, distantly serrated, lobed lacinate or 1 – 2 pinnatipartite, white tomentose beneath, lobes acute irregularly serrate, lower petioled; head clusters, horizontal paniced racemes, involucre bracts wooly, inner almost woolly scarious, corollas glabrous.

FF: Aug – Dec.

Distribution: In dryland, open forest, often shows gregorous growth in humus laden

soil in study area.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf/Stem/Root.

Ethnomedicinal uses: Powdered leaves are used during breathlessness, cough, and headache; fresh juice extract is used as antiseptic in newly cut wound. Powder stem and root is taken to cure asthma and abdominal distension.

108. *Gynura angulosa* DC.

Vern. Name:- Kha.: Punni

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 114

Succulents, tall herbs, upto 1.5 m high, corymbosely branched above, stem quite glabrous, succulent, ribbed, corymbosely branched, leaves large, 10 – 18 cm long, obovate, oblanceolate, acuminate, irregularly toothed, base contracted, simple or aucicled, upper oblong; heads large, involucre of bracts and achenes quite glabrous or papillose between the ribs; head 2 – 3 cm, individual flower white, covered by green involucre of bracts.

FF: May - Dec.

Distribution: In abandoned jhum field and secondary forest in Chongkam and Namsai, NE region.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Leaf.

Ethnomedicinal Uses: Leaf is consumed as salad. It is also given to cure insomnia and high heart palpitation. Paste of raw leaf is applied over forehead during headache. The leaf is cooked and consumed during difficult toilet and constipation.

109. *Calendula officinalis* L.

Vern. Name: Kha.: Kal bon; Hind. – Zargul; Eng.- Calendula.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 118

Aromatic annual herb, upto 60 cm high, stem hispidly pubescent; leaves obovate lanceolate, smoothly pubescent, acuminate, alternate, ca 3 – 5 x 2 – 2.5 cm, dull green, lower leaf spatulate, quite entire, upper lanceolate, base cordate-amplexicaul, toothed or subentire; inflorescence solitary, terminal, stipules sharp, peduncle 2 – 3 cm in length; head large yellow or orange, ray floret curved, 2 – 3 seriate, elongated, arranged at outer whorl of head in valvate or twisted manner; receptacle naked.

FF: Jun - Jul.

Distribution: Cultivated in garden for ornamental purpose.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Flower/Leaf.

Ethnomedicinal uses: Decoction of florets are use to cure vomiting tendency. Leaf extract is applied in cuts and wound, skin ulcer and sprain muscle. It is also used as anti-inflammatory agent during joint pain and skin burn.

110. *Lectuca gracilis* DC.

Vern. Name: Kha.: Tangmuka

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 136

Glabrous slender milky herbs upto 20 cm high, few solitary or many from the roots; leaves ca 10 – 14 x 1.5 – 2 cm, radical alternate, long and linear lanceolate, upto 12 cm length, acuminate, quite entire, rarely toothed or ciliate, cauline, sessile, base often ciliate; flowering stem slender, simple or forked, head 2 – 3 cm long, 3 – 8 flowered, erect, narrow in open, often excessively branched corymbs, outer involucre of bracts minutes, petal yellow.

FF: Jul – Nov.

Distribution: The plant is found in open Jhum land and taraced rice field in entire Lohit District, throughout Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Flower/Young shoot/Leaf.

Ethnomedicinal uses: The leaves and tender shoots are slightly sweet-bitter which is consumed as vegetable in raw form with Maize. It is consumed to cure chest pain, indigestion and excessive gas accumulation in stomach, cough and frequent urination (diuretic).

111. *Sonchus arvensis* L.

Specimen Examined: Sheelawati Monlai, Mishmi Hills, Anjaw District, SMZU 311

Plate No. 3.c.

Annual herbs, 1.5 m high, rootstock creeping, stem glabrous, shinny, bear milky latex, tall and umbellately branched above; leaves ca 12 – 20 x 4 – 10 cm, glabrous, runcinate pinnatifid, spinous toothed cauline, appressed rounded auricles; inflorescence head terminal, yellow, homogamous, peduncle glandular hispid, all flowers legulate, involucre of bracts present, ray and disc floret distinct, petal small numerous, yellow.

FF: Dec - Jan.

Distribution: Throughout NE region, mostly in Jhumland and open habitat.

ES: H/T/ST/Tm/C

HS: Wild.

PPU: Flower/Leaf.

Ethnomedicinal uses: The leaves are taken in raw to cure cough, chest congestion, diabetic tendency, jaundice, insomnia and stomach pain. White latex is applied to cure blistered and allergic skin.

112. *Tagetes erecta* L.

Vern. Name: Kha.: Pansian; Ass.: Naharial phul; Hind.: Makhlamali gendu; Eng.:

African marigold

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 108

A stout braching herbs, bushy, upto 70 – 90 cm high, stem ribed or quadrangular at young; leaves strongly scented, pinnately dissected, sharply toothed, acute, glabrous; flower solitary, terminal heads in cluster, large, peduncle long, upto 5 cm long, stipule dentate, weak; involucre of bract green, ribed, ray floret large, dense; pappus white bristle; achens black.

FF: Sep - Dec.

Distribution: Cultivated in Indian garden as ornamental. Native of Maxico (Ramesh Bedi, 2000).

ES: H/T/ST/Tm/C

HS: Cult.

PPU: Flower/Leaf.

Ethnomedicinal uses: Juice extracts of flower is used to treat skin ulcers, eyes redness, and piles. Paste of leaf and floret is use to cure feeling of hotness in chest, joint pain and frequent urination. A decoction of flower is use to cure male impotency and female shyness.

113. *Plumbago zeylanica* L.

Vern. Name: Kha.: ya sukni khao; Ass.: Boga agechita; Hind.: Safed Chita; Eng.:

White leadworth.

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 156

Herbs or scandent undershrubs, often 80 – 100 cm long, cylindrical, spreading, branches diffused; leaves ca 4 – 8 x 3 – 5 cm, alternate, entire, ovate, suddenly

narrowed into petiole, rachis of spikes pubescent or glandular; flower long spiked, 15 – 30 cm, bracts and bracteole shorter than calyx; calyx tubular, ca 2 - 3 cm long, limb 5 fid, toothed; corolla patent, white; stamen free.

FF: Jan - Feb.

Distribution: In open places in study area. Sample collected from Pankaw village, 20km from Chongkam town.

ES: H/T/ST/Tm/R

HS: Cult.

PPU: Flower/Leaf.

Ethnomedicinal uses: Leaf paste is mixed with powdered rhizome of *Zingiber officinale* and *Khaemferia galangal* and applied in fractured bone. Boiled leaves are consumed to enhance appetite. Root powder is applied in anal tips to cure piles.

114. *Plumbago rosea* L.

Vern. Name: Kha.: Ya sukni nak; Ass.: Ronga agechita; Hind.: Lal Chitra; Eng.: Fire Plant

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 154

Plate No. 3.d

Spreading herbs upto 80 cm long, stem terete, cylindrical, branches diffused; leaves alternate, entire, elliptic, tapering to the short petiole, rachis of spikes glabrous; flower long spike, 20 – 35 cm long, bracts shorter than calyx, calyx tubular; corolla tube hairy, lobes 5, patent, red or pink; stamen free; style smooth at base, slender, with 5 terminal branches, ovary narrowed at the apex; capsule membranous.

FF: Jan - Feb.

Distribution: Found in cultivated condition in Pankaw Village, a 20km east of Chongkam town.

ES: H/T/ST/Tm/R

HS: Cult.

PPU: Flower/Leaf/Root

Ethnomedicinal uses: Leaf paste is used to heal fractured bone, leprosy and bile secretion. Roots are taken as abortifacient.

115. *Ardisia pedunculosa* Wall.

Vern. Name: Kha.: Tasang

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 152

Plate No. 3.e.

A small struggling shrub upto 1.3 m high, stem glabrous, branches pendent; leaves ca 8 – 17 x 1.5 – 5 cm, glabrous, elongate lanceolate, obscurely toothed, lightly dotted, base cuneate, acute, petiole 2 – 4 mm, pendent; umbel placed racemosely on the peduncles, peduncle 5 – 9 cm, sometimes crowded close to the end of branches, appearing to form a large compound panicle, pedicles 4 – 5 cm, often long, minutely rusty sometime when young; buds 2 – 3 mm, acute, pendent; flower rose red, fruits reddish or dark blue, seeds solitary, globose.

FF: May - Sep.

Distribution: Under forest floor and sometime in secondary forest of Lohit valley, Assam and throughout Arunachal Pradesh.

ES: H/T/ST/Tm/R.

HS: Wild

PPU: Fruits/Flower/Leaf/Seeds

Ethnomedicinal uses: Paste of both seeds and leaves are used in chest pain, difficult breathing, body pain, and feeling of itche in liver, jaundice and yellow fever, frequent urination. Fresh leaf and flower paste is used as anti-inflammatory agent.

MYRSINACEAE

116. *Embelia ribes* Burm.f.

Vern. Name: Kha.Ton ya pachaie; Hind.: Baberang; Sans.: Vidanga

Specimen Examined: Sheelawati Monlai, Dosuk,Lohit. SMZU 212

Plate No. 3.f.

A scandent or scrambling shrub, stem warty, spinescent; bark grey; leaves ca 5 – 9 x 2 – 4 cm, glabrous, scattered reddish glands; lateral nerves many, very slender; midrib very prominent beneath; base cuneate or rounded, petiole short, 1.5 cm, glandular margined, flower 5 merous, greenish yellow, small, in pubescent terminal or axillary lax, panicles, pedicel 6 – 7cm long; bract small, deciduous; calyx, ciliate; corolla lobes imbricate in bud, elliptic, pubescent; fruit red or scarlet, globose or ovoid, (2-)3-4(-5).

FF: Feb - Aug.

Distribution: In middle and lower elevation of Arunachal Pradesh, in Kamlang, Namsai Lohit.

ES: H/T/ST/Tm/R.

HS: Wild

PPU: Fruit.

Ethnomedicinal uses: Powdered fruit is taken during constipation, chest hotness and urine redness. Its powder is also used to cure male problems.

OLEACEAE

117. *Nyctanthes arbor-tristis* L.

Vern. Name: Singpo/ Kha.: Kansuki; Hind.: Harsingar; Sans.: Prajatah; Eng.: Night Jasmine

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 244

Small tree, erect, upto 10m. high, often forming coppice, scabrid-pilose; leaves ca 10 – 11 x 5 – 6 cm, opposite, ovate, acute, base rounded; texture rough, lightly pubescent; flower small, bracteate head disposed, in terminal trichotomous cymes;

calyx ovoid, cylindrical, split or deciduous; corolla 1.5 mm long, light orange yellow, 3 - 7 lobes, elliptic, imbricate in bud; anther 2, subsessile ovary 2 celled, style cylindric, bifid, ovule one in each cell, erect; capsule orbicular, 0.3mm long.

FF: May – Oct.

Distribution: Most probably, exotic to the region and naturalized through plantation near home garden.

ES: Sr/T/ST/Tm/C.

HS: Cult.

PPU: Flowers bud/Leaf.

Ethnomedicinal uses: Powder of sundried flower buds are mixed in lukewarm water and taken during malarial fever, chest pain and diareheoa. Leaf paste is applied to cure skin inflammation. Powdered leaf is taken in small quantity to cure cough, frequent urination, mouth wound and indigestion.

118. *Olea polygama* Weight.

Vern. Name: Kha.: Kungnok

Specimen Examined: Sheelawati Monlai, Pothar Gaon, Lohit. SMZU 248

Small tree or shrub, 10 – 12 m high, bark grey; leaves glabrous, ca 5 – 10 x 3 – 4 cm across, elliptic, mucronate, suddenly acuminate coriaceous, cuneate, secondary nerves 8 pairs, subimpressed beneath, brownish to grey green; inflorescence panicle axillary, 1 – 2.5 cm long, male on one tree, female hermaphrodite and located on another tree; male flower with corolla, female without, corolla 4 - lobed; stamen 2, filaments; ovary 2 - celled, drupe ellipsoid, 1.4 cm, endocarp bony or crustaceous, 1 seeded.

FF: Jun - Sep.

Distribution: Along secondary and under forest floor in Namsai forest, foothills of Lohit Valley.

ES: Sr/T/ST/R.

HS: Wild.

PPU: Leaf/Seed

Ethnomedicinal uses: Powder are mixed with powder of dry rhizome of *Zingiber officinalis*. The crude drug is taken taken orally twice a day during gas trouble and stomach pain.

APOCYANACEAE

119. *Rauvolfia densiflora* Wall.

Vern. Name: Kha.: Peetkhum

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU 242

A large shrub sometime small tree, bark grey corky; leaves ca 12 – 15 x 3 – 4 cm, oblanceolate, or ovate, acuminate, glabrous, bright green above, pale beneath; lateral nerves 10 – 20 on either half, arcuate, base cuneate; petiole 4 cm, flowers 2 cm long, white, tinged with pink, in lax cymes, peduncle 3 – 4 in long; pedicel slender; corolla 0.4 mm long, reddish, lobes elliptic oblong; drupes very rugose, ellipsoid, solitary or in pairs, purplish black when riped, supported by persistant calyx; seeds flat, tubercled.

FF: Jun - Sep.

Distribution: Under shade habitat and forest floor in Kamlang WLS and near Parsuramkund area.

ES: Sr/T/ST/R.

HS: Wild.

PPU: Leaf/Root/Seed

Ethnomedicinal uses: The white latex and seeds are used in skin diseases. Powder root is used to cure aneamia, bleeding and blood cancer.

120. *Catharanthus roseus* L.

Vern. Name: Kha.: Tasinairasi ; Hind.: Dada bahar; Sans.: Nityakalyani; Eng.: Red periwinkle

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 241

A perennial herb reaching a total height of 20 – 80 cm, branches erect, numerous, young part hairy, leaves ca 7.5 x 2.5 cm, slightly foetid, petiolate, length 1.25 cm, lanceolate, entire, shining green, glabrous above; flower pink or white, sepal 5, petal 5, rotate, arranged in axillary or terminal cymose, solitary or clusters; fruits hairy, 2 -3 cm long, minute, seeds black.

FF: Dec - Jan.

Distribution: Cultivated as ornamental in homegarden, potherbs for its beautiful pink flowers.

ES: H/T/ST/C

HS: Wild/Cult.

PPU: Leaf/Root

Ethnomedicinal uses: Roots are main sources of alkaloids used in malarial fever and cancer. Leaf juice is applied to wasp sting. It is also used as sedative and tranquillizer.

121. *Plumaria acutifolia* Poiret.

Vern. Name: Kha.: Ankra; Ass.: Gulanchi; Hind.: Golainchi; Eng.: Pagoda tree

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 246

Erect, small tree, branches very thick, with crooked trunk and rough bark; branches swollen; leaves ca 12 – 17 x 7 – 9 cm, scattered elongate, numerous, horizontal, oblong acute at both ends, 8 – 12 inch; flowers many, fragrant, white within, large, in terminal 2 - 3 cymose; bracts many; calyx small, 5 fid; corolla white, rotate; stamens near the base of the tube; anthers obtuse.

FF: Dec - Jan.

Distribution: Mostly in dryland of Lohit and plain of Assam.

ES: Sr/T/ST/C

HS: Wild/Cult.

PPU: Leaf/Bark

Ethnomedicinal uses: Powder leaf and bark is used in malarial fever along with fruit pulp of *Terminalia bellerica* and dried flower buds of *Nyctentis arbortristis*.

122. *Alstonia scholaris* L.

Vern. Name: Kha.: Motongke; Ass.: Chatiana; Hind.: Chaitin; Sans.: Saptaparna; Eng.:

Devil tree

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 236

Plate No. 1.g.

A large evergreen tree, trunk tall, hight 15 – 20m, buttressed, with bitter milky sap; branches whorl, leaves whorl, 4 – 7 in number, ca 10 – 13 x 2 – 2.5 cm, smooth shining, dark green above, whitish beneath, petiole stout; inflorescence terminal raceme, flower large, pale purple to greenish white in compact; corolla large, twisted, tube short, throat villous, stamen-5, filament free, ovary subsessil, hirsute, fruit large, 20 – 90 cm long, pendulose in clusters, woody.

FF: Dec - Mar.

Distribution: Throughout India, abundant in study area.

ES: Tr/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Leaf/Bark

Ethnomedicinal uses: Most acclaimed medicinal tree in Ayurved. Khamti people used powder of bark and leaves in cancer, malarial fever, liver complain, and joint pain. Milky juce is used in skin irritation and inflammation.

123. *Tabernaemontana divaricata* L.

Vern. Name:Kha.: Pokopii; Ass.: Katanaiphul

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 233

Shrubs, bark greyish white, minutely fissured; branches dichotomous; leaves ca 3 – 13 x 1 – 5 cm, elliptic lanceolate, oblong lanceolate, ovate, acuminate, base cuneate, often oblique, shining green above; cymes upto 10cm long; flowers faintly fragrant, white, rotate, 4 – 6 cm across; follicles yellow, divaricate, 2 – 5 cm long; seeds red, arillate.

FF: Dec - Jan.

Distribution: Under forest floor, often cultivated in garden through vegetative cutting.

ES: Sr/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Leaf/Stem/Flower

Ethnomedicinal uses: Leaf paste is used as one of the many components in healing fractured bone. Raw flower is used as anti-inflammatory agent. Powdered stem is used in diabetic, gastritis.

124. *Nerium indicum* Miller.

Vern. Name: Kha.: Neram; Ass.: Karabi; Hind.: Kaner; Sans.: Karavera; Eng.: Indian Oleander

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 112

Erect evergreen shrub upto 4 - 6m high; leaves usually ternate, ca 12 – 16 x 2 – 3.5 cm, linear lanceolate, tapering at both ends, coriaceous, glossy green above, paler beneath; nerves obscure, numerous, parallel; flower 3 – 4 cm across or more, fragrant, usually rosy, in terminal cymes; calyx divided, segment transverse, corolla tube 2 – 3 cm, funnel shaped, hairy within, lobes laciniate; seeds linear, 3 cm long, brownish hairs.

FF: Apr - Dec.

Distribution: Cultivated in garden as ornamental; thrive well in both tropical and subtropical zone in study area.

ES: Sr/T/ST/C.

HS: Wild/Cult.

PPU: Leaf/Root

Ethnomedicinal uses: Decoction of root and leaf paste is applied externally during skin ulcer, boil eruption and irritation. Roots are reported to be quite poisonous in Ayurveda and used as antidote to snake bite, often used by Hindu women for suicidal.

125. *Parabarium micranthum* DC.

Vern. Name: Kha.: Pokung ; Ass.: Dhopalata.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 276

Climbing glabrous shrubs, a very tall climber; branches slender, pendulous, pustular, ultimate sometimes puberulous; leaves ca 6 – 10 cm x 3 – 4 cm, thinly coriaceous; nerves very oblique, slender; glabrous, ovate lanceolate, obtusely acuminate, nerves 3 - 5 pairs, cymes long peduncle, glabrous or puberulous, pedicell slender, short; calyx shorter than length of corolla, segment ovate; corolla glabrous, lobes faliate, spreading; stamen at the base of corolla.

FF: Dec - Mar.

Distribution: Along the road side of Chongkam and Namsai area, throughout Arunachal Pradesh.

ES: Scl/T/ST/C.

HS: Wild

PPU: Root/Leaf

Ethnomedicinal uses: Paste of stem and leaves are used in malarial fever, freshly cut wound for quick healing. White milky exudates is used in skin irritation and ulcer. Root paste is used to treat insect bite.

126. *Allamanda cathartica* L.

Vern. Name: Kha.: Yakunglota; Konkani: Kanangi

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 243

Plate No. 3.h.

An unarmed scandent shrub often suberect; leaves ca 12 – 13 x 6 – 7 cm, whorled, quite shining, quarternate, oblanceolate; petiole with intrapetiolar glands; flower showy, yellow in axillary paniced cymes; branchlet subulate, 3 – 5 cm long; calyx 5 fid, green, corolla 7 cm long; tube cylindrical, limb ventricose, lobes 5, rounded, yellow, throat hairy; ovary 1 celled; ovules many; fruits spiny, 2 valved, seeds flat; radicle superior.

FF: Dec - Jan.

Distribution: Cultivated as ornamental in the garden for its perennial yellow flowers.

ES: Scl/T/ST/C.

HS: Wild/Cult

PPU: Root/Leaf

Ethnomedicinal uses: Leaves are used in feeling of hotness in chest pain, cough and fever. White latex is applied externally in skin ulcer.

127. *Allamanda neriifolia* Hook.

Vern. Name: Kha.: Kaungang

Specimen Examined: Sheelawati Monlai, Manmow, Lohit. SMZU 113

Spreading shrub or erect, leaf ca 9 – 12 x 5 – 6 cm, whorl, 3 – 4, veins prominent, quite glabrous, dark green above, pale beneath; flower gregorous, 7 – 10 flower in single spikes; petal yellow, campanulate or tubular, lip 5, tube 5 – 6 cm long, 3 – 4 cm in diamtre; fruit globose round, ornamented with straight pointed spines all over.

FF: Dec - Jan.

Distribution: Under forest floor and secondary forest throughout Namsai Forest Division and foot hill region of Kamlang WLS.

ES: Sr/T/ST/C.

HS: Wild

PPU: Root/Leaf/Flower

Ethnomedicinal uses: Leaves are used in feeling of hotness in chest pain, cough and fever. White latex is applied externally in skin ulcer.

ASCLEPIDIACEAE

128. *Calotropis gigantea* L.

Vern. Name: Kha.: Akonata; Ass.: Akom

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 163

Plate No. 3.i.

Small tree or large shrubs, bark white, fissured; leaves ca 3 – 20 x 3.5 – 12 cm, oblanceolate, oblong ovate, acute or obtuse, base cordate, thick, coriaceous, floccose tomentose when young; corymbs 8 - 20 cm long, corolla ultimately spreading; follicles 6 – 10 cm long, turgid.

FF: May – Oct.

Distribution: Along the road side and wasteland, near railroad in India and Northeast India.

ES: Sr/T/ST/C.

HS: Wild/Cult

PPU: Root/Leaf/Bark

Ethnomedicinal uses: The powdered leaf and bark is used in malarial fever, and joint pain. White latex is applied externally during skin ulcer. Boiled leaf is spread over whole body to cure pain and tiredness, boil and eruption.

129. *Cryptolepis buchanani* Roem.

Vern. Name: Kha.: Yalong; Ass.: Harjora lota; Hind.: Karanta; Sans.: Jamba sariba

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 214

Large twinners; leaves ca 7 – 15 x 2.5 – 5 cm, oblong, oblong lanceolate, acuminate, base cuneate, smooth, smooth, glaucous beneath, cymes 2-4 cm across, trichotomous, subglobose; flowers 0.5 – 0.8 cm long, pale yellow; follicles 5 – 10 cm long; divarictae, pointed.

FF: May - Jan.

Distribution: Rarely in forest floor and secondary forest as twinners in plain and foothill region of Lohit valley.

ES: CI/T/ST/C.

HS: Wild/Cult

PPU: Leaf

Ethnomedicinal uses: Leaf paste is used as main components added to the paste of *Hemidesmus indicus* and *Euphorbia neriifolia* and applied to fractured portion of bone and kept for one week. The process is repeated until cure.

130. *Hemidesmus indicus* Weight.

Vern. Name: Kha.: Thotnamchi; Ass.: Nahor lota; Hind.: Nagjiva Sans.: Ananta.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 134

Perennial prostrate or twining shrub; rootstock woody; stems slender, terete, glabrous, thickened at node; leaves ca 5 – 10 x 2.8 – 3 cm, variable, elliptic to oblong, linear lanceolate, apiculate, broad at base, dark green above; flower crowded in sessile, pedicel short, bract imbricate, calyx 2.5 cm, ovate, corolla 5 cm, purplish inside, acuminate; follicles 10 – 15 cm, cylindric, glabrous; seeds 608 cm long flattened; black.

FF: Mar - Jun.

Distribution: In moist and dry habitat along foothill of Lohit Valley and rest of Arunachal Pradesh, throughout NE India.

ES: CI/T/STTm/C.

HS: Wild

PPU: Stem/Leaf

Ethnomedicinal uses: The paste of bark and leaves are used as components in medicines preparation for bone resetting. The same is use during joint pain, inflammation and urine sensation.

131. *Holostemma annulare* Wall.

Vern. Name: Kha.: Yauk puk; Hind.: Chirvel; Sans.: Arkhaphuspi

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 245

Twining glabraous climber, leaves ca 10 – 13 x 3 – 6 cm, faintly puberulose, opposite, membranous, cordate, basal lobes spreading or incurved, petiole 4 – 7 cm, midrib glandular, cymes umbelliform, irregular racemes, peduncles 3-4cm, pedicels long; corolla 10 lobed, fleshy, subacute, incurved; anther large, horny, shining, 10 winged column; stigma 5 winged; follicles smooth, thick, acute; seeds comose.

FF: Mar - Jun.

Distribution: In forest floor, often grow as twinner in secondary forest of Lohit Valley and Assam.

ES: CI/T/ST/Tm/R.

HS: Wild

PPU: Leaf/Milky sap from stem

Ethnomedicinal uses: Leaf paste is used in healing fractured bone, antiseptic. The milky latex of stem is applied in skin ulcer.

132. *Holarrhena pubescens* Wall.

Vern. Name: Kha.: Miligkuam; Ass.: Dudh Khiri

Specimen Examined: Sheelawati Monlai, Tenga Pani, Lohit. SMZU 130

A deciduous shrub, gregorous, upto 10 m high; leaves ca 8 – 10 x 3 – 7 cm, opposite, ovate, elliptic oblong, rounded or tapering at base, entire, acuminate; flower terminal cymes, fragrant, creamy white; calyx 5 lobed, ca 0.3 cm long, lanceolate,

acute; corolla slightly bulging at base, throat shining; follicles 2, slender upto 20 cm long, curved, coma brown.

FF: July – Dec.

Distribution: In dense and disturbed forest in plain and foothill area of Lohit Valley, throughout Eastern Himalayan Region.

ES: Cl/T/ST/Tm/R.

HS: Wild

PPU: Bark/Root

Ethnomedicinal uses: Fresh root paste is applied in boils and sores, skin affection. Powdered stem bark is taken with cool water during dysentery, chronic diarrhea and general stomach pain.

BORAGINACEAE

133. *Cordia dichotoma* Forst.f.

Vern. Name: Kha.: Mawphaman; Ass.: Kotra gaborhuta

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 117

Middle size tree, boles straight branches, bark ashy or brownish, longitudinal wrinkles; leaves ca 2.5 – 14 x 2 – 10 cm, broadly ovate, ovate orbicular or elliptic, entire, sinuate, acute or bluntly acuminate, sparsely hairy, rough above; corymbs upto 10 cm across; flowers white, fragrant, upto 0.5 cm long; fruit ovoid, glossy, yellow in maturity, 1 - 1.6cm in diameter, pulp, sweet, adhesive; seeds brownish black.

FF: Oct - Jan.

Distribution: In open forest, throughout Arunachal Pradesh, Meghalaya and Assam.

ES: Cl/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Fruit/Leaf/Stem/Root

Ethnomedicinal uses: The fruit juice is added as ingredient during medicine

preparation for healing fractured bone. It is used during diarehea; applied to cure burn skin and swelling. Roots are consumed in raw to cure stomach worm.

HELIOTROPIACEAE

134. *Heliotropium indicum* L.

Vern. Name: Kha.: Sankieng; Ass.: Hatishuria bon; Hind.: Chitiphul

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 301

Small much branched, procumbent herb, strigose, perennial, woody at base, branches slender; leaves ca 1.5 – 2.5 cm, linear, tapering towards apex, pubescent, lower surface pale white; flowers less than 2.5 cm long, bract linear, calyx lobe ovate, enlarging in fruit, corolla white; fruit dehiscent at apex, hair pointed.

FF: May - Oct.

Distribution: Along the roadside and secondary forest in Namsai, throughout India.

ES: H/T/ST/Tm/C.

HS: Wild

PPU: Leaf/Root

Ethnomedicinal uses: Leaf paste is taken with hotwater during chest suffocation and breathlessness; root powder is used in liver pain, gum bleeding, and mild cough.

CONVOLVULACEAE

135. *Argyreia nervosa* Burm.f.

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 419

Large climber, young stem tomentose; leaves ca 9 – 21 x 7 – 18 cm, ovate, acute or shortly acuminate, base cordate, densely depressed silky beneath; nerves impressed above; cyme capitate, peduncle short, subsessile, 8 – 8 cm across, bract grey silky, broadly ovate; flower pink, silky hairy outside, 3 – 4 cm long; fruits 2 - 3 cm in diameter, yellow – orange.

FF: May – Aug.

Distribution: Gregorous climber in secondary forest of Chongkam, near roadside, throughout NE region.

ES: Cl/T/ST/Tm/C.

HS: Wild

PPU: Leaf/Root

Ethnomedicinal uses: Leaf is slightly warmup on burning flame and spread to the back side of the body to relieve pain and general bodyache. White fluid is applied in wound and joint imflamation.

136. *Ipomoea aquatica* Forsskal.

Vern. Name: Kha: Humen; Ass.: Kalmou

Specimen Examined: Sheelawati Monlai, Hyuliang, Anjaw. SMZU 233

Twining or prostrate herbs, rarely shrubby or erect; stem terete, cylindrical and soft, greenish puplish; leaves ca 12 – 15 x 8 – 10 cm, variable, alternate, entire, lobed or divided, acute apex; flowers solitary or in cymes, 7 – 10 cm long, bract various; calyx - 5, equal or unequal, enlarged in fruit, corolla campanulate, pink, limb plicate, slightly lobed, stamen - 5, ovary superior, 2 (rarely-4) celled, fruit 4 - 6 valved capsule, rarely indehiscent; seeds usually-4, woolly, cotyledon bilobed.

FF: Sep – Dec.

Distribution: A twining shrubs abundantly grow in marshy habitat in plain of Lohit & Anjaw and adjoining part of Assam.

ES: Cr/T/ST/Tm/C

HS: Wild

PPU: Leaf/Shoot

Ethnomedicinal uses: Raw leaves and young stem are cooked and consumed as vegetable. It is used to relieve chest pain, liver disorder, lack appetite and constipation.

CUSCUTACEAE

137. *Cuscuta reflexa* Roxb.

Vern. Name: Kha.: Akash lota; Ass.: Amarlatu; Akashebela; Eng.: Dodder

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit & Anjaw. SMZU 211

Leafless twining parasites, yellow or reddish fleshy stem; flower minute, white, fascicled, sessile or shortly pedicelled, subracemose, bract very fleshy, subquadrate, sepal 5, shortly connate; petal 5 lobed, campanulate, imbricate in bud; stamen 5, inserted near the throat of corolla; ovary 2 celled, 4 – ovuled, stigma bifid; capsule globose, seeds glabrous.

FF: Feb - Apr.

Distribution: In secondary and degraded forest of Lohit and other district of Arunachal Pradesh, Assam.

ES: CI/T/ST/Tm/C.

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: Juice extract of whole plant is taken with raw milk during liver pain, and yellow eyes (jaundice), brown urination (Diabetis). The paste of stem is applied during inflammation in muscle and knee joint.

SOLANACEAE

138. *Solanum violaceum* Ortega.

Vern. Name: Kha.: Miyangkom; Ass./Beng.: Beyakura; Hind.: Barhanta

Specimen Examined: Sheelawati Monlai, Hawa camp, Anjaw. SMZU 287

Prickly shrubs, 0.5 – 1.5 m tall, much branched, pubescent overall with dense, stalked, 5 – 11 rayed stellate hairs; stems and branches with recurved pale yellow prickles, gray stellate tomentose; leaves unequal paired; leaf blade ovate, ca 5 – 8 x 2 – 7 cm, tomentose, straight needlelike prickles, base cordate or truncate, margin 5 –

7, sinuate lobed, acute; flower racemed, 2 – 6 cm; corolla blue-purple, sometimes white, rotate, lobes ovate-lanceolate; fruiting pedicel stellately pubescent, prickly; berry shiny orange, green patch at young, globose, 0.8 – 1.3 cm in diam; seeds sub-discoid, 2 mm in diam.

FF: Jan – Dec.

Distribution: In secondary forests, dry thickets, wastelands, roadsides in study area.

ES: H/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Fruit

Ethnomedicinal uses: Fruits are used for relieving gastritis pain, indigestion, high blood pressure, cough, toothache, and externally for skin ulcer.

139. *Solanum ferox* L.

Verna. Name: Kha.: Mopu

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 119

Plate No. 4.a.

A coarse undershrub; young parts densely brown, stellately woolly and prickly; leaves ca 8 – 12 x 5 – 8 cm, ovate, sub-orbicular, rather shallowly lobed; lobes blunt, rather membranous with stellate hairs beneath as well as above, compound spikes on the nerves and midrib; base truncate; petiole 5 – 7 cm long; flower in short lateral cymes; calyx densely villous outside; fruits berry globose, about 1 in in diameter, hispid, pubescent green at young.

FF: Jan – Dec.

Distribution: Throughout Assam, middle and lower elevation of Arunachal Pradesh; rare in study area.

ES: H/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Fruit

Ethnomedicinal uses: The juice extracts of fruits and leaves are taken during gastritis, high BP, liver complain and general debility.

140. *Solanum torvum* Swartz.

Vern. Name: Kha.: Mehengchang; Ass.: Hathibekuri; Burmese: Kayangyin

Specimen Examined: Sheelawati Monlai, Tiding, Anjaw. SMZU 228

A medium size tomentose shrub, ca 1.5 – 4 m high, erect, prickly; leaves ca 12 – 20 x 10 – 17 cm, without prickle or with few prickle beneath midrib, leaf lobed, shallow, rarely deep, softly hairy above, peduncle axillary, short, cyme often bifurcate, flower white, anther orange yellow; fruit 1.4 cm, seated on the green calyx, dark green, smooth, turn yellow in maturity.

FF: Feb – Nov.

Distribution: In secondary and disturbed habitat, throughout Northeast India.

ES: H/T/ST/Tm/C.

HS: Wild

PPU: Fruit

Ethnomedicinal uses: Fruit paste is consumed to cure chronic gastritis, diarrhea, high BP, liver pain, malarial fever and indigestion. Leaf infusion is applied in skin ulcer, infection.

141. *Withania somnifera* L.

Vern. Name: Kha.: Bhubitong; Ass.: Aswagondo; Hind.: Asvaganda; Chinese: Shui qie

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 135

Herbs perennial, 30 - 150 cm tall, pubescent with dendritic hairs; stems woody proximally, erect or reclining, branched, tomentose; petiole 1 – 2 cm; leaf obovate - oblong, ca 2.5 – 12 x 2 – 7 cm, glabrescent adaxially except along midvein,

pubescent abaxially, base cuneate, apex acute; inflorescences subsessile clusters of 4 – 6 flowers; peduncle obsolete; pedicel ca. 5 mm; calyx campanulate, 3 – 5 mm, tomentose; lobes deltate, 1 – 2 mm; corolla yellowish green, narrowly campanulate, 5 – 8 mm, tomentose at throat; lobes ovate, spreading or recurving, 2 – 2.5 mm; berry shiny, scarlet, globose, 5 – 8 mm. Seeds drying pale brown, reniformdiscoid, 2 – 2.5 x 2 mm.

FF: Jul - Oct.

Distribution: Abundant in Northwest India, rare in NE India.

ES: H/T/ST/Tm/R.

HS: Wild

PPU: Root/Fruit

Ethnomedicinal uses: Paste of fruits and roots are used to cure male impotency, improve general debility and weakness. It is also used as brain tonic.

142. *Datura stramonium* L.

Vern. Name: Kha.: Pukumii; Ass./Hind.: Datura; Sans.: Dhaturah; Eng.: Torn apple.

Specimen Examined: Sheelawati Monlai, Hyhuliang, Anjaw, SMZU 221

Annual shrub, upto 1 – 2 m high, puberulose; leaves stalked, ca 16 – 18 x 5 – 9 cm, ovate, deeply toothed or sinuate, pale green; flower solitary axillary or 2 – 3 from each inflorescence; calyx 2.5 – 4.5 cm, 6 lobed, pubescent, stellately tomentose; corolla tubular, large, upto 8cm long, purplish or white, 2.5 – 4.5 cm in diam., 5 lobed; berry erect, slightly ovoid or rounded, deeply 4 valved, covered with rigid long and short prickles surrounded.

FF: Jan - Jul.

Distribution: Comon in dry patches, open forest and roadside in study area.

ES: H/T/ST/Tm/R.

HS: Wild

PPU: Fruit/Leaf

Ethnomedicinal uses: Paste of leaf and berry is applied externally during dog bite.

Powder fruits is taken as digestive and paste is used to treat burnt skin, inflammation.

BIGNONIACEAE

143. *Millingtonia hortensis* L.

Vern. Name: Singpo/Kha.: – Meteka

Specimen Examined: Sheelawati Monlai, Kherem, Lohit. SMZU 116

Plate No. 4.b.

An erect tree upto 20 m high, bark corky; leaves opposite, 2 - 3 pinnate, branches drooping, shining, aromatic, leaflet ca 3 – 4 x 1.6 – 2 cm, ovate, lanceolate, sinuate or crenate, young pubescent, matured glabrous; peduncle 4 – 6 cm, panicle many flowered; calyx small, 5 toothed; corolla 5 lobed, tube slender, acute, subcalvate, white, pleasantly aromatic; stamen shortly exerted; stigma exerted; capsule acute at both end, valves woody, seeds winged attached to opposite margin of septum.

FF: Jun – Sep.

Distribution: Rare at higher elevation of Lohit District in secondary forest.

ES: Tr/T/ST/Tm/R.

HS: Wild

PPU: Leaf/Flower/Bark

Ethnomedicinal uses: The infusion of leaves, bark and flower are used during chest pain, asthma, jaundice. The pastes of roots are use as componenets in healing fractured bone.

144. *Oroxylum indicum* L.

Vern. Name: Kha./Ass.: Bhatgila; Hind.: Sonapatha; Sans.: Syanakam; Eng.: Indian trumpet tree

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 101

Medium sized deciduous tree, 12 – 15 m high; bark thick, brown, grayish corky, laxly branched or unbranched, branches erect or suberect; leaves glabrous, 1 – 2 m long, leaflet 5.5 – 14 cm, ovate, broadly orbicular, lightly pubescent, dark green, oblanceolate, acuminate, thick, deciduous; flower terminal raceme, 9 – 10 cm long, light yellow to white in clusters; seed thin, white, winged, numerous with moderately hard seed coat borne in long compressed pod of length 70 – 100 cm, dark brown, splitting open on drying. **FF:** Sept - Oct.

Distribution: Common in degraded forest in study area, rare in temperate zone of Arunachal Pradesh.

ES: Tr/T/ST/Tm/C.

HS: Wild

PPU: Bark

Ethnomedicinal uses: Powdered bark of stem and roots are bitter and use in jaundice, chest pain, cough, fever, diarrhea, and heart pain.

PEDALIACEAE

145. *Sesamum orientale* L.

Vern. Name: Kha.: Til, Ass./Hind.: Kalatil

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 219

Herbs annual, erect, to 1.2 m tall; stems 4-angled, finely pubescent; leaves opposite or alternate; leaf blade lanceolate to ovate, variously 3 parted, ca 4 – 20 x 2 – 10 cm; spike long, tapering towards apex; flowers white, pink, or mauve-pink with

darker markings; calyx persistent; corolla 1.5 - 3.3 cm; capsule narrowly oblong, beak broad, short; seeds horizontally arranged, double fringe conspicuous; testa white, brown, or black when ripe, smooth.

FF: Aug - Oct.

Distribution: Cultivated in jhum field in study area, rest of Arunachal Pradesh and Hilly region of Northeast India as oil seed crop.

ES: H/T/ST/Tm/C.

HS: Cult.

PPU: Leaf/Seed

Ethnomedicinal uses: Powdered seed is taken during pregnancy to ensure safe delivery of child. The oil extract is used for messaging the headache. Raw aromatic leaf is uses as antiseptic and relieving inflammation of muscle. The cooked vegetable is consumed during chest pain, constipation.

ACANTHACEAE

146. *Eranthemum palatiferum* Ness.

Vern. Name: Kha.: Murmuchhi patta

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 106

Perennial herb upto 40 cm high, stems pubescent upwards; leaves elliptic acuminate at both end, pubescent on midrib, ultimately glabrate, nerves 8 – 10 paires, ca 8 – 9 x 10 – 12 cm, inflorescence racemes, foot often long, pubescent; calyx linear, pubescent, corolla tube linear at apex, pale publish, often with yellowish spot on middle lobes, stamen 4, 2 fertile; ovary glabrous, capsule pubescent, seeds reticulate rugose, glabrous.

FF: Sep. – Nov.

Distribution: Common in open patches, forest floor and disturbed site throughout Lohit Valley.

ES: H/T/ST/Tm/C.

HS: Wild

PPU: Leaf

Ethnomedicinal uses: The juice extract of leaves are taken during stomach pain, cough and mental dizziness.

147. *Phlogacanthus thyrsoiflorus* Roxb.

Vern. Name: Kha.: Mochomkhum; Ass.: Titaphul

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 512

Gregorous shrub, upto 4 m high, stem sparsely branched, quadrangular; leaves ca 10 – 34 x 3 – 9 cm across, oblanceolate elliptic, elliptic oblong, acuminate, spikes 10 – 25 cm long, flower deep red, base 1.5 – 2.6 cm long, slightly curved; calyx tubular, setaceous, densely pubescent, corolla, densely villous, tube broad, curved; stamen and style glabrous, capsules 3.5 – 4.4 cm long, dilated at tip, subquadrangular; seeds compressed, shortly but densely hairy.

FF: Sep – Nov.

Distribution: In both wild and cultivated condition in Lohit Valley and plain part of Assam.

ES: H/T/ST/Tm/C.

HS: Wild/Cult

PPU: Seed

Ethnomedicinal uses: The leaves are boiled with water and soup is used for bathing to relieve body tiredness and pain. The cooked leaves are taken as vegetable during stomach pain and indigestion.

148. *Justicia jendarussa* Burm.f.

Vern. Name: Kha.: Yapangnang; Ass./ Beng.: Jagatmadan; Hind.: Nilinragandi

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 421

Undershrub, 0.5 – 1.3 m high, branches subteret, sometime raised lines; leaves ca 7 – 8 x 2.5 – 3 cm, lanceolate, linear lanceolate, petiole base swollen, 7.4 – 12.2 cm long, narrow, glabrous when young, flower white or spotted purplish, arranged in interrupted spikes of 6 – 12 cm long, from upper most leaf axil in terminal panicle; calyx glabrous, linear segment; corolla 1.4 cm, curved; capsule 1.4 cm clavate.

FF: Dec - May.

Distribution: Under forest floor and in secondary forest. Often cultivated in garden as ornamental.

ES: H/T/ST/Tm/C.

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Leaf paste is used for body messaging to relieve pain. It is also used as ingredient in preparation of vitality medicines.

149. *Adhatoda zeylanica* Medic.

Vern. Name: Kha.: Bogabahog; Ass.: Bahaka tita

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 418

A dense shrub, upto 4 m high, sometime arborescent upto 10 m high; leaves ca 14 – 18 x 7 – 9 cm, elliptic acute at both end, entire, shining, spikes dense, ca 10 cm long, bract obovate, glabrous, falcate- oblong deeply 5 lobed, equal; corolla tube, broad lanceolate, white tubular, rose color bar in throat, 3.5 cm; stamen glabrous; ovary minutely hairy; capsule clavate, pubescent 4 seeded; seeds glabrous.

FF: Mar - Jul.

Distribution: Commonly encounter in entire Assam and plain of Lohit in cultivated condition.

ES: Sr/T/ST/Tm/C.

HS: Wild/Cult.

PPU: Leaf

Ethnomedicinal uses: Paste of leaf is mixed with other plants and used as vitality medicines. Powdered stem bark and roots are used as malarial and jaundice drug with lukewarm water in small quantity.

THUNBERGIACEAE

150. *Thunbergia grandiflora* Roxb.

Vern. Name: Kha.: Kekop; Ass.: Kakua loti

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 432

Plate No. 4.c.

A large climber, young parts tomentose; stem round or quadrangular in young, grey; leaves ca 5 – 15 x 6 – 15 cm, much broad, ovate, ovate orbicular in outline, shallowly 5 or more lobed, dentate at base, acute, base deeply cordate, 7 – 11 nerved, scabrous, tomentose; flowers ca 6 – 7 cm long, fascicled on usually pendent racemes, white or light bluish white, campanulate; capsules 3 – 5 cm long, 4 qutrous beak.

FF: Apr - Jul.

Distribution: In forest floor, secondary forest and wasteland as climber to big or medium size trees, throughout Arunachal.

ES: CI/T/ST/Tm/C.

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Juice extract of leaf is applied in annus to cure piles. Raw paste is used to relieve muscle pain.

VERBENACEAE

151. *Lantana indica* Roxb.

Vern. Name: Kha.: Kahunga; Ass.: Gophul; Hind.: Kdujoli; Eng.: Indian Lantana

Specimen Examined: Sheelawati Monlai, Hawaii, Anjaw. SMZU 421

Shrub, gregarious upto 4 m high, branchlet pubescent; bark grayish-brown; leaves ca 4 – 7 x 1.6 – 3 cm, ovate lanceolate, acute, base cuneate, margin crenate, pubescent, pale grey beneath; hairy or pubescent; spikes 4 – 5 cm long, flower umbellate cymes, 0.4 – 0.5 cm long, pink, throat yellow; calyx pubescent, green, corolla pink, 5 lipped, carpel gynoebasic; fruits purplish green but at maturity, 0.3-0.4cm across.

FF: Apr – Oct.

Distribution: Frequent along forest margin, roadside, wasteland and secondary forest, near stream and flood plain of Assam, and plain part as well as hills Lohit valley.

ES: Sr/T/ST/Tm/C.

HS: Wild

PPU: Root/Stem bark/Leaf

Ethnomedicinal uses: Leaf paste is applied in freshly cut wound, inflammation in joint and muscle. Powdered bark and roots is applied in old wound as disinfectant and enable quick healing.

152. *Stachytarpheta jamaicensis* L.

Vern. Name: Kha.: Yahangeng

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU-1123

Plate No.4.d.

Herbs, bushy and pendent quadrangular branches, height upto 60 cm; leaves toothed, petiole reduced, subtuse, base decurrent, elliptic serrate, nearly glabrous, ca 1 – 4 x 5 – 6 cm; inflorescence terminal spike, 3 – 12 cm long and slender, flower ultimately somewhat sunk in thickened rachis, bract lanceolate, 4-toothed calyx 2 mm, corolla 3.5 mm long, white to light bluish, limb oblique, 5-lobed, inner lobed of corolla pubescent; stamen-2, fertile, anther cell ovate, divericate vertically.

FF: May – Jul.

Distribution: In Lohit and open places Assam.

ES: H/T/ST/C.

HS: Wild/Cult.

PPU: Root/Stem bark

Ethnomedicinal uses: Leaf paste and powdered bark is used to treat low vitality.

Powder of whole plant along with dried *Embllica officinalis* is used as anaemic medicines.

153. *Verbena officinalis* L.

Vern. Name: Kha.: Yahangnon

Specimen Examined: Sheelawati Monlai, 2 mile, Lohit. SMZU 104

Pubescent herb, upto 80 cm high, decumbent, quadrangular, erect; branchlet arise in whorl or quite diverse; leaves ca 6 – 7 x 0.5 – 1 cm, ternately whorled, coarsely toothed or pinnatifid, narrow, acute, pubescent, hoary nerves beneath; spikes terminal, dense, upto 20 cm long, flower 2 - 3 cm, calyx 4, oblong, teeth minute; corolla bluish white, campanulate, lobes subquadrate, throat hairy; pyrenes 3 ribbed, smooth.

FF: Jun – Aug.

Distribution: In open forest, roadside, river bank, flood plain and wasteland in plain of Chongkam and Namsai forest division.

ES: H/T/ST/C.

HS: Wild/Cult.

PPU: Leaf

Ethnomedicinal uses: The leaf powder is used to relieve chest hotness and bronchitis.

The paste is used during muscle inflamaion and bodyache.

154. *Vitex nigundo* L.

Vern. Name: Kha.: Yompeng; Ass.: Pasutia; Hind.: Nirgundo; Eng.: Chaste tree

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 107

Under shrubs or small tree upto 10 m high, bark grey, quite smooth; branches suberects, quadrangular, aromatic-foetid; leaves 3 – 5 foliate, leaflets ca 3 – 12 x 1 – 2 cm across, lanceolate, ovate-lanceolate or oblong-lanceolate, acuminate, base cuneate, glaucous beneath; panicles upto 15 cm long; flowers purplish or purlish white, 0.4 – 0.6 cm long; drupes 0.4 cm across.

FF: Apr – Oct.

Distribution: In forest margin, open forest, wasteland in the plain of Chongkam village and Gananagar of study area.

ES:Sr/T/ST/C.

HS: Wild/Cult.

PPU:Leaf

Ethnomedicinal uses: Decoction of powdered leaf is mixed with lukewarm water and consumed during severe gastritis and malarial fever.

155. *Clerodendrum inerme* Gaertn.

Vern. Name: Kha.: Pirolauk; Ass.: Banjoi; Hind.: Lanjai

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU-128

Struggling shrub, much branched, scandent, stem slender, pale brown, twiggy; leaves opposite, ca 3 – 5 x 1.5 – 2.2 cm, elliptic obovate, glabrous, acute, entire, petiole 7 – 9 cm long, slightly pubescent; flower in axillary pedunculates cymes, 3 – 9 flowers in peduncle, slender, 1.5 – 4.6 cm long; bract minute, subulate; calyx enlarged into fruit; corolla tubular, slender, 2.6 cm, white, lobes subequal, crenulate margin; stament 4, much exserted, hairy; ovary glabrous; drubes pyriforms.

FF: Jan – Dec.

Distribution: Cultivated as ornamental in near backyard, fencing and garden in Namsai and Chongkam, Assam.

ES:Cl/T/ST/Tm/C

HS: Wild/Cult

PPU: Leaf

Ethnomedicinal uses: The paste of leaf is used to relieve inflammation of skin and joint pain, and muscle sprain.

156. *Clerodendrum serratum* L.

Vern. Name: Kha.: Patuiya; Ass.: Nangal Bangha

Specimen Examined: Sheelawati Monlai, 2nd mile, Lohit. SMZU - 283

Plate No. 4.e.

Shrub, or undershrubs upto 2 m high; young branchlets quadrangular, bark grayish; leaves ca 6 – 25 x 2 – 10 cm, oblong or oblanceolate, or obovate-elliptic, acute or acuminate, base narrowed, cuneate, glabrescent; panicles upto 30 cm long, pyramidal; flowers 1.4 – 2.5 cm, bluish white or reddish white; drupes 0.6 – 0.8 cm across, globose, obovate, black when ripen.

FF: May – Dec.

Distribution: In open places, forest margin and wasteland throughout Arunachal Pradesh and Lohit Valley.

ES: Sr/T/ST/Tm/C.

HS: Wild

PPU: Leaf

CDT: Pound

Ethnomedicinal uses: The fresh juice extract of leaves are consumed during urine sensation. The paste of raw leaf is applied over forehead during headache and viral fever.

157. *Clerodendrum colebrookianum* Walp.

Vern. Name: Kha.: Patakhaie; Ass.: Nehphaphu

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU - 289

Shrubs, high upto 5 m; bark grey, shining; crown globose, usually foetid smell;

leaves ca 6 – 23 x 5 – 18 cm, broader, ovate-orbicular, obtuse, base subcordate or truncate, glabrous above, pale beneath; corymbs compound, 7 – 24 cm across; flowers 2 – 3 cm, white; drupelets globose, bluish-green, 0.5 - 0.8 cm across.

FF: Jun - Dec.

Distribution: Common in wasteland, forest margin, and secondary forest in study area.

ES:Sr/T/ST/Tm/C.

HS: Wild

PPU:Leaf

Ethnomedicinal uses: The boiled leaves are consumed as vegetables during indigestion, high blood pressure and liver pain. The paste of raw leaf is applied over forehead during viral fever.

158. *Clerodendrum viscosum* Vent.

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU-1283

Plate No. 4.f.

Shrub, upto 3 m high, young part light green, tomentose, lenticular, warty; leaves ca 8 – 18 x 7 – 16 cm, ovate lanceolate, quite broad, acute or acuminate, base rounded or subtruncate, distantly dentate, serrate or subentire, pubescent; panicles corymbose, upto 22 cm long, flower 2 – 3 cm long, white or tinged pink, bracts reddish; drupes bluish black, 0.8 – 1 cm across, shining.

FF: Feb - Aug.

Distribution: Abundantly grow in wasteland, forest margin and near village patches at the boundary of Assam and Arunachal Pradesh.

ES:Sr/T/ST/C.

HS: Wild

PPU:Leaf

Ethnomedicinal uses: The powder of dried leaf and bark is used as components in

preparation of pills to cure gastritis and appendix. The powder is taken in small quantity during diabetic and high blood pressure.

159. *Clerodendrum fragrans* Willd.

Vern. Name: Kha.Khae Hom

Specimen Examined: Sheelawati Monlai , Momong, Lohit. SMZU 423

Shrubs, upto 2 – 3 m high, sparsely branched, branchlet quadrangular, tomentose; leaves ca 8 – 15 x 8 – 16 cm across, ovate, orbicular, acute or acuminate, base truncate, shallowly subcordate, irregularly dentate, sparsely pubescent above; corymbs 4 - 6cm, bracts reddish, acuminate, pink; corolla numerous, aestivation valvate or imbricate, rosy appearance, more than 1 seriate; fruits purplish, ovoid, quite shining.

FF: Feb - Aug.

Distribution: Common in wastedland, roadside and forest margin in Namsai. Leaf almost like *Clerodendrum viscosum* but flower pink, inflorescence almost reduced and much fragrant.

ES:Sr/T/ST/C.

HS: Wild

PPU:Leaf/bark

Ethnomedicinal uses: The powdered leaf and bark is used in diabetic. A dosage of 2 - 3 pills twice a day to protect the liver cirrhosis.

LAMIACEAE

160. *Ocimum basilicum* L.

Vern. Name: Kha.: Sabering; Ass.: Ban tulosi; Hind.: Babul tulsi; Eng.: Sweet basil.

Specimen Examined: Sheelawati Monlai Chongkam, Lohit. SMZU 279

Herbaceous, 60 – 80 cm high, erect, glabrous or pubescent, leaf ovate, toothed or entire, bract petiolate, fruiting calyx very shorter, pedicelled, 2 lower teeth ovate-

lanceolate, longer than the rounded upper, corolla 0.2 - 0.3 mm long, very small, 5 lip, upper lip 4 lobed, imbricate, pink or purplish, bilabiate, hardly longer than calyx; filaments 4; stigma 2 fid, bicarpellary, style, gynobasic, fruit schizocarpic; nutlet 4, rugose, or broadly oblong, nearly smooth, light dark.

FF: Aug – Nov.

Distribution: Cultivated in home garden in the plain of Lohit in study area. Distributed throughout tropical India, Africa, Malaya and Pacific Island, indigenous in Punjab (J.D Hooker, 1885).

ES:H/T/ST/C.

HS: Cult./Wild

PPU:Leaf

Ethnomedicinal uses: The juice extract of fresh leaves are used as antiseptic, skin eruption, red eye, earache, sinusitis, cough and viral fever in Child.

161. *Ocimum sanctum* L.

Vern. Name: Kha.: Tulsi; Ass.: Tulosi; Hind.: Tulsi, Eng.: Holy basil

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 280

Stem woody below, herb, 80 cm high, aromatic, highly branched, erect, ascending or spreading; leaves ca 2.5 – 5.6 cm x 3.5 – 4 cm, opposite, dentate or lobed, sometime entire at base, pubescent, purplish brown or light greenish, inflorescence upto 20cm long spikes, 6 – 10 flower racemed, emit fine scent, calyx 5-toothed, deflex, pubescent; corolla small, 5 lip, upper lip 4 lobed, purplish, bilabiate; stament 4, fifth posterior filament suppressed; stigma 2 fid, bicarpellary, style, gynobasic, tetralocular ovary, fruits schizocarpic. nutlet 4, subrugose, pale red brown.

FF: May – Nov.

Distribution: Cultivated in study area, Asiatic origin, cultivated all over India for medicinal and worship purpose.

ES:H/T/ST/Cult./C.

HS: Cult./Wild

PPU:Leaf

Ethnomedicinal uses: Leaf decoction and juice is used in earache, sinusitis, malarial fever, jaundice, and cuts and wound, piles, boils, traumatic swelling, rheumatism.

162. *Solenostemon scutellarioides* L.

Vern. Name: Kha.:Ya muksii; Eng.: Coleus.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 542

Perennial herb, stem robust and fleshy, upto 40 cm long, suberect or erect, pubescent, quadrangular; leaves simple, ca 3 – 5 x 2 cm, opposite or whorled, ovate, orbicular, acuminate, obtusely crenate, slightly pubescent, upper surface mottled with brown sanguine patches of green colour; inflorescence 18 – 25 cm long spikes, flower bluish white, numerous, in clusters or racemed; calyx throat villous, hood of corolla toothed with bluish orange patches outside, petal 5, stamen 4, carpel bifid; nutlets small and glabrous.

FF: Mar – May.

Distribution: Along the road side, often found cultivated in garden for ornamental purpose in study area.

ES:H/T/ST/C.

HS: Cult./Wild

PPU:Leaf

Ethnomedicinal uses: Decoction of leaf is used in rheumatic arthritis, inflammation and muscle pain. Paste is applied on joint wrapped with banana leaf and kept overnight.

163. *Pogostemon benghalensis* Kuntze.

Vern. Name: Kha.: Ya kin phit; Ass.: Sukloti; Hind.: Kali bhant

Specimen Examined: Sheelawati Monlai, Manmow Lohit. SMZU 502

Plate No. 4.g.

Large shrub or bush, branches rounded at old, quadrangular at young, slightly pubescent, upto 3.5 m high; leaves ca 3 – 7 x 3.5 cm, simple, opposite decussate, across, petiole 2.5 cm long, upper surface dark green, lower light green, doubly serrated, obovate, acuminate, glabrous; inflorescence paniculate, dense hoary pubescent, terminal stout spikes, whorls, many flowered closed, pubescent; enclosing a fascicles of sessile flower; corolla 3 lobed, middle lobe narrow, bluish pink or white coloured; stamen 4, much exserted, filaments bearded; carpel 1 celled.

FF: Feb - Apr.

Distribution: Along roadside with gregarious habit in rich humus soil in Chongkam, Tezu and Namai.

ES:H/T/ST/Cult./R.

HS: Cult./Wild

PPU:Leaf

Ethnomedicinal uses: Dry leaf powder is mixed with powdered flower buds of *Nyctanthes arbortritis*. Prepared crude drug is used to cure malarial fever, jaundice, body pain and indigestion. Raw leaves are boiled and the water is used for bath to relieve physical tiredness. The soup of boiled leaf is consumed during chest and stomach pain.

164. *Pogostemon brachystachys* Benth.

Vern. Name: Kha.: Pukummu

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 503

Stem struggling, upto 30 cm high, low procumbent below, much branched, pubescent, hairs deflexed; leaves small, ca 4 – 5 x 2 – 3 cm across, ovate, subacute, doubly crenate, variable, rarely oblong lanceolate, hirsute or finely tomentose; spike dense villous, 10 – 13 cm, whorls confluent or lower separate, bracts minute, linear;

calyx minute, 5-lobed, hirsute or hispid, teeth subulate ciliate; corolla small, 3 merous, pink purplish, tube hardly exerted, lobes hirsute; stamen 4; nutlet small, rounded to ellipsoid, light dark.

FF: Dec – Feb.

Distributio: In secondary forest of Lohit Valley, and near villages of Chongkam and Namsai circle.

ES:H/T/ST/C.

HS: Wild

PPU:Leaf

Ethnomedicinal uses: Decoction of leaf powder is used in malarial fever, and jaundice.

Fresh leaf juice is used as insecticides and applied in skin irritation.

165. *Elsholtzia blanda* H. Keng

Vern. Name: Kha.: Yanonma

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 308

Slender puberulous hoary herb upto 30cm, branches 4 angled; leaves opposite, petioled, elliptic lanceolate, acuminate, serrate, ca 6 – 11 x 2 – 3 cm across, slightly pubescent; spikes 7 – 12 cm long, slender paniced or one sided, flower minute, bracts subulate and lanceolate; calyx 5 toothed, ureolate glandular pubescent, teeth erect, lanceolate; corolla small, tube short, 4 lipped, upper lip erect, notched, spreading, white, sparingly pubescent; stamen 4, diversing, fliments naked; style sub-equally 2 fid, lobes subulate; nutlets broadly ellipsoid.

FF: Jul – Oct.

Distribution: The plant is widely distributed in Chongkam and Namsai circle of Lohit in open habitat mostly Asiatic (J.D Hooker, 1885).

ES:H/T/ST/Tm/C.

HS: Wild

PPU:Leaf

Ethnomedicinal uses: Fresh juice extracts are used in stomach pain, sinusitis. Leaf powder is taken along with *Zinger* twice a day during coughs and chest complains.

166. *Perilla frutescens* L.

Vern. Name: Kha.: Nga khaw; Ass.: Boga til; Hind.: Banjira; Eng.: Perill.

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 302

Annual herbs, 10 – 15 cm, stem quadrangular, edges obtuse; length, 0.5 – 1.5 cm in diameter, pubescent, dull purplish green; with longitudinal grooves, longitudinal striae on all sides; nodes slightly bulgy, with opposite scars of branchlets, leaf blade somewhat curled, ovate, acuminate, base orbicular, both side purplish green, ca 4 – 11 x 2.5 – 9 cm, pubescent or coarsely crenate, aromatic; petiole 2 – 7 cm, odour fresh and fragrant, slightly acrid; flower white; calyx 2, campanulate, 5-toothed, corolla 5 stamen 4, subequal, erect, style 2 fid; nutlets subrugose, coarsely reticulate.

FF: Sep – Nov.

Distribution: In agricultural field and deforested area of Chongkam and Namsai circle of Lohit District.

ES:H/T/ST/Tm/C.

HS: Wild

PPU:Leaf/Stem/Seed

CDT: Slice, Pound

Ethnomedicinal uses: Stem powder is used in abdominal distension, morning sickness, threatened abortion. Leaf powder is used in oppression chest feeling, nausea, vomiting, food poisoning from crab and insects, common cold, cough, headache. Seeds are used in cough and asthma.

167. *Mosla dianthera* Maximovicz.

Vern. Name: Kha.: Ngakai

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 343

Annual and aromatic, erect herb, upto 1.4 m high; Stem slender, sparsely pubescent; leaves ca 2 x 1.5 cm across, petiole 0.6 mm, ovate, serrate, acute, arranged in whorls; flower in terminal axillary second raceme, bracts minutes; calyx campanulate, 0.7 mm long, 5 toothed, lower 2 longer, throat pubescent, hemispherical, fruiting enlarged; corolla tube light pubescent, short, 0.8 mm long, white or purplish, upper notched, lower 3 fid; stamen 2; staminodes 2, disc a large posticous gland; nutlets subrugose coarsely reticulate.

FF: Jun – Aug.

Distribution: In open places in Chongkam, Namsai and Wakro circle of Lohit District.

ES:H/T/ST/Tm/R.

HS: Wild

PPU:Leaf

Ethnomedicinal uses: Fresh juice extracted from leaf is applied on skin during allergy, irritation and inflammation. Paste is applied as antiseptic in freshLY cuts & wounds.

168. *Mentha piperita* L.

Vern. Name: Kha: Piche hun; Sing:Balasen; Hind.: Pudina; Eng. Peppermint

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 1132

Plate No. 4 h

Annual, glabrous strong scented herb, upto 1.5 m high, stem quadrangular at young; rootstock creeping, white and segmented; leaves petioled, ca 2.5 – 10 cm x 2.4 cm across, arranged in whorl, petiole coarsely serrated, acute apex, obtuse at base, smooth above, rarely sparingly hairy on the nerves below, ovate or oblong lanceolate, sometimes bractiform; inflorescence in terminal spikes, cylindrical, interrupted below; bracts minutes, pedicel and flower glabrous or very sparingly hispid, calyx often white or red, corolla white, minute.

FF: Sep – Oct.

Distribution: Cultivated in Indian garden in open habitat, marshyland, roadside of Chingkam in Lohit Valley.

ES:H/T/ST/R

HS: Wild

PPU:Leaf/Stem

Ethnomedicinal uses: Leaf paste is consumed as salad along with rice during stomach pain, excess gas formation. The paste is used during joint pain. The powder of dried leaf and stem is taken along with hotwater during cough and indigestion.

169. *Mentha arvensis* L.

Vern. Name: Kha.: Pechi hun; Ass./Hind.: Pudina; Eng.: Cornmint

Specimen Examined: Sheelawati Monlai , Pankaw, Lohit. SMZU 1220

Erect herb, 8 – 13 cm high, stem short, branched with short hairs, dense and turned black or purplish; leaves narrow below, stalked, ovate, oblong lanceolate, toothed, upper similar and large; inflorescence whorl, flower lilac in axillary distant whorl non at the top; calyx bell shaped, hairy, triangular, campanulate, 5 - teeth, throat of calyx naked; corolla subequally 4 lobed, pubescent; bracteole acute shorter than the flower; stamen 4, equal, erect; anther cells parallel; style arm short; nutlet dry, smooth.

FF: May - Oct.

Distribution: The plant is often cultivated throughout in Indian garden for salad and medicinal use.

ES:H/T/ST/TmCult./C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Leaf paste is used to cure stomach pain, chest congestion, joint pain, cough, and indigestion, liver complain, sudden and frequent urination.

170. *Salvia coccinea* L.

Vern. Name: Kha.: Keompang; Eng.: Scarlet Sedge

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 345

Plate No. 4.i.

Dwarf annual aromatic herb, height 60 cm., stem quadrangular, pith larger than cortical tissue, branches soft hairs, purplish green; leaves ca 2 – 2.5 x 2.5 cm, whorled, cordate, crenate, hairs ciliate, light green above, pale beneath; inflorescence spikelet, 10 – 18 cm, flower solitary, calyx campanulate, lip-3 toothed, soft or woolly; corolla pubescent, bilabiate, upper lip 1, erect, lower lip 3, spreading, bright scarlet red, stamen 2, anthers elongated connective; carpel 2 fid style, exserted, slightly equal to length of stamen, 2.5 – 2.9 cm long; ovary rectangular, seed or nutlet slightly subrugose.

FF: May - Jun.

Distribution: The plant is seems exotic, a Mesoamerican origin, mostly cultivated in India, Assam, Lohit Valley.

ES:H/T/ST/TmCult./R.

HS: Cult

PPU: Leaf

Ethnomedicinal uses: Powdered leaf is consumed along with lukewarm water during chronic cough and severe mental headache. Raw leaf paste is used as antiseptic in cut wound to stop bleeding, traumatic swelling and rheumatism.

171. *Salvia splendens* Buc'hoz ex Etl.

Vern. Name: Kha.: Keomokmu; Eng.: Salvia

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 346

Herbaceous, upto 80 cm high, stem quadrangular, stout at lowerhalf, slightly pubescent; leaves shining, ca 10 – 12 x 4 – 6 cm, acuminate, crenulate, tinged purplish sometime; inflorescence verticillaster, calyx much broad, tubular, outer dens,

stellately hairy or tomentose, reddish or rose red, acuminate; corolla asymmetric, bilabiate, 3 - 5 lipped, elongated, red rose; stamen 4, carpel with forked stigma, bicarpellary but later tetracarpellary, white.

FF: Apr - May.

Distribution: Cultivated in Indian Garden, also grown and utilized in the study area.

ES:H/T/ST/Tm/Cult./C

HS: Cult

PPU: Leaf

Ethnomedicinal uses: Paste of young stem and leaves are used in skin burn caused by fire and hot water. Soup is taken to relieve constipation.

172. *Leucas aspera* Spreng.

Vern. Name: Kha./Ass.: Dulong bon; Hind.: Chotahalleusa.

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. Hayuliang, Anjaw. SMZU

546

A variable annual herb, upto 15 – 45 cm high, stem quadrangular erect, branched below, stout, hispid or scabrid; leaves shortly petioled, ca 2.5 – 7.4 x 0.7 – 1.2 cm, linear, oblong lanceolate, crenate, pubescent, base tapering; flower sessile or nearly so in terminal and axillary whorl reaching 2.5 - 6 cm diameter, calyx 10 nerves, tubular, tube curved, tooth smooth; corolla white, densely woolly pubescent above, lower lip 3 fid, twice longer than upper one, stamen 4, nutlets ovoid.

FF: May – Jun.

Distribution: Along the road side, wasteland and open places in study site, throughout India.

ES:H/T/ST/Tm/C

HS: Cult

PPU: Leaf

Ethnomedicinal uses: Fresh juice extracted from leaf is poured in nostril and ear hole to cure nose bleeding, sinusitis, skin inflammation, rheumatism, cists & wounds, skin eruption, earache. Powdered dry leaf is consumed with water during coughs and headache.

AMARANTHACEAE

173. *Amaranthus viridis* L.

Vern. Name: Kha.:Pulom; Ass.: Khutura.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 548

Erect herb, upto 30 cm, stem soft, smooth, branched; leaves ca 5 – 6 x 3 – 4.5 cm, ovate, entire, tips rounded or notched, base cuneate, dull green above, glabrous; spikes elongated, terminal, flower in cluster or whorl fashion; sepals 3, utricle rugose, acute, indeshiscent; sepal oblong acute, membranous keel; style 2 – 3; seeds black.

FF: Jan - Aug.

Distribution: In wasteland, forest margin, marshy land, and open places in study site, throughout Arunachal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: The leaf paste is used as anti-inflammatory agent. Cooked leaves are consumed as vegetable during constipation.

174. *Amaranthus spinosus* L.

Vern. Name: Kha.: pulom kang; Ass.: Hati Kantamari; Hind.: – Kantenatia; Eng.:

Prickly Amaranth

Specimen Examined: Sheelawati Monlai, Chaglogam, Anjaw. SMZU 1126

Erect herb, upto 80 cm high, gregorous, stem terete, hard, spine straight, shinning; leaves ca 7 – 8 x 4 – 5 cm, ovate, oblong linear or aristate obtuse, base cuneate, dark green,

entire, acuminate, petiole long, slender, leaf axils with 5 spines; spikes 15 - 20 cm long, flower minute, bracts setaceous, sepals acuminate, female obtuse apiculate; stamen 5; stigmas 2 fid; utricle rugose, equaling sepals, top thickened; seeds black shining.

FF: Jan – Aug.

Distribution: Common in marshy land, near stream, wasteland and open places in all part of Lohit Plain.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: The leaves are cooked and eaten as vegetable to relieve fever, constipation and to restore appetite. Paste of raw leaf and stem is applied in muscle inflammation, and joint pain.

175. *Amaranthus spinosa* L.

Vern. - Name: Kha.: Mokhonkai Phak; Hind.: Gudrisag

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 1123

Distribution: Found to be grown in wild and commonly encountered in the study area.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: Gouty arthritis and Urarthritis. Plant paste mixed with secretion collected from the naval portion of male deer is applied to the inflammation caused by defects in uric acid metabolism resulting in deposits of the acid and its salts in the blood and joints.

176. *Achyranthes aspera* L.

Vern. Name: Kha.: Kungrak; Ass.: Bionihakota; Hind.: Chirchita; Eng.: Prickly Chaff.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 1129

Herb upto 20 – 30 cm, stem pubescent, branched; leaves 3 – 10, ca 5 – 7 x 3 – 3.4 cm, broadly elliptic acuminate, variable, thick, pubescent tomentose, orbicular obovate or elliptic, rarely glabrate, petiole short; spikes rigid, foot long rachis slender, much elongated, erect or bent, bracteoles ovate, spined, acute or hooked ; stamen 5, staminoides fimbriates at margin.

FF: Jun – Sept.

Distribution: In wasteland, forest margin and marshy land, and open places throughout India.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: The juice extract of leaf is used to relieve muscle pain and inflammation. Fresh paste is used in piles and chest pain.

177. *Alternanthera sessilis* L.

Vern. - Name: Kha.: Yachnung; Matikanduri; Hind.: Gudrisag

Specimen Examined: Sheelawati Monlai, Piyong, Lohit. SMZU 549

Prostrate herb, 30 – 60 cm, branches many, nodes villous, root prostrating or ascending, leaves ca 3 - 7 x 2 – 3 cm, opposite, linear oblong lanceolate or elliptic obtuse or subacute, fleshy, obscurely denticulate ; flower small, white, capitate; heads axillary, often clustered; sepals unequal, rigid acute, stamen 2 – 3, anther 1 celled, ovary orbicular, stigma sessile, ovule 1, pendulose from long basal funicle; utricle broader than perianth; seeds lenticular, cotyledon narrow.

FF: Jan – Aug.

Distribution: In plain and foothill area, wasteland, forest margin, near roadside in Namsai forest division.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Leaf paste and juice extract is consumed during feeling of vomiting tendency and stomach unrest, inflammation, skin burn and feeling of hotness in the chest.

178. *Aerva sanguinolenta* L.

Vern. - Name: Kha.: Yachnung; Matikanduri; Hind.: Gudrisag

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 1131

Distribution: Scattered in the open fields in the wet soil. Commonly seen in the study area.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf

Ethnomedicinal uses: Cut wound and Skin Burn. Leaf paste is applied to the cut wounds and injuries.

CHENOPODIACEAE

179. *Chenopodium album* L.

Vern. Name: Kha.: Polom; Ass.: Jilmil; Hind.: Bethuasag; Sans.: Vastuka;

Specimen Examined: Sheelawati Monlai, 2nd Mile, Lohit. SMZU 550

Erect or ascending, slender or decumbent shrub, angled, nearly glabrous green, high upto 4 m, stem irregular, fallen leaf scars persist, white powdery appearance or dark purplish; leaves extremely variable, ca 5 – 10 x 4 – 6 cm across, petiole 3 – 4 cm, rhombic, deltoid or lanceolate acute or obtuse, lyserate, entire or toothed, irregularly lobulate, upper narrowing, more entire; spikes axillary terminal, clusters or compact lax paniced, thyrsoid; sepals keeled, covering utricles; seeds

smooth, keeled.

FF: Aug – Dec.

Distribution: Grows in wild and also cultivated in Jhum field for seeds as food and leaf as vegetable study area.

ES: H/T/ST/Tm/C

HS: W/Cult

PPU: Leaf/Seed

Ethnomedicinal uses: The seeds are cooked and consumed as food. The tender leaves are cooked and eaten as vegetable to relieve indigestion, diarrhea, constipation, and chest complaint.

ARISTOLOCHIACEAE

180. *Aristolochia indica* L.

Vern. Name: Kha.: Ishamul; Eng.: Indian Birthwort

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU551

Plate No. 5.a

Twining or climber, stem twisting, dull grey, diameter ca 0.9 – 3 cm; branches spreading, pendent; leaves ca 6 – 10 x 4 – 6 cm, oblanceolate, base cuneate, entire margin, acuminate, quite glabrous, dense, veins few, prominent; flower few, solitary, pinkish, arised from the stem base; corolla tube narrow at base.

FF: Jul – Oct.

Distribution: Grows in secondary forest and some open areas of Chongkam forest. It is found to be cultivated in Lathao and Momong villages by few herbalist who knew its importance.

ES: CI/T/ST/R

HS: Wild/Cult.

PPU: Stem/Root

Ethnomedicinal uses: Sundried powdered stem and roots are taken with few ml of water during fever and irregular mens in women. Fresh paste of root is consumed in small quantity during depression and stomach indigestion. It is also applied in skin disease, scorpion and dog bite skin.

PIPERACEAE

181. *Piper sylvaticum* Roxb.

Vern. Name: Kha.: Pokimeyo; Ass.: Auni Pan; Hind.: Jangli Pan

Specimen Examined: Sheelawati Monlai, Hyuliang, Anjaw. SMZU 1134

A low creeping herb, stem succulent, several feet long, angular or furrowed at maturity; leaves ca 9 – 10 x 8 – 9 cm, membranous, petiole long, broadly ovate or ovate cordate acuminate, 5 - 7 nerves from the base or linear pair higher inserted, upper leave elliptic or oblong lanceolate, shorter petiole; spikes shortly peduncled, males 5-6 cm long, slender; female fruting short, erect,; fruit free.

FF: Jun – Aug.

Distribution: In forest floor, forest margin and sometime in disturbed area throughout Arunachal Pradesh.

ES: CrH/T/ST/Tm/C

HS: Wild

PPU: Leaf/Fruit

Ethnomedicinal uses: Powdered leaves are rolled to pills. 2 - 3 pills are consumed per day to cure chronic cough (blood coughing), TB, headache and general body pain.

182. *Piper mullesua* D. Don,

Vern. Name: Kha.: Imphitlom thon; Ass.: Ass./Eng.: Pipli

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU 553

Much branched, twigging shrub, upto 1.5 m high, branches terete, woody, lower warted, leaf petiole slender; leaves ca 7 – 9 x 6 – 8 cm, membranous, elliptic

lanceolate or obtusely caudate acuminate, 5 nerved, base acute, rarely cariateous, nerves strong beneath, nervules transverse; fruiting spike globose, very shortly peduncled; individual fruit dark, covered with thin fleshy pulp, dark brown.

FF: Jan – Apr.

Distribution: Rare along the foot hill region of Lohit, mostly in warmer part of Arunachal Pradesh.

ES: Sr/T/ST/Tm/C

HS: Wild/Cult.

PPU: Leaf/Fruit

Ethnomedicinal uses: The pills prepared from leaf and seed powder are used to cure to cough, malarial fever and physical tiredness.

183. *Piper nigrum* L.

Vern. Name: Kha.: Imphitlom; Ass.: Jalok; Hind.: Gulmirch; Sans.: Maricha; Eng.: Black pepper

Specimen Examined: Sheelawati Monlai, lathao, Lohit. SMZU 556

Quite glabrous, stem stout climbing shrub, trailing and rooting at node, root terete; leaves petioled coriaceous, variable ca 5 – 10 x 6 – 8 cm, broadly ovate oblong, nearly orbicular at base, rounded, oblique, 5 – 9 nerves above base, 2 – 3 basal pairs, strong, alternate; fruiting spikes robust, variable length, rachis glabrous; flower dioecious, often polygamous, female bears 2 anthers, male pistilloides, anthers 2 celled; female bract shorter, copular, wholly adnate, margin without raised, fruit globose, sessile, red, pulp thin.

FF: Jan - Apr.

Distribution: Common in forest floor, and forest margin, disturbed forest, often found as climber on the trunk of *Bombax ceiba* in cultivated condition along the valley of Chongkam, and Gunanagar area of Namsai forest area.

ES: CI/T/ST/Tm/C

HS: Wild/Cult.

PPU: Leaf/Fruit

Ethnomedicinal uses: The powder of seeds are mixed with hot tea and taken during cough, chest pain and sleeping sickness and malarial fever to dissipate heat from the body.

SAURURACEAE

184. *Hauttuynia cordata* Thunb.

Vern. Name: Kha.: Pukhoi; Ass.: Musandri

Specimen Examined: Sheelawati Monlai, 2nd mile, Lohit. SMZU 557

Plate No.:5.b.

Herbaceous, rootstocks creeping, stem erect, 10 – 15 cm long, leafy subsimple, angular, pubescent at nodes; leaves ca 7 – 8 x 5 – 7 cm, broadly ovate cordate, acuminate; glabrous or nerves pubescent at beneath; gland dotted; petiole 3 – 4 cm, base sheathing; spikes terminal, peduncled, involucre of bracts 4 – 6, white petaloid form; flower dense, minutes, in globose-elongated in fruit like structure; perianth 0, ; stamen 3, filament adnate to ovary, style free, erect, stigmatose on the inner surface; ovules many; seeds globose, testa membranous.

FF: Dec – Jan.

Distribution: Common in forest floor, side of foot path, and open places in study area.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Root/Stem/Leaf

Ethnomedicinal uses: The paste of root is used in jaundice. Paste of whole plant is used to cure dysentery and diarrhea. The leaves are cooked and consumed with rice to eliminate indigestion, insomnia.

CHLORANTHACEAE

185. *Chloranthus erectus* Verdcourt

Vern. Name: Kha.: Ya hang

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 697

Under shrub, 1 – 3 m high, glabrous; stem rounded, greenish black, shining, node swollen at base of branchlet; leaves ca 7 – 12 x 4.5 – 8 cm, acuminate, oblong elliptic lanceolate, distantly serrated, entire near base, dark green above, pale beneath; inflorescence spikes, upto 10 cm long, erect or sub erect, much branched; flower- calyx and corolla indistinct, bisexual, bract minute, 0.01 - 0.2 mm in length, in paires, parianth slightly hard or fleshy, white, small, 10 - 16 in number, arranged opposite in bracts sheathing; stamen 2, filament short; carpel 1; fruit succulent, white.

FF: May – Dec.

Distribution: Along stream and shade habitat, under forest floor in Chongkam, Namsai and Kamlang WLS (Anjaw), Indo-Myanmar.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: Leaf paste is used to cure joint pain, ankle swelling and fractured bone, rheumatic arthritis, skin eruption, pus, and chronic constipation. It is also used to treat foot swelling and wound in elephant feet caused by penetration of prickles.

186 *Chloranthus serratus* Thunb.

Vern. Name: Kha.: Yasinhuang

Specimen Examined: Sheelawati Monlai, Parsuram Kund, Lohit. SMZU 189

Herb or under shrub, 2 – 4 m high, glabrous; root cylindrical, 10 cm long, 0.5 – 2 mm in diameter, grey; stem rounded, shining; leaves ca 6 - 12 cm x 5 - 7 cm, acuminate, oblong elliptic lanceolate, distantly serrated, dark green above;

inflorescence spikes, purplish below, upto 6cm long, branched; flower- calyx and corolla indistinct, bisexual, bract minute, white, 0.5 – 1 cm in length, in pairs, perianth, white, small; fruit succulent, white.

FF: May – Dec.

Distribution: Along stream and shade habitat, under forest floor of wakro circle; tropical and temperate region of Purvanchal and China, Indo-Malaya.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Leaf/Root

Ethnomedicinal uses: Leaf and root paste is used to cure ankle swelling and fractured bone, rheumatic arthritis, skin eruption, sores. Sundry powdered root is applied during snake bite.

MYRISTICACEAE

187. Myristica fragrans Houtt.

Vern. Name: Kha.: Badam Hom, Nutmeg

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 148

Medium size to large evergreen tree, exotic, height 30 – 35 m; leaves ca 10 – 12 cm x 5 – 6 cm, glaucous beneath, acuminate, serrated, oblong. exhibit sexual dimorphism, male and female plants different; male flower borne on separate tree and assisted by insect during pollination; fruit solitary, yellow, fleshy pericarp the seed, ovoid, 3 cm long, 2 cm in diameter, grooved longitudinally, hard dull solid and difficult to break; endosperm white, odour aromatic and strong, taste pungent, slightly bitter.

FF: Feb – Apr.

Distribution: The plant is cultivated as exotic tree in backyard in Assam and Lohit district of Arunachal Pradesh for its fruits.

ES:Tr/T/ST/Tm/C

HS: Wild

PPU: Fruit Pulp and Nut

Ethnomedicinal uses: Fruit pulp is used in low vitality. The prepared sundried pills are taken during indigestion. Nut is used in diarrhea, as brain tonic and used to cure jaundice.

LAURACEAE

188. Cinnamomum tamala Fr. Ness

Vern. Name: Kha./Ass.: Tejpat; Hind.: Tezpat; Sans.: Tamalpatra; Eng.: Indian cassia lignea

Specimen Examined: Sheelawati Monlai, Kheram, Lohit. SMZU-231

A medium size upto 8 m high, bark aromatic; leaves ca 6 – 10 x 2 – 4 cm, ovate oblong or lanceolate, usually acuminate, 3 nerved, alternate, shining, highly aromatic on crash; panicles scarcely exceeding the leaves, parianth sparingly silky pubescent; flowers minute, 2 – 3 cm long, stamen and ovary villous, fruit small ellipsoid.

FF: Jun – Sep.

Distribution: Rare in temperate forest but less frequent in tropical and subtropical forest of Eastern Himalaya (Arunachal and Plain of Lohit.).

ES:Tr/T/ST/Tm/R

HS: Wild

PPU: Leaf/Bark

Ethnomedicinal uses: The paste of raw leaf is applied over forehead to relieve from viral fever and headache. The powdered bark is use in cough, mental depression and asthma.

189. *Cinnamomum glanduliferum* Meissn.

Vern. Name: Kha./Ass.: Gonsarai

Specimen Examined: Sheelawati Monlai, Tiding, Anjaw. SMZU 200

A large tree, trunk dark grey furrowed, bark aromatic, yellowish, high upto 26 m, crown ovoid cone, dense, branches stout; leaves ca 4 – 12 x 2.5 – 6 cm, thickly coriaceous, often glaucous beneath, ovate or obovate elliptic, acuminate, base cuneate, glabrous, pale beneath; panicles 2. 4 – 6 cm long; peduncle long, flowers 0.3 – 0.5 cm, greenish-yellow, sparsely pubescent, without villous; stamen hairy; fruits obovoid, ellipsoid, 2-3 cm long.

FF: Apr – Aug.

Distribution: At the higher elevation of Eastern Himalaya and is found as we move from Lohit towards Anjaw.

ES: Tr/T/ST/Tm/R

HS: Wild

PPU: Leaf/Bark/Seed

Ethnomedicinal uses: Pulp of fruit is highly aromatic and consumed to relieve cough and to rejuvenate health during vitality. Powder of bark is used as component in the making of anti-diabetic medicines.

190. *Litsea cubeba* Lour.

Vern. Name: Kha.: Rukmeer; Ass.: Mejankori; Hind.: Siltimbur; Sans.: Kankolam

Specimen Examined: Sheelawati Monlai, Walong, Anjaw. SMZU 173

Middle size deciduous tree, upto 15 m high, trunk green, quite glabrous shining, black when dried, fragrant, branches suberect or pendent; leaves ca 6 – 15 x 2 – 5 cm, alternate, greenish, lanceolate, caudate acuminate, glaucous beneath, nerves 12 – 15 pairs, slender; inflorescence solitary or corymbose, peduncle short, terminal buds naked, 10 – 15 flowers, flower pale yellow; sepal membranous, stamen 9 – 10, 3

glandular, filaments hairy, fruit 0.5 – 0.7 cm across, green, black when dried.

FF: Nov – Jul.

Distribution: Common in Kamlang, Anjaw and Mishmi hills.

ES:Tr/T/ST/Tm/C

HS: Wild

PPU: Leaf/Bark/Seed

Ethnomedicinal uses: Powder of dried fruits are eaten with rice as stimulant. It is also taken to relieve hypertension and insomnia, high palpitation of heartbeat. The leaves and wood are burnt at home to eliminate viral fever, cough and epidemics.

191.Litsea monopelata Roxb.

Vern. Name: Kha.: Hoi phet; Ass.: Sualu; Hind.: Meda; Sans.: Gajapipali

Specimen Examined: Sheelawati Monlai, wakro, Lohit.SMZU 172

Middle size subdeciduous tree, upto 15 m high, bark tissue yellow, aromatic, persistent branch scars; leaves ca 9 – 18 x 5 – 10 cm, broadly elliptic, ovate or obovate, acute or rounded at apex, entire, slightly tomentose beneath; flower greenish yellow, axillary in umbellate silky heads; perianth 5 partite, oblong; stamen 9 – 12; fruits 0.5 cm long, ovoid, dark.

FF: May – Jul.

Distribution: Common along the forest margin, secondary forest in Lohit Valley, Kamlang WLS.

ES:Tr/T/ST/Tm/C

HS: Wild

PPU: Leaf/Seed/Bark/Root

Ethnomedicinal uses: The powder of dried bark is used for relieving chest suffocation (asthma), mental dullness. The paste of bark is used in healing fractured bone. Seeds are used in rheumatic pain. Roots applied in sprained muscle to relieve pain and skin

allergy.

LORANTHACEAE

192. *Viscum monoicum* Roxb.

Vern. Name: Kha.: Talmungoni

Specimen Examined: Sheelawati Monla, Dosuk, Lohit. SMZU 188

Large bushy shrub, branches dropping, terete, epiphytic or parasitic, brownish green, stem with prominent node, angled, stout; leaves ca 2 – 9 x 1 – 3 cm, shortly petioled, oblique or falcate acute or acuminate, 3 - 5 nerved, nerves strong, often parallel type; flowers 1 - 3, minute, monocious, axillary sessile or peduncled fascicles, bracts cuspidate in terminal leafless shoot; perianth segment 4, triangular oblong; fruit oblong, rusty tomentose, yellowish, pulp sticky; nut 3 angled, brownish. **FF:** Jun – Sep.

Distribution: In Lathao and Tezu forest as epiphytic; lower & middle elevation in through Arunachal Pradesh.

ES:ESr/T/ST/Tm/R

HS: Wild

PPU: Leaf/Fruit

Ethnomedicinal uses: The paste of young tender leaf and sticky fruits are used to heal fractured bone.

EUPHORBIACEAE

193. *Euphorbia hirta* L.

Vern. Name: Kha.: Dud boon; Ass.: Gakhiroti boon; Hind.: Dudha jhar; Sans.: Dugdhlka; Eng.: Snake weed.

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 232

Prostrate or nearly erect and ascending herb with a length of 18 – 54 cm, annual; Branches quadrilateral; leaves ca 1.5 – 4 x 1.2 – 1.8 cm, opposite, oblique, oblong-lanceolate or ovate-lanceolate, acute or subacute, dentate or serrulate, slightly

pubescent, rough in texture, glandular, dark green above, glaucous beneath; flower in numerous raceme formed in whorl at leaf base, minute, grey white, unisexual.

FF: Jan – Dec.

Distribution: Common along wasteland, open places, roadside in plan of Namsai and Chogkam area.

ES:H/T/ST/R

HS: Wild

PPU: Whole Plant

CDT:Pound

Ethnomedicinal uses: Whole plant is used in carcinoma; roots powder and powder of dried leaves are used to cure tuberculosis and anemia.

194. Euphorbia neriifolia L

Vern. Name: Kha.: Sepak; Ass.: Hiju; Hind.: Sehund; Sans.: Snuhi; Eng.: Common Milk hedge

Specimen Examined: Sheelawati Monlai, Lathao,Lohit. SMZU 1119

Plate No. 5.c.

Succulent shrub; branches 5 angled; bright green, spines stipular, arising from thick tubercles; leaves alternate, ca 7 – 14 x 3 – 5 cm across, obovate oblong, fleshy, rounded at apex, narrowed down to the base; involucre of bracts yellowish, forming 3 flowered cymes; lateral one shortly pedicellate, bisexual; central male sessile; lobes large; capsule 1 cm in diam., 3 lobed.

FF: Dec - May

Distribution: Often found planted near backyard, open forest and wasteland in Lohit valley.

ES:Sr/T/ST/R

HS: Wild/Cult.

PPU: Stem/Leaf

CDT: Slice/Pound

Ethnomedicinal uses: The paste of stem is used in resetting fractured bone. The white latex from stem and leaves are used as abortifacient, to treat skin diseases, cuts & wound.

195. Glochidion multiloculare Voight.

Vern. Name: Kha.: Maknung

Specimen Examined: Sheelawati Monlai, Sengshap, Lohit. SMZU 137

Plate No. 5.d.

Evergreen small shrub, stem quite shining, young part quite smooth, bright green, node region angled; leaves ca 3 – 7 x 1.5 – 3.0 cm, linear oblong or oblong lanceolate, obtuse or subacute, dark green above glaucaous beneath, soft, slightly pendent; flower greenish purplish, in axillary clusters on stout pedicels; male tepals 6 in 2 series, ca 0.3 cm long, oblong; stamen 4 -12; female tepals unequal; overy lobed, capsules ca 2.5 cm in diam., depressed globose.

FF: Apr – May.

Distribtution: Introduced in homegarden in Namsai town. Grow wild in forest floor and degraded forest of Namsai forest division, Assam and tropical Arunachal Pradesh.

ES: Sr/T/ST/R

HS: Wild/Cult.

PPU: Leaf

Ethnomedicinal uses: The juice extract of leaf is used to cause subfertility to women, anti-inflammatory agent. The leaves are cooked and consumed as vegetable.

196. Phyllanthus emblica L.

Vern. Name: Kha.: Makhaam; Ass.: Amlokhi; Hind.: Amla; Eng.: Indian grosseberry

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 525

Medium sized deciduous tree, height 18 – 22 m; bark dark grey, fissured, wood light, hard; branches two types-determinate and indeterminate; determinate shoot shorter, shed from tree during February to March annually, bears flowers at proximal end of nodes; leaves ca 0.5 – 1.3 x 0.2 – 0.3 cm, bipinnate, small, oblong, subacute or obliquely cordate at base, stipules 0.1 cm long, ovate; male flower yellow, female greenish yellow in axillary clusters, dioecious; style connate, bifid, distally dilated, emerged from newly determinate shoot; fruit drupe with fleshy pericarp, light fluorescent green colour, taste sour-acrid.

FF: Mar – Jul.

Distribution: Throughout India, China and Malaya; commonly cultivated in wasteland, home garden.

ES: Tr/T/ST/C

HS: Wild/Cult.

PPU: Fruitpulp

Ethnomedicinal uses: The sundried pulp is used to relieve high blood pressure, indigestion, low vitality, liver complaint (jaundice), piles, dysentery, cough and constipation.

197. Jatropha curcas L.

Vern. Name: Kha. Randagulo; Ass.: Bongali ara; Hind./ Sans.: Dravanti; Eng.: Physic nut.

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 1167

Medium size shrub or small tree, 6 m high, stem irregularly angled, watery lax, dull grey; leaves ca 5 – 14 x 5 – 10 cm across, broadly ovate, slightly 3 - 5 lobed, acute, cordate at base, petiole 10 – 17 cm long; flower yellow, in panicle racemes; flower yellow, elliptic- obovate; stamen 10, 2 seriate; female sepals and petals as in male; stigma 2 lobed; disk deeply 5 lobed; capsules 3 cm in diam., faintly lobed; seeds

brownish, ovoid, 0.6 cm long.

FF: May – Nov.

Distribution: Through out India, in the Valley of Lohit, mostly in wasteland, forest margin, degraded forest and often planted as fencing poles in village home garden.

ES:Sr/T/ST/Tm/C

HS: Wild/Cult.

PPU: Seed/Leaf/Stem bark

Ethnomedicinal uses: The paste of bark and leaves are used as anti-inflammatory agent, applied in boil and skin eruption. Branches twig are used as toothbrush. The powdered seeds and bark are used to relieve fever and sudden cry of child.

198. Jatropha gossypifolia L.

Vern. Name: Kha.: Randgula; Ass.: Bhut ara; Hind.: Lal errand; Sans.: Dravanti; Eng.: Bellyache bush.

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 157

Small shrub, upto 6 m high, young stem reddish purplish; leaves ca 6 – 12 x 5 – 12 cm, alternate, palmately lobed; cordate or subcordate at base; lobes elliptic, acute, margin entire, petiole and stipules with glandular hair; flower purplish red, in subcorymbose cymes; bracts lanceolate; sepals 0.4 cm long, hair glandular, persistent; petals 0.5 cm long, ovate elliptic; stamens basally connate; capsules 1.5 cm in diam., oblong, 3 lobed.

FF: Aug – Dec.

Distribution: Rare along the degraded forest, roadside and wasteland of Namsai area in Lohit Valley, Assam.

ES:Sr/T/ST/Tm/R

HS: Wild

PPU: Seed/Leaf/Stem bark

Ethnomedicinal uses: The paste of bark and leaves are used to relieve joint and muscle inflammation. The paste of raw fruits and bark are used to relieve viral fever and skin infection.

199. *Jatropha podagrica* Hook.

Vern. Name: Kha.: Nukrang; Eng.: Purging nut

Specimen Examined: Sheelawati Monlai, Sengchap, Lohit. SMZU 1156

Dwarf shrub, rootstock swollen, eglandular, glabrous, bark ridged horizontally at some point; leaves ca 15 – 30 x 10 – 20 cm, petiole 15 – 22 cm long, lamina broadly large, palmately lobed, smooth green above, glaucous beneath, deciduous, orbicular, caudate acuminate segments, stipules capillary multifid eglandular; bracts entire, sepal glabrous, inflorescence umbellate cyme cluster, peduncle long, 4 – 7 cm, individual flower bright scarlet red or orange red, anther linear, urceolate, fruits greenish, subglobose, tripartite, slightly ridged longitudinally.

FF: Feb – Jun.

Distribution: The plant is found cultivated in home garden as ornamental purpose in study area. Native of Mesoamerica.

ES:Sr/T/ST/R

HS: Cult.

PPU: Seed/Stem Bark

Ethnomedicinal uses: The paste of bark is applied on cut and wound. It is also used as anti-inflammatory agent and applied on joint and knee swelling. Powdered seeds are used as purgative during constipation.

200. *Croton roxburghii* Balak.

Vern. Name: Kha.: Hong kii

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 1137

Plate No.:5 e

Middle size tree upto 12 m high, crown pyramidal; bark grayish, quadrangular at young, whitish dull, faintly aromatic; leaves ca 10 – 18 x 4 – 10 cm, broadly elliptic oblong, lanceolate, repand serrate, acute glabrous, light green above, glandular, glaucous beneath, deciduous, spike elongated, upto 20 cm cymes, yellowish white, flower minute; sepal 5, petal 5, sepal woolly, smaller than petal; stamen 10, curved at end, partite; carpel 0, ovary tricarpeal, fruit 0.7 – 1.5 cm, slightly rough, glandular pubescent, triangularly ridged; seeds white, 2 - 3 enclosed in seed coat.

FF: Feb – May.

Distribution: Plant is rare and distributed along the wasteland, disturbed forest, forest margin in plain of Lohit and Assam.

ES:Sr/T/ST/R

HS: Wild

PPU: Seed/Root

Ethnomedicinal use: Decoction of fruit powder is used in leukemia, pus, boil and skin eruption. Seeds are used as purgative during chronic constipation.

201. Croton tiglium L.

Vern. Name: Kha.: Saklang; Ass.: Kanibi; Hind.: Jamalgota; Sans.: Jepalah; Eng.:

Purging croton

Specimen Examined: Sheelawati Monlai, Momong, Lohit. SMZU 1143

Small shrub, young shoot sparsely, stellately hairy, bark grey corky lenticellate; leaves ca 5 – 16 x 3 – 8 cm, broad, long-petioled, membranous, texture rough, ovate or elliptic oblong, acute apex, yellowish when matured or dried, glandular below, nerves 2 - 3 pairs above the bases, gland minute, sessile; flower whitish yellow, minutes, 0.6 cm across, irritant, bract subulate, male pedicel stellately hairy, sepal nearly glabrous, petal narrow, woolly edged; stamen glabrous, receptacle villous; capsule tripartite, obovoid, rough at surface, cotyledon white.

FF: Sep – Nov.

Distribution: Along the forest margin, wasteland, and forest floor; often planted in home garden at Chongkam.

ES:Sr/T/ST/R

HS: Wild

PPU: Leaf/Fruit

Ethnomedicinal use: Leaf paste is used to relieve constipation. Powder of dried fruit is taken during chronic malarial fever.

202. Croton caudatus Geiseler.

Vern Name: Kha.: Sinkua; Ass.: Lotamahudi; Hind.: Sawaka

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 1369

Scandent pubescent shrub, much spreading; leaves ca 5 – 12 x 3 – 9 cm, orbicular ovate, base cordate, acute apex, pubescent, hair shorts; flowers pale yellow, unisexual, arranged in long terminal, pubescent, racemes; stamen numerous, exserted; female sepals ovate, hairy tomentose, ovary woolly; capsules 2.6 cm long, trigonous, oblong.

FF: Apr – Oct.

Distribution: Common along roadside, secondary forest and wasteland in entire region of Lohit plain.

ES:Sr/T/ST/C

HS: Wild

PPU: Leaf/Fruit

Ethnomedicinal use: Leaf paste is used to relieve muscle pain. Powder of dried fruit is taken during chronic constipation and malarial fever.

203. Ricinus communis L

Vern. Name: Kha.: Ton kong; Ass.: Era Gach; Hind.: Erandi; Sans.: Eranda; Eng.:

Castor plant

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 134

Plate No.56

Small to large shrub, upto 10 m high, stem stout, grey; leaves alternate petiole 8 – 17 cm long, 6 – 11 lobes; ca 20 – 40 cm x 20 – 36 cm across, lobes ovate-lanceolate, acuminate, serrate; flower pale yellowish, monoecious in terminal pyramidal, leaf opposed panicles; male flower 1 cm long; tepals 0.6 cm long, ovate-lanceolate, glandular; stamens many in branched fascicles; female tepals 0.7 cm long; capsule 3 lobed, echinate, seeds 0.6 cm long, ovoid, brownish, faintly aromatic.

FF: Jan – Dec.

Distribution: In village wasteland, degraded forest in Lohit Valley and entire Arunachal Pradesh, Assam and rest part India; native of tropical Africa.

ES:Sr/T/ST/Tm/C

HS: Wild/Cult.

PPU: Seed/Leaf

Ethnomedicinal uses: The leaves are warmed up in burning flame and instantly spread over the dorsal side of body to relieve backpain and general bodyache. The same is applied in specific part of the body to relieve muscle pain. Powdered seeds are used as purgative, constipation, stomach gas trouble.

MORACEAE

204. Artocarpus heterophyllus Lamk.

Vern. Name: Kha.:Malang ; Ass.: Gose Kathal; Hind.: Kathal; Sans.: Panasa; Eng.:

Jack Fruit

Specimen Examined: Sheelawati Monlai, Tezu, Lohit. SMZU 159

Evergreen tree upto 20 m high, trunk ornamented with fruit, white latex exudates on cut, bark dark; leaves, ca 6 – 17 x 5 – 10 cm, elliptic or obovate, coriaceous, base

cuneate, dark green above, shining, stipules large, caduceous, milky juice on cut; flower cylindrical, axillary terminal heads, embraced by leathery, caduceus sheath arising from trunk; perianth lobe 2, stigma spatulate in female heads; fruit oblong, yellow tubercled, ca 8 – 15 cm length, 7 – 12 cm in diam.; seeds white, mesocarp tissue fleshy, sweet when ripened.

FF: Mar – Aug.

Distribution: Found in both cultivated and wild in home garden and abandoned jhum filed in Lohit Valley.

ES: Tr/T/ST/Tm/C

HS: Wild/Cult

PPU: Young leaf/Seed

Ethnomedicinal uses: White milky latex is used as antiseptic in freshly cut wound, ring worm infected skin. The seeds are cooked and consumed during constipation. Endocarp and mesocarp part of fruit is taken as vegetable which act as excellent purgative agent.

205. Cudrania cochinchinensis (Lour.) Kudo-Masam.

Vern Name: Kha.: Malang kaei

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 558

Scandent thorny shrub, stem bent, sometime touch the ground, mature bark grey, young green smooth, small gland dotted, prickles, ca 2- 4 cm long, sharply pointed; leaves alternate, ca 5 – 12 x 2 – 5 cm, elliptic obovate or oblong-elliptic, acute or obtuse, dark green above, glaucous beneath; flower greenish yellow, dioecious heads; fruiting calyx as enlarged bracts, densely crowded into syncarp; fruit globose.

FF: Apr – Dec.

Distribution: Under forest floor, shady places and degraded secondary forest throughout NE region.

ES:Sr/T/ST/Tm/R

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: The sundried powder of stem and leaves are used as components in preparation of medicines for curing jaundice and piles.

206. *Ficus hispida* L.

Vern Name: Kha.: Mawa; Ass.: Khahata dimoru, Hindi: Anjir.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 1138

Brown hispid shrub, upto 10 m high, youngstem terete, brown pubescent-hispid; leaves, ca 9 – 24 x 5 – 10 cm, broadly ovate oblong or subovate, crenulate, acuminate, truncate base, rounded, scabrous above, hispid beneath, coriaceous, minutely dentate; receptacle ca 1 – 2.6 cm in diam., depressed globose, hispid brown, clustered on trunk, leafless hanging branches; male parianth trilobed; stamen 1.

FF: Jan – Dec.

Distribution: Grow in secondary forest and under forest floor, near stream in tropical and temperate Arunachal Pradesh, Lohit valley and Assam.

ES:Sr/T/ST/Tm/R

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: Powder of stem bark and roots are used to cure perennial cough and TB. The leaves and fruits are used to relieve liver toxicity due to heavy sugar and alcohol intake. It is used as anti-diabetic.

207. *Ficus semicordata* Buch

Vern. Name: Kha.: Manau

Specimen Examined: Sheelawati Monlai, Parsuram Kund, Lohit. SMZU 560

Medium size tree, slightly bent at slope, bark grayish brown, milky latex

exudates when cut; leaves alternate, ca 10 – 24 x 5 – 10 cm, oblong or elliptic-lanceolate, acute or acuminate apex, unequal or cordate at base, entire or serrate, scabrous, petiolate; receptacle 1.4 cm in diam., globose or pyriform red, paired or clustered on leafless drooping branches from the main trunk, smooth red, juice sweet when ripe; basal bract 3; stamen 1, male & female flower shortly pedicellate.

FF: Jan – Dec.

Distribution: In dense forest, degraded secondary forest, near stream and hill slope throughout Arunachal Pradesh, Parsuram Kund area of Lohit valley.

ES: Tr/T/ST/Tm/C

HS: Wild

PPU: Leaf/Stem

Ethnomedicinal uses: The paste of bark is used to relieve tooth ache. The ripened globose red receptacles are sweet and consumed as food to relieve constipation, improve digestion, stomach ache and low vitality.

208. *Morus laevigata* Wall.

Vern. Name: Kha.: Ton momonn ; Ass.: Nuni gach; Eng.: Pendula / Mulberry

Specimen Examined: Sheelawati Monlai, Pothar gaon, Lohit. SMZU 399

A large tree, bark grey, resin dark brown, bark section yellow when cut, fresh latex white, milky copious; leaves ca 12 – 16 x 7 – 13 cm, petiole 2.5 cm, lamina ovate, cordate, finely serrated or serrulate, membranous, scabrous above, glabrous beneath, lateral nerves 5 – 8 on either side, base 3-nerved, truncate or rounded; spikes elongated, 6 – 10 cm long, soft, drooping, male spikes hairy, flowers sessile, sweet, fragrant, tepals hairy; female spikes glabrous, style pillous; fruits yellowish white, long, syncarp cylindrical.

FF: Feb – May.

Distribution: In dense forest, stream sides in plain part of Lohit and hilly terrain in

Parsuramkund and Kamlang WLS, Lohit.

ES:Tr/T/ST/Tm/C

HS: Wild

PPU: Stem/Resin

CDT: Slice/Pound

Ethnomedicinal uses: Sun dry powdered stem is mixed with powdered rhizome of *Hedychium densiflorum* and consumed with warm (boiled) water to relieve stomach pain and gas trouble. Fresh white latex is applied in cuts and wound to prevent germ infection. Matured dark brown resins are used to cure joint pain and rheumatism.

209. *Morus indica* L.

Vern. Name: Kha.: Ton Mong Nai; Ass.: Eri gach (Bola); Eng.: Indian Mulberry

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 432

Large shrub, resin brownish; leaves ca 10 – 15 x 7 – 10 cm, cordate, acuminate, often deeply lobed, sharply serrulate, scabrous; male sepal elliptic, hairy, female spike short ovoid, sepal obovate, outer keeled, inner flat, style long, hairy, connate below; fruit sweet.

FF: Mar – Jun.

Distribution: Plain and foothill region of Lohit, Assam, throughout Arunachal Pradesh.

Leaf used to feed silkworm in Assam.

ES:Tr/T/ST/Tm/C

HS: Wild

PPU: Stem/Root/Leaf

Ethnomedicinal uses: Stem powder is used to cure chest pain, bronchitis. Paste of root bark is applied in wound. Leaf paste is used to cure tonsillities, throat pain.

210. *Morus serrulata* Roxb.

Vern. Mish.: Mukmai su; Ass.: Bola; Himalayan Mulberry

Specimen Examined: Sheelawati Monlai, Hyuliang, Anjaw. SMZU 1108

A lofty tree, attaining upto 30 m high, girth of trunk 6 – 7 m in diameter, young part pubescent or tomentose, wood hard yellow or light brown, resin brown, fragrant; leaves ca 8 – 20 x 7 – 15 cm, often lobed, membranous, petiole 3 – 5 cm long, young leaf pubescent beneath, stipules broadly lanceolate, male spike 3 – 4 cm long, female 1 cm long, peduncle softly tomentose; male sepal elliptic oblong, villous, filaments flattened below, style very hairy, connate below; fruit mucilaginous, shortly cylindrical, purple, sweet.

FF: May – Jun.

Distribution: From foothill region of Lohit upto Hyuliang and Kamlang WLS, throughout Arunachal Pradesh.

ES: Tr/T/ST/Tm/C

HS: Wild

PPU: Stem/Fruit

Ethnomedicinal uses: Stem powder is taken during heart pain, erratic behaviour of child. Fruit is sweet and eaten during mouth ulcer. Fresh resin is applied in eye pain, wound and insect sting; used to kill infected worm in cow wound.

GROUP: ANGIOSPERM – MONOCOTS

ORCHIDACEAE

211. Cymbidium aloifolium L.

Vern. Name: Kha.: Mok ya Seppu

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 235

Epiphytic herb, short pseudobulbous, covered with sheathing leafbases; leaves ca 20 – 34 x 2 – 2.6 cm, linear-oblong, obliquely 2 lobed at apex, shining, thick smooth;

flower yellowish, purple in lateral side, drooping few flowered racemes; sepals free, subequal; petal free, subequal, spreading; lips 3 lobed, seeds minutes, dull white or yellowish powder like packed in cylindrical seeds cover.

FF: May – Jun.

Distribution: On high tree trunk under forest floor, exposed area, sometime on small tree trunk and dead wood surface in Namsai forest area.

ES: EH/T/ST/Tm/C

HS: Wild

PPU: Leaf/pod

Ethnomedicinal uses: The fresh paste of young pods and leaf is given orally with glass of water to cure epilepsy/madness. The same is used to improve memory.

212. Cymbidium bicolor Lindl.

Vern. Name: Kha.: Mok ya Seppu

Specimen Examined: Sheelawati Monlai, Kamlang WLS, Lohit. SMZU 179

Epiphytic herb, short pseudobulbous, covered with sheathing leafbases; leaves ca 25 – 30 x 1.6 – 2.1 cm, linear-oblong, obliquely 2 lobed at apex, shining, thick smooth; flower tinged purplish or light brown in inner side, spike drooping, few flowered racemes; sepals free, subequal; petal free, subequal, spreading; lips 3 lobed, pod elongated, pointed, slightly ridged, shining green, seeds minutes, dull yellowish powder like packed in cylindrical pod.

FF: Apr. - Jun.

Distribution: On high tree trunk under forest floor, in Namsai and Kamlang WLS area.

ES: EH/T/ST/Tm/C

HS: Wild

PPU: Leaf/Root/Flower

Ethnomedicinal uses: Powder of root is used in epilepsy, mental depression. Leaf

paste is used to cure joint swelling, rheumatic pain, skin inflammation. Flower applied in burnt face, used to cure dark spot on skin.

213. *Eria panna* L

Vern. Name: Kha.: Seppurang

Specimen Examined: Sheelawati Monlai, Maidu, Lohit. SMZU 306

Epiphytic herb, rhizome thick, leaf sheath sparingly woolly, pseudobulbs o; leaves 10 – 15 cm long, 0.9 – 1.2 cm in diameter, obscurely channelled, linear terete, acuminate, quite smooth; scape terminal, much shorter than leaves, slender silky woolly, densely white, 3 -4 flowers, pale yellow; bract 1.2 cm long, sepal 1.4 cm, linear, dorsal oblong; petal much smaller, linear oblong, puberulose, ovate, very thick, concave at middle, inner pale yellow or light orange; anther mitriform.

Distribution: Rare on tree trunk in Maidu and middle elevation of Mishmi Hills of Anjaw.

ES: EH/T/ST/Tm/C

HS: Wild

PPU: Leaf/pod

Ethnomedicinal Uses: Leaf paste is used in healing fractured bone, skin inflammation and wound.

ZINGIBERACEAE

214. *Alpinia galanga* L.

Vern. Name: Kha.: Khing pang; Ass.: Karphul; Hind.: Kulanjan; Eng.: Greater Galangal

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 125

Perennial rhizomatous herbs, upto 2.4 m high, rhizome cylindrical, stout, covered with scales, aromatic; leaves ca 90 – 100 x 10 – 15 cm, alternate, lanceolate, narrow towards acute apex, upper surface glabrous, lower slightly pubescent, dull

green, irregular, somewhat wavy margin, stem surrounded by leaf base with scape; inflorescence in terminal raceme, dense upto 32 cm long, individual flowers arranged in clusters in opposite decussate manner, white, matured fruit red and globose shaped.

FF: May – Aug.

Distribution: In marshy land, disturbed forest, hill slope, near stream slope, roadside in Chongkam and Namsai circle in well aerated soil with pH range of 6.3-6.9.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Fruit

Ethnomedicinal uses: Powder of dried rhizome is used to heal fractured bone. Paste of rhizome is applied on gum to cure toothache. A pinch of powder is consumed during vomiting tendency and excessive gas formation in stomach.

***215. Ammomum subulatum* Roxb.**

Vern. Name: Kha.: Elaichi; Hind.: Bari Elaichi; Eng.: Larger Cardamom

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 128

Stem leafy, leafblade ca 30 – 70 x 7 – 11 cm, oblong lanceolate, green glabrous on both surfaces; spikes globose, dense shortly peduncled, 5 – 7 cm, bract red brown, horny cusp; calyx corolla tube ca 2.5 cm, corolla lip obovate-cuneate, imarginate, yellowish white, calyx rather longer than corolla segment, filaments short, anther crest small truncate, capsule 2.5 cm globose, red brown, densely echinate; seeds pungent, pleasant taste.

FF: Aug – Feb.

Distribution: In selected or isolated patches of forest margin, near hill slope and stream in Lohit valley, restricted to Eastern Himalaya at an altitude of 1000 – 3000m (JD Hooker 1894).

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Fruit

Ethnomedicinal uses: The fresh paste of rhizome is applied on allergic skin and wound. The powdered rhizome is boiled with hot water and taken as stimulant and body tonic; cause perspiration and purgation during headache and viral fever. The fruits are sweet and edible.

216. *Curcuma caesia* Roxb.

Vern. Name: Kha.: Khing nak; Ass.: Kalahaladhi; Hind.: Nar Kachuri; Eng.: Black Zedoary

Specimen Examined: Sheelawati Monlai, Piyong, Lohit. SMZU 256

Annual herb, rootstock large, rhizome aromatic, cross-section pale grey after few minutes of cutting; petiole long green, leaves ca 25 – 75 x 25 – 30 cm, tuft, oblong, acuminate, broad, narrowed down to petioles, pink or purplish at nerves above; flower bract white pink or pale yellow, arranged in alternate in pedunculate spikes, inner lobes of corolla lips reddish yellow, lobes 3, oblong orbicular; stamen 1.

FF: Apr – Jul.

Distribution: Occurs in wild or in cultivated condition in Chongkam and Namsai area in forest margin, open forest and wastelands.

ES: H/T/ST/Tm/C

HS: Wild/Cult

PPU: Rhizome/Fruit

Ethnomedicinal uses: The paste or powder of dried rhizome is applied in venomous bite. The fresh juice extract of rhizome and leaves are applied in localized burn and inflammation.

217. *Hedychium gracile* Roxb.

Vern. Name: Kha.: Mok ya heu hom

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 201

Herb, leafy stem 1.3 m high, leaves cylindric, thin, glabrous, ca 15 – 30 x 12 – 18 cm long, oblong lanceolate, spike long, moderately dense flower, 1 flower in single bract, wrapped tightly round the calyx, calyx longer than bract, flower small greenish white, corolla tube cylinder, segment linear, staminodes narrow, shorter than corolla segment, lobe distinctly clawed, filament bright red, anther linear, capsule globose.

FF: Jun – Oct.

Distribution: Fairly common under forest floor and forest margin in secondary forest of Chongkam and Namsai and NE region.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome

Ethnomedicinal uses: The powder of dried rhizome is mixed with powdered seeds of *Piper longum* in hot water which is consumed during chest suffocation and Asthma. The juice extract of raw rhizome is taken during jaundice and liver complaint.

218. *Hedychium coccineum* Buch.

Vern. Name: Kha.: Heu hom

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 206

Herb with leafy stem; leaves ca 50 – 90 x 14 – 25 cm, lanceolate, broad, base rounded, narrowed gradually from middle to the point; spike ca 70 – 80 cm, moderately dense flowered; bract oblong; calyx shorter than bract; flower small, bright crimson; staminodes lanceolate, lip orbicular, distinctly clawed, deeply bifid, stamen twice as long as lip; anther linear.

FF: Jun – Sep.

Distribution: Grow under forest floor and sometime in forest margin and wasteland

through Arunachal Pradesh and entire region.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Young shoot.

Ethnomedicinal uses: Powder of dried rhizome is taken with warm water during use in gastric trouble. The paste of raw rhizome is applied on joint pain and rheumatism. Young shoots are consumed during hypertension and heart pain.

219. *Hedychium densiflorum* Wall.

Vern. Name: Kha./Chakma: Mensila

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 205

Pseudo-stem upto 1.5 m; leaves ca 50 – 70 x 10 – 15 cm, glabrous, dark green, oblong-narrow, spike long, moderately dense flower, bract small, oblong; calyx longer than the bract, cylindric, flower small bright yellow or orange, staminoides lanceolate, lip cuneate, deeply bifid, stamen as long as lip.

FF: Jul – Aug.

Distribution: Along forest margin and under forest floor in Chongkam and Namsai area.

ES: H/T/ST/Tm/R

HS: Wild/Cult

PPU: Rhizome.

Ethnomedicinal uses: The pastes of rhizome are applied during leg swelling. The juice extract of rhizome is used to cure asthma and vomiting tendency.

220. *Khaemferia galanga* L.

Vern. Name: Kha.: Wan hom; Ass.: Kanja bura; Hind.: Mudunirbisha

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 210

Plate No. 5 f

Dwarf herb, leaves almost touch the ground, rootstock tuberous, aromatic, fibrous root fleshy, cylindric; leaves 2, ca 7 – 12 x 5 – 9 cm, spreading horizontally, laying flat on surface of the ground, rotund ovate, deltoid acuminate, thin, deep green, smooth, 10 – 12 ribbed petiole short, channeled; flower 6 – 12 the centre of plant between the leaves, fugacious, fragrant, length of calyx and bracts equal; corolla tube ca 2.4 cm, pinkish white; staminodes 1 – 2 cm long.

FF: Apr – Jun.

Distribution: In forest margin of Lathao and Pankaw forest of Chongkam. Also found in cultivated condition in herbal garden in Pankaw village.

ES: H/T/ST/Tm/C

HS: Wild/Cult.

PPU: Rhizome

Ethnomedicinal uses: Powder of dried rhizome is consumed during vomiting tendency and excessive gas formation in stomach; boiled soup from fresh rhizome is taken during hyperacidity of stomach and also taken as brain stimulant.

221. Kaempferia rotunda L.

Vern. Name: Kha.: fu ya homhing; Ass.: Bhumichampa; Burmese: Myaebantouk; Hind: Bhuichampa

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 232

Rootstock tuberous, leaves erect and large arise from rootstock, ca 25 – 30 x 7 – 10 cm, oblong or ovate-lanceolate; usually variegated with dark tinged purplish beneath, light green above; flower fragrant, 2 – 8 cm long, ground originated, crowded radical spike, only 2 - 3 opening at time, corolla tube ca 5 – 7 cm long, spreading linear; staminodes oblong acute, white, 3 – 5 cm; lip lilac or reddish, rather shorter, 2 gid orbicular; anther deeply 2 fid, lanceolate lobes.

FF: Apr – Jul.

Distribution: Uncommon in open places and forest margin in higher elevation but rare in middle and lower elevation of Arunachal Pradesh and Lohit valley.

ES: H/T/ST/Tm/C

HS: Wild/Cult.

PPU: Rhizome

Ethnomedicinal uses: Powder of dried rhizome is consumed during mental dizziness. Boiled soup from fresh rhizome is taken during abdomen pain, brain stimulant and excessive gas formation in stomach. Fresh rhizome is applied on burnt skin and freshly cut wound for quick healing.

***222. Zingiber officinale* Rosc.**

Vern. Name: Kha.: Khing; Ass.: Adrok; Hind.: Adrak; Eng.: Zinger

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 178

Rootstock biannual, tubers many, sessile, aromatic; leafy stem 20 – 50 cm long, leaves ca 30 – 40 x 2 – 3.5 cm, smooth, bright green above, pale beneath, quite glabrous, tapering towards apex; spikes oblong cylindrical, bract greenish, suborbicular, cuspidate, corolla segment lanceolate, green, subequal; stamen dark purplish-black.

FF: Oct – Dec.

Distribution: Place of origin not sure but widely cultivated across the globe for spices and medicinal purposes, considered as sacred and used in socio-religious ceremony among the Asiatic tribal societies.

ES: H/T/ST/Tm/C

HS: Cult.

PPU: Rhizome

Ethnomedicinal uses: The paste of rhizome is added as one among the many ingredients used during preparation of medicines for healing fractured bone. It is also considered sacred which is used with alcohol during religious ceremony. Fresh

rhizome is taken during sleeping sickness and constipation to boost up energy and enthusiasm.

223. *Zingiber zerumbet* L.

Vern. Name: Kha.: Khing Misrung

Specimen Examined: Sheelawati Monlai, Dosuk, Lohit. SMZU 145

Rootstock tuberous, cut section pale yellow inside, leafy stem ca 60 – 80 cm; leaves ca 30 – 35 x 12 – 15 cm, oblong-lanceolate, dark green above pale beneath, quite glabrous in both surface; spike oblong, very dense, bract orbicular, green at young, reddish in maturity; corolla segment whitish, lip sulphur yellow, unspotted, midlobe orbicular, emarginated, basal lobes large, orbicular, lobes as long as bracts; stamen pale; capsule oblong.

FF: Sept – Nov.

Distribution: Very rare in hill areas, often common and cultivated near foothills of Namsai and Chognkam area.

ES: H/T/ST/Tm/R

HS: Wild/Cult.

PPU: Rhizome

Ethnomedicinal uses: The paste of rhizome is used as ingredient in herbal formulation for healing fractured bone. The juice extract of rhizome is applied over forehead during headache and nausea, joint pain and inflammation.

224. *Costus speciosus* Koenig.

Vern Name: Kha.: Mantung; Ass.: Jamlakhuti; Hind.: Keyu; Eng.: Canda

Specimen Examined: Sheelawati Monlai, Hawaii, Anjaw. SMZU 312

Tall herb, or undershrub, stem spirally twisted, dark green or purplish, leafy, fleshy; rootstock creeping, tuberous; leaves spirally arranged, ca 10 – 18 x 4 – 7 cm, elliptic or obovate, oblanceolate, acuminate, sessile, silky pubescent beneath; flower

white, large globose terminal, spikes ovoid; bracts ca 2 cm long, ovate, reddish; calyx 3 toothed; petal elliptic; stamen perfect 1, base hairy; capsules globose; trigonous, persistent calyx at top.

FF: Jul – Oct.

Distribution: Under forest floor, open places, near stream or shade area of hill slopes throughout NE region.

ES: TH/T/ST/Tm/C

HS: Wild

PPU: Leaf/Rhizome

CDT: Pound

Ethnomedicinal uses: The fresh paste of rhizome is mixed with glass of lukewarm water to relieve sudden mental stroke, epilepsy and tension. It is also used to cure throat infection. Fresh leaf paste is applied in burnt skin.

225. *Cautleya spicata* Smith.

Vern. Name: Kha.: Miamisrung

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 328

Pseudostems 30 – 70 cm; leaves 4 – 7, petiolate; legule 5 – 10 mm, membranous, apex obtuse or acute; leaf blade oblong lanceolate to linear, 12 – 30 x 2 – 8 cm, base rounded, obtuse, caudate-acuminate; spikes 8 – 12 cm, densely many flowered; bract red, oblong, 2.5 – 3 cm, longer than calyx; flower yellow; calyx 1.4 – 2.5 cm, split on one side, apex 2 toothed; corolla 2 – 3 cm, lobes lanceolate, lateral staminodes subequalling central lobe of corolla; labellum 2.5 cm, apex 2 cleft; anther linear, 1.5 cm; capsule red, globose, 1 cm in diameter; seeds black, ovoid, enclosed in white scabrous aril.

FF: Jul – Sep.

Distribution: Under forest floor, sometime found as epiphytic on tree trunk in

Kamlang WLS (Anjaw), foothill area of Namsai.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome

Ethnomedicinal uses: Paste of rhizome is used to cure burn skin caused by fire and hot water. It is also applied during ankle pain, swelling in foot and muscle.

MARANTACEAE

226. *Phrynium pubinerve* Blume.

Vern Name: Kha.: Tong; Ass.: Kao pat

Specimen Examined: Sheelawati Monlai, Hawaii, Anjaw. SMZU 1012

Roostock reeping, tuberous, perennial; leaves large, petiole longer than the blade, upto 100cm long, cylindrical, green, fibrous, lamina ca 20 – 70 x 15 – 30 cm across, oblong, acuminate, dark green above, pale white beneath; spikes globose from the side of petiole, rarely terminal, main bract oblong, incurved scarious tip breakes in bristles; corolla segment longer than the tube, fruite 3 seeded; seeds hard, white, triangular.

FF: May – Oct.

Distribution: Fairely common in forest floor, near stream, shady places, damp area in eastern Himalaya.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Seed/Leaf

Ethnomedicinal uses: The paste of rhizome is used to relieve mental stress. The crushed seeds are taken during chest pain. Leaves are used in religious rites. It is also useich is gifted to the girl from her parent in their marriage functions.

CANNACEAE

227. *Canna indica* L.

Vern. Name: Kha./Ass.: Parijat phul

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 365

Herbaceous, rootstock tuberous, leafy stem fleshy, teret, jointed, leaves ca 20 – 45 x 8 – 16 cm, oblong to elliptic-lanceolate, acuminate, upper surface dark green, lower glaucous, quite glabrous; flowers reddish, or yellowish in lax terminal racemes; bracts orbicular; perianth 6, 3 sepaloid, free, inner petaloid, connate below; lip orange spotted red; inner stamen fertile with 1 celled anther, adnate to petaloid margin; capsules ca 2.3 cm long ellipsoid, covered by persistent calyx.

FF: July – Oct.

Distribution: Common under forest floor, near stream and in marshy habitat, often grows with *Musa balbisiana* in both tropical and temperate Arunachal Pradesh and Lohit valley.

ESTH/T/ST/Tm/C

HS: Wild

PPU: LeaF/Rhizome/flower

Ethnomedicinal uses: The fresh paste of rhizome is mixed in glass of hot water which is taken to relieve sensational urination. Paste of flower and leaf extract is applied in burnt skin to relieve inflammation.

MUSACEAE

228. *Musa paradisiaca* L.

Vern. Name: Kha.: Koi athia, Ass.: Kol, Hind.: Kela

Specimen Examined: Sheelawati Monlai, Lathao. SMZU 1121

Stem green, high upto 10 m, leaf blade 1.8 – 2.5 m long, petiole 40 – 50 cm long, firm pulp; flower erect or decurved spikes, subunisexual, female at lower, male

upper, bracts large, spathaceous ovate or orbicular; calyx slit down one side to the base, 3-lobes; bracts of male flower persistent; corolla lobes as long as calyx, wrapped round the stamen and style; stamen perfect, 5, sixth rudimentary, filiform; ovules 3 celled, superimposed, stigma subglobose, 6 lobed, fruit fleshy, sweet when ripe, sticky, indehiscent; seed sterile or absent.

FF: Jan – Dec.

Distribution: The plant is commonly cultivated as horticultural crop for its fleshy fruits in entire north east region.

ES:Sr/T/ST/Tm/C

HS: Cult

PPU: Leaf petiole/Flower

Ethnomedicinal uses: Power of dried leaf petiole is used in herbal formulation for general weakness and anemia [mixed with powder pulp of *Embilica officinalis*.] The fresh paste of flower is mixed with Earth worm and given to subfertile women. This treatment improve the fertility of women.

IRIDACEAE

229. *Iris domestica* L.

Vern. Name: Kha.: Monshi; Ass.: Barabaji phul; Kela Phul

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 1196

Roostock creeping, persistent scar of bract; stem erect, leafy, flat at middle, ca 1.5 m long; leaves ca 60 – 80 x 20 – 30 cm, ensiform, equitant; inflorescence branched, sheath membranous, spathes cylinder, several flowered, bract scarious; flower pedicelled; perianth tube short, petal tinged orange yellow, shrinkaged after sun set; stamen and carpel filiform, inserted; capsule ovoid, membranous; seeds subglobose, testa fleshy, shining.

FF: Jun – Dec.

Distribution: Cultivated in entire Arunachal Pradesh and plain of Lohit at home garden for its ornamental.

ES:TH/T/ST/Tm/C

HS: Cult

PPU: Leaf/Rhizome

Ethnomedicinal uses: The soup of boiled rhizome and leaves are consumed as health tonic. It is also taken to relieve stomach pain, gastritis trouble and cough. A fresh leaf paste is applied as antiseptic in freshly cutwound.

AMARYLLIDACEAE

230. Zephyranthes candida L.

Vern. Name: Kha.: Hopu

Specimen Examined: Sheelawati Monlai, Manmaw, Lohit. SMZU 194

Small herb, upto 20 cm high, rootstock tuberous, tuber white, scapes alternate, leaves narrow, elongated, acute, almost cylinder, numerous, arised fromt the base of rootstock; flower solitary, arise from middle or nearly from tip of bulb, pedicel much elongated, petal white, acute, oblanceolate, stamen 5 - 6, anther yellow, stigma slightly forked or inconspicous.

FF: Mar – Feb.

Distribtuion: Cultivated as ornamental in home garden for its beautiful flower in study area, Arunachal Pradesh.

ES:H/T/ST/Tm/C

HS: Cult.

PPU: Leaf/tuber

Ethnomedicinal uses: About 200gm paste of rhizome is taken along glass of raw cow milk during jaundice and asthma. The fresh juice extract is applied on annus to cure piles; applied in localized burn and inflammation.

TACCACEAE

231. Tacca integerifolia Ker.

Vern. Name: Kha.: Kiang patta

Specimen Examined: Sheelawati Monlai, Tenga pani, Lohit. SMZU 225

Roostock subcylindric; leaves ca 50 – 60 x 30 – 40 cm, entire elliptic-ovate, scape recurved, shorter than the petiole, brushed leaves and petiole sticky, surface smooth, greenish purplish, involucre leaves 4, subequal, sessile, ovate, acuminate, perianth lobes spreading, 3 inner largest and broadest; bract numerous, filiform, 6 – 12 flowered; flower pedicelled, bluish, greenish grey or violet.

FF: July – Dec.

Distribution: Fairly common in eastern Himalayas, Arunachal Pradesh mostly grow under forest floor and near stream, common in study area.

ES:H/T/ST/Tm/C

HS: Cult.

PPU: Leaf/petiole

Ethnomedicinal uses: Petiole and leaf paste is used in healing fractured bone. The boiled soups are taken during constipation, mild fever and malaria.

DIOSCOREACEAE

232. Dioscorea pentaphylla L.

Vern. Name: Kha.: Kuan mung

Specimen Examined: Sheelawati Monlai, Manmow, Lohit. SMZU 183

Tuber oblong ca 1.8 m, stem slender, prickly at base, rarely above, often bulbiferous; leaves 3 - 5 foliate, ca 8 – 10 x 4.5 - 5.5 cm, glabrous or sparsely pubescent beneath, bract shorter than the flower; male panicle hispidly pubescent, spike lax, dense flower, flower sessile or pedicelled; filaments and staminoides very short.

FF: Aug – Oct.

Distribution: In dense forest floor and sometime in secondary forest in hill terrain or step slope in the study area and entire Arunachal Pradesh.

ES:CI/T/ST/Tm/R

HS: Wild

PPU: Leaf/Tuber

Ethnomedicinal uses: Tubers are roasted and eaten to cure indigestion. The juice exudates from cut section of raw tuber are applied on wound for quick heal. Leaves are fragrant and decoction is used to cure asthma and insomnia.

233. *Dioscorea floribunda* Mart. & Gal.

Vern. Name: Kha: Mann

Specimen Examined: Sheelawati Monlai, Manmow, Lohit. SMZU 184

Plate No. 5.g.

Climber with under ground tuber and Bulbils. Leaves are deltoid and prominently nerved from base. Tuber irregular large brown. Yellow or yellowish when cut.

FF: Sep – late Jan.

Distribution: In dense forest floor and sometime in secondary forest in hill terrain or step slope in the study area.

ES:CI/T/ST/Tm/R

HS: Wild

PPU:Leaves,Tuber

Ethnomedicinal uses: The juice exudates from cut section of raw tuber are accumulated for use as contraceptive agent for female. Leaves are used as one of the ingredient for curing bone fracture.

STEMONACEAE

234. *Stemona tuberosa* Lour.

Vern. Name: Kha.: Jarkung

Specimen Examined: Sheelawati Monlai, reserve area, lohit. SMZU 133

Twining herb, lower stem woody, dark grey green; leaves opposite, ca 10 – 24 x 3 – 12 cm, ovate cordate or ovate lanceolate, acuminate; secondary nerves parallel, petiole long, quite smooth, shining green above, pale green beneath, tissue sticky on bruishes; flower solitary, axillary, white; perianth 4 segment, 3 – 5 cm long, lanceolate, greenish white, acuminate; capsule ovoid oblong; tuber tapering towards base, arranged in cluster, upto 20 cm deep in soil, grey white, section sticky.

FF: May – Jul.

Distribution: In forest floor, degraded forest area in Lohit valley and rest of Arunachal Pradesh.

ES: TwH/T/ST/Tm/R

HS: Wild

PPU: Leaf/Tuber

CDT: Pound

Ethnomedicinal uses: Leaf paste is used to resetting fractured bone of hands and legs. The sundried tubers are roasted in fire and consumed as medicines to relieve diarrheha and stomach pain. Fresh paste of tuber is applied in joint pain (rhuematism).

LILIACEAE

235. *Allium cepa* Linn.

Vern. Name: Kha. Plomo; Ass.: Piyazi; Eng.: Onion

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 220

Small aromatic herb, bulb swollen, tuberous roots numerous; leaves subdistichous fistular, shorter than the inflated scape, teret, acute apex, green; flowers solitary, umbellate head, pedicel shorter than stellate flowers, sepal linear, oblong; filament exserted; inner 2 toothed.

FF: Aug – Nov.

Distribution: Cultivated in the garden for spices and medicinal purposes in entire region of North east and cosmopolitan worldwide.

ES:Hr/T/ST/Tm/C

HS: Cult.

PPU: Leaf/Bulb

Ethnomedicinal uses: The raw bulb is taken during impotency and general weakness. The juice extract is applied on skin to cure small fox, measles and also applied as antiseptic in freshly cut wound.

236. Allium sativum L.

Vern. Name: Kha.: Plo ching; Ass.: Lason; Eng.: Garlic

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 163

Highly aromatic herb, bulb free or cluster, white, not seated on a rootstock; leaves flat, green, scape slender, spathes long beaked, head bearing bulbils and flower; sepal lanceolate, acuminate, inner filament 2 toothed.

FF: Aug – Nov.

Distribution: Cultivated in both warmer and cold parts of world as aromatic spices herb in large scale.

ES:Hr/T/ST/Tm/C

HS: Cult.

PPU: Leaf/Bulb

Ethnomedicinal uses: The crushed bulb is applied on cut wound as antiseptic. The same is mixed with leaves of *Mentha arvensis* and consumed with few ml of hot water during chronic gastritis, used to kill stomach worm and cure stomach ulcer.

237. Hemerocallis fulva L.

Vern. Name: Kha.: Kaunkai; Ass.: Ronga Lily; Eng.: Yellow day Lily

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 141

Plate No.5.h.

Perennial herbs stem green, quite glabrous, ca 1- 2 m high; roots tuberous; leaves ca 10 - 15 x 1.5 cm, lanceolate, elongated, narrow, acute, glabrous, upper surface green, lower dull green, in two whorl, arise from rootstock and stem; spike long, flower solitary, or 3 – 5, bright orange yellow, valvate, funnel shaped, 6 – 10 flower in fork shaped scape, stamen 4, anthers numerous, yellow, dorsifixed, carpel 1, later developed into tricarpellary ovary, stigma slightly decurved, style long; fruit triangular, green; seeds glabrous, shining and black.

FF: May – Sep.

Distribution: Cultivated in home garden and backyard for ornamental purposes in Chongkam and Namsai circle, Town of Tezu.

ES:Hr/T/ST/R

HS: Culti.

PPU: Leaf/Tuber

Ethnomedicinal uses: Fresh paste of rhizome and leaf is used to cure vomiting tendency. It is also consumed during urine sensation, and similar paste is applied in joint pain and inflammation.

238. *Chlorophytum arundinaceum* J. G. Baker

Vern. Name: Kha.: Sungranai

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 142

Erect herb, ca upto 80 cm long, roots fibrous; leaves oblonglanceolate, acute or acuminate, narrowed down to broad petiole; quite glabrous – shining, ca 15 – 30 x 1.5 – 3 cm; flower white, petal 4 - 5, valvate, ca 3 – 5 cm length, stamen dull yellow, pedicel 2 – 3 cm, arranged in elongate spike, raceme; perianth segment 6, lanceolate; capsules 2 lobed.

FF: Jun – Aug.

Distribution: In cultivated condition in home garden in the villages of Chongkam and Namsai of Lohit Valley.

ES:Hr/T/ST/R

HS: Cult.

PPU: Leaf/Tuber

Ethnomedicinal uses: Leaf paste is applied in joint pain, inflammation. The tubers are used in vitality herbal formulation; 2-3 pills are consumed in a day.

239. *Paris polyphylla* J. E. Smith

Vern. Name: Hindi: Mithi Bach

Specimen Examined: Sheelawati Monlai, Chaglagam, Anjaw. SMZU 364

Plate No. 5.i.

A herb with creeping rhizome and erect stems upto 45 cm of height; leaves are in whorls, petiolate and acuminate. Flowers are yellow and solitary. The flowering and fruting starts from April-August.

Distribution: They occur in patches along side of the mountainous limit of Chaglagam and Kibithoo of Anjaw District and higher altitude (1500-2500 m) of Arunachal Pradesh.

ES:Hr/ST/T/R

HS: Wild

PPU: Rhizomes

Ethnomedicinal uses: Leaf paste is applied in joint pain, inflammation. The tubers are used in vitality herbal formulation; 2-3 pills are consumed in a day.

ASPARAGACEAE

240. *Asparagus racemosus* Willd.

Vern. Name: Kha.: Sittishsora; Ass.: Satavari

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 193

Struggling scandent undershrubs, spinous, root tuberous, white tapering narrow downward, clusters of root hairs near tips; leaves in cladodes in tufts of 2 - 6, aricular, greenish, falcate, ca 1.4 -2.6 cm long, triquetrous; flower white, short solitary or fascicled racemes; parianth 6 partite, petaloid; berries globose.

FF: May – Sep.

Distribution: Rare in the Lohit Valley mostly in open grassland and degraded habitat.

ES: Sr/CI/T/ST//R

HS: Wild

PPU: Tuber

Ethnomedicinal uses: The fresh paste of tuber is mixed with glass of milk and consume during low vitality and impotency. It is also used to cure low memory, mental dizziness and stomach unrest.

SMILACACEAE

241.Smilax perfoliata Lour.

Vern. Name: Kha.: Rungma; Ass.: Tikoni barua

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 172

Climbing shrub, young stem powdery white, matured glabrous, stout, prickly; leaves ca 5 – 20 x 3 – 12 cm, elliptic-lanceolate or oblong-ovate, retuse or shortly acuminate, cuneate or cordate at base; petioled stout, short, auricles at base; tendrils arise from tips of auricles; flower ca 1.5 cm long, axillary racemosely developed into many umbels; berries globose, ca 0.9 mm diam., greenish, white powdery at young, dark red in maturity.

FF: Jun – Jan.

Distribution: Under forest floor, secondary forest as climber in some deciduous trees in Namsai forest; Arunachal Pradesh.

ES: CI/T/ST/Tm/C

HS: Wild

PPU: Leaf/Berris

Ethnomedicinal uses: The fresh leaves and berries are boiled with hot water and juice is drink during sensational urination; cure symptoms of brown urination. The fresh paste of berries are used as components in healing fractured bone, burn skin to relieve inflammation.

PONTEDERIACEAE

242. Monochoria vaginalis Burm.f.

Vern. Name: Kha.: Metekabon

Specimen Examined: Sheelawati Monlai, Dosuk, Lohit. SMZU 150

An aquatic herbs, hight, ca 5 – 52 cm, rootstock suberect or oblique, usually very short; leaves varying from broadly ovate to ovate-oblong from an obtuse, ca 5 – 14 x 4 – 7 cm, rounded, truncate or a cordate base, but never saggitate or hastate; flower racemeform, solitary, 3 – 25 petal dark blue or light blue, perianth ca 11 – 15 mm long, shortly stalked, tepal-6, lilac blue, stamen - 6, 5 shorter, 1 longer, anther yellow, many ovules, fruits membranous capsule; seeds ovoid with longitudinally ribbed.

FF: May – Aug.

Distribution: Abundant in plain of Chongkam and Namsai in wet rice paddy field and wetland.

ES: AqH/T/ST//C

HS: Wild

PPU: Root/Leaf petiole/Leaf

Ethnomedicinal uses: Root paste is used to cure bleeding gum, asthma, chest pain and feeling of suffocation. The leaves and stem are cooked and consumed as vegetable to improve appetite, relieve indigestion and constipation.

COMMELINACEAE

243. Commelina benghalensis L.

Vern Name: Kha.: Sukbon; Ass.: Kona simolu; Hind.: Kanchara; Sans.: Kankata;

Eng.: Day Flower.

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 153

Diffuse herb, stem fleshy, underground stem white cleistogamous fertile flower; leaves ca 2.5 – 5.4 x 1.6 – 4 cm, elliptic-ovate, subacute or obtuse; sheaths pubescent, hairy on mouth; spathes 1-3 together, ca 1.0 – 1.5 cm long, funnel shaped; flower bluish violet, 1-3 flower in cymes; seeds of capsules 5.

FF: Jul – Nov.

Distribution: In open places, near stream and wasteland in Chongkam and Namsai forest.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Stem/Leaf

Ethnomedicinal uses: The paste of fresh leaf and stem is applied on fire burnt skin for quick healing, to relieve inflammation.

244. Commelina diffusa Burm.f.,

Vern. Name: Kha.: Sukam boon; Ass.: Kansimal

Specimen Examined: Sheelawati Monlai, Plantation area, Lohit. SMZU 283

Diffuse herb, stem coarsely ciliate; leaves, ca 2.7 – 7.5 x 0.9 – 1.5 cm, lanceolate or ovate lanceolate, cordate at base, acute apex, sheath margin hoarsely pubescent or ciliate; spathes, ca 2 – 3.6 cm long, ovate lanceolate, cordate at base; flower 1-3 in cymes, ca 1.5 cm long, bluish; ovary 3 celled; capsules oblong; seeds

reticulate.

FF: Jan – Jun.

Distribution: In near stream, wasteland and moist places of Namsai forest, throughout Aruanchal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Stem/Leaf

Ethnomedicinal uses: Paste of leaf and stem is applied in fire burnt skin, use as potential agent to reduce inflammation. The application method is similar to *C. benghalensis*.

ARECACEAE

245. Areca catchu L.

Vern. Name: Kha.Ton Tamul; Ass.: Tamul; Eng.: Areca nut.

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 233

Tall unbranched, annulated palm upto 20 m 15 m high, trunk with prominent leaf scars, grey; leaves ca 1 – 2.5 long, pinnatisect, frond large, petiole stout; flower monoecious, white in spadix branched; nut ovoid, ca 3.5 – 5 x 2.5 – 3 cm, smooth green.

FF: Jun – Dec.

Distribution: Cultivated in wasteland and home garden for its nut in Namsai, Lathao and Chongkam.

ES: Tr/T/ST/C

HS: Cult.

PPU: Root/Nut

CDT: Pound

Ethnomedicinal uses: Powdered roots are boiled in hot water and taken orally to clean

toxicity of mother wombs during childbirth. The nuts are used as appetizer and stimulant.

246. *Calamus tenuis* Roxb.

Vern. Name: Kha. Munn Khum; Ass.: Jati bet

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 234

Scandent palm, sometime struggling in ground, or climbing in open forest; prickly armed, brownish dark, spines sharply pointed; leaves ca 50 – 60 cm long, pinnate; leaflets many, linear-lanceolate; rachis armed, prickly recurved; spadix long decompose; spathe tubular; flower unisexual, spikes small; fruits subglobose, yellowish, ca 0.7 – 1.2 cm dia., mucronate, ripen cover fleshy sweet acide, nut hards.

FF: May – Dec.

Distribution: In open forest, degraded forest, under forest floor, near swampy or marshy land in plain of Namsai forest.

ES: SCL/T/ST/Tm/C

HS: Wild

PPU: Roots/Stem

Ethnomedicinal uses: The powdered roots and stem are used to heal paralysis and fracture bone by tie up paste of plants parts and wrapped by banana leaves for few days for complete healing. Fresh juice from cut section of stem is applied in fresh cut wound.

247. *Livistona jenkinsiana* Griff.

Vern. Name: Kha. Thongko; Ass. Toku pat; Eng.: Jenkins palm

Specimen Examined: Sheelawati Monlai, Lathao, Lohit. SMZU 244

Tree, trunk upto 20 m high, leaves 1.8 m including long petiole, petiole spinous, lamina broad, 70 - 80 cm, reniformly flabellate, glaucous beneath; spadix ca 8 – 15 cm, branches dichotomous, simple or compound; spathes about 10 cm, woody, scurfy; flower cluster on small tubercles, small greenish, eubractate, cupular, corolla

twice as bract; drupe reniformly globose, 0.6cm in diam., laden blue, hard.

FF: May – Sep.

Distribution: Found wild condition in hills of Itanagar, Upper Subansiri and Siang Districts of Arunachal Pradesh and plain of Assam.

ES: Tr/T/ST/Tm/R

HS: Wild/Cult.

PPU: Seed

Ethnomedicinal uses: Powders of matured cotyledons are taken in raw during general weakness and anemia. Seeds are taken with the paste of young leaves of *Murraya keonigi* in case of diarrhea.

248. *Caryota urens* L.

Vern Name: Kha.: Kunhang ; Ass.: Chewa gach

Specimen Examined: Sheelawati Monlai, Plantation area, Lohit. SMZU 231

Tall stout palm; stem crisscrossed with dark hair like tough fibres; leaves large, decurved, 3 – 5 m long, bipinnate; leaflet cuneiform, obliquely truncate, toothed; spadix large, upto 2 – 3 m longm interfoliar; pendent; flower monoecious, female between 2 males; fruits globose, dark purlish, 1- 2 seeded.

FF: Feb – Jul.

Distribution: Found cultivated condition in village forest, homeyard, near Buddhist shrines in Chongkam of Lohit Valley and at higher altitude upto 2000 m in both tropical and temperate Arunachal Pradesh.

ES: SCL/T/ST/Tm/C

HS: Wild

PPU: Seed

Ethnomedicinal uses: The plant is considered scared among the Buddhist Khamti of Chongkam. The powdered seeds are used to cure tootache; stomach indigestion and

muscle sprain.

PANDANACEAE

249. Pandanus odorifer Kuntze

Vern Name: Kha./Chakma: Rishi patta

Specimen Examined: Sheelawati Monlai, Nongtaw, Lohit. SMZU 278

Shrubby, rarely erect, densely branched, cupious aerial shoot; leaves 1 m, ensiform, caudate-acuminate, margin with ascending spinules, drooping, glossy green; spathes white, fragrant, fruite yellow – brown; drupes confluent of 5-20, very woody.

FF: Oct – Feb.

Distribution: Rare along forest margin and forest floor of Chongkam and Namsai area, tropical and temperate zones of Arunachal Pradesh and Assam.

ES:Sr/T/ST/Tm/C

HS: Wild

PPU: Leaf/young shoot

Ethnomedicinal uses: A powder of dried leaf is taken along with the powdered leaves of *Solanum nigrum* during liver pain. The pastes of young shoot are applied in localized swelling and inflammation in body.

ARACEAE

250. Acorus calamus L.

Vern Name: Kha.: Sabbhu; Ass.: Bach; Hind.: Vacha.

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 155

Aromatic herb, rootstock creeping; leaves distichous, upto 50 cm long, narrow, ensiform, base equitant, nerve parallel, erect, acute apex; peduncle leaf like, spathe ensiform; spadix sessile, cylindrical, flowering upwards, green; sepals 6, orbicular, concave, tips incurved; stamen 6; filaments flat, reniform; ovary conical, 2-3 celled, ovule

pendulose; berries few seeded; seeds oblong.

FF: Aug – Nov.

Distribution: Common in marshy land and water logged area of open forest in Chongkam and Namsai circles; throughout India.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Rhizome

Ethnomedicinal uses: Paste of rhizome and leaf used are used in sore throat, low vitality, epilepsy, as brain tonic, chronic diarrhea. The powdered rhizome is used as insecticides.

***251. Arisaema tortuosum* Engl.**

Vern. Name: Kha.: - Karbas

Specimen Examined:- Sheelawati Monlai, Manmaow, Lohit. SMZU 174

Plate No. 6.a

Tubers spheroidal, 10 – 13 cm diameter, petiole 20 - 30 cm long, green, sheath mottled with purple; leaf 2-3, leaflet 30 - 50 cm, distant or crowded, almost radiately disposed; peduncle 38 – 40 cm, spathe 10 – 15 cm, pale green or purplish, tube subcylindric, gaping; spadix uni or bisexual; appendage like rat tail, quite smooth.

FF: May – Mar.

Distribution: Often rare, in forest floor, sometime in open places in study area, throughout Arunachal Pradesh.

ES:H/T/ST/Tm/C

HS: Wild

PPU: Tuber

Ethnomedicinal uses: Paste of leaf petiole is used applied in anus during piles, applied on skin incase of leprosy. Paste of tuber is used as anti-dote to snake and scorpion bite.

252. *Homalonema aromatica* Roxb.

Vern Name: Kha.: Suanpa

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 273

Aromatic herb, corm underground or partialFly exposed, dark grey; leaves ca 20 – 40 x 15 – 30 cm, broad at middle, apex acute, quite glabrous, shining, green, petiole long, cylinder, sheathing at base; spathes erect, convolute, green; spadix terete, included; flower unisexual; male & female meeting together; fruits berry, dark brown.

FF: Sept – Dec.

Distribution: Grow in wild in moist and shady places of Chongkam forest; often found under dense forest floor. A mostly cultivated in kitchen garden and backyard of home for ornamental and medicinal purpose.

ES: H/T/ST/Tm/R

HS: Wild

PPU: Rhizome/Leaf/Petiole

Ethnomedicinal uses: The cooked rhizome and petiole is eaten to cure impotency and low vitality. The paste of raw leaf is applied on localized swelling, pus and joint pain (rheumatism).

253. *Alocasia macrorrhiza* Schott

Vern Name: Kha.: Panam mon; Ass.: Kochu

Specimen Examined: Sheelawati Monlai, Kaichu, Lohit. SMZU 188

Plate No. 6.c.

Corm or stem attain upto 3 m high, 10 cm diam., leaves ca 80 – 120 x 60 – 90 cm, large, broadly ovate, sagittate repand, basal lobes rounded, connate, sinus narrow, nerve 10 – 12 paires, petiole long, upto 1m long, peduncle 2, short, stout; spathe limb hooded, cuspidate at top; spadix nearly long as spathe, appendages nearly equaling the inflorescence; cylindric, sulcate; ovary incompletely 4 celled; berries bright red.

FF: Jun – Oct.

Distribution: Having wide distribution in forest margin and moist as well as in dry degraded forest and wasteland in study area; along the roadside Namsai subdivision.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Leaf petiole

Ethnomedicinal uses: The powder of dried petiole is used to cure malaria. The juice of cut section is applied in anus to cure piles.

254. *Lasia spinosa* L.

Vern. Name: Kha.: Sibenjento; Ass.: Sengmora; Sans.: Laksmana

Specimen Examined: Sheelawati Monlai, Nanam, Lohit. SMZU 145

Plate No. 6.b.

Herb, stout and spinous, rhizome branched, petiole peduncled, prickly beneath leaf nerves and petiole; leaves long petioled, hastate, entire or pedately pinnatifid; spathe long, narrow, fleshy, twisted, base convolute, deciduous; spadix short, cylidric, dense flowered; sepal 4 – 6, obovate; stamen 4 – 6, filaments short, flat; ovary ovoid, 1 celled; berries subpyramidal, 6 sided; seed compressed; macropodal embryo.

FF: Jun – Sep.

Distribution: Eastern Himalaya, Arunachal Pradesh and entire Northeast India. Mostly grow in open places, near stream and marshy land, fairely common in study area.

ES: AH/T/ST/Tm/C

HS: Wild

PPU: Petiole

Ethnomedicinal uses: The paste of leaf petiole is applied in the affected part of fractured bone. The boil leaves and petiole are consumed to cure stomach ulcer.

255. *Pothos scandens* L.

Vern. Name: Kha.: Uhang

Specimen Examined: Sheelawati Monlai, Tezu, Lohit. SMZU 147

Climbing, epiphytic herb, rooting at nodes; stem somewhat fleshy, cylinder green; leaves ca 2 - 10 x 1 - 5 cm, ovate or obovate-lanceolate, acute or acuminate, cuneate or rounded at base; petioled winged or small leaf blade found; spathes ca 0.6 cm long, cuspidate green; spadix globose or ovoid, orange yellow; flower hermaphrodite, perianth segment 6, berries dark red, oblong.

FF: Feb – Jul.

Distribution: On trunk as epiphytic in Namsai forest area; in both dense and disturbed forest, more frequent in dense forest.

ES: EH/T/ST/Tm/C

HS: Wild

PPU: Stem/Leaf

Ethnomedicinal uses: Paste of fleshy stem and leaves are used as ingredient in polyherbal formulation to fractured bone. Also applied in freshly cut wound as antiseptic.

CYPERACEAE

256. *Cyperus corymbosus* var. *brevispiculosus* Kuntze

Vern. Name: Kha.: Yahoookan

Specimen Examined: Sheelawati Monlai, Pankaw, Lohit. SMZU 316

Erect herb, stem 70 – 100 cm, cylindrical, shining, green, when dry often more or less transversely septate, upper most leaf short, nearly 18 cm long; bract leaf like, umbel, green, not ovate at base, keeled with margin recurved in dry state, much overtopping the inflorescence; spikelets ferruginous, grey white or sometime reddish.

FF: Nov – Feb.

Distribution: The plant is often rare in study area which is mainly cultivated near backyard for the medicinal purposes.

ES: GH/T/ST/R

HS: Wild/Cult.

PPU: Stem/Root

Ethnomedicinal uses: The paste of root and stem is used to heal fractured bone. It is also applied in wound for quick healing.

POACEAE

257. *Bambusa tulda* Roxb.

Vern. Name: Kha.: Mabang; Ass.: Bhujuli banh

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 152

Tufted tall bamboo, culms ca 6 – 10 cm in diam., 15 - 25 m high, internode smooth shining; leaf blades ca 10 – 25 cm long, linear lanceolate, rough at margin, sheath striate; legule bristly, white; culm sheath truncate at top; blades cuspidate, hairy inside; spikelets 7 -12 flowered, head loose; caryopsis hairy pubescent at apex.

FF: Once in 60 -70 years

Distribution: Planted near home yard and open forest as crop of village forestry in Namsai and Chomgkam, entire Northeast India.

ES: GSr/T/ST/Tm/C

HS: Cult.

PPU: Culm

Ethnomedicinal uses: The macerated powdere of raw culm is used as antiseptic in freshly cut wound which enable blood clotting thereby prevent excessive bleeding of wounded tissues.

258. *Pennisetum compressum* R. Brown

Vern. Name: Kha.: Hakkha

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 165

Perennial grass, stem 20 -30cm, , densely tufted; leaves 10 – 15 cm(12-18 inch), very narrow, convolute, silkily villous towards the base; sheath glabrous or ciliate; legule obscure; spikes 6 - 7 cm; purplish; involucels pedicelled, pedicels villous, bristly, few, much long than the rest, all at base.

FF: Oct – Dec.

Distribution: Common in grassland and open field in the study area, throughout India.

ES: GSr/T/ST/Tm/C

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: The juice extract of the bunch of whole plants is applied in anus tip to cure piles. The same fresh juice is consumed during sensational urination.

259. Saccharum officinarum L.

Vern. Name: Kha.: Oei; Ass.: Kuhiar; Hind.: Ganna; Eng.: Sugarcane

Specimen Examined: Sheelawati Monlai, Gunanagar, Lohit. SMZU 166

Succulent perennial herb upto 6 m tall, culm jointed, slightly swollen at internode culm, colour varies from purplish to green; leaf sheath roughly pubescent, leaf blades ca 1.2 m long, 3 - 5 cm wide, lanceolate, acuminate, surface rough, margin roughly, minutely dentate, bristly; panicles 40 – 70 cm long, spikeletes narrow, 3 – 4 mm long, each spikeletes bear white hairs at base.

FF: Dec – Mar.

Distribution: Cultivated in small pocket of Gunanagar, sometime at the periphery of Jhum field for domestic consumption in study area and widely cultivated in commercial scale in Northern India.

ES: H/T/ST/Tm/C

HS: Cult.

PPU: Extract of caned sugar

Ethnomedicinal uses: The juice extract is made to cane sugar. It is mixed with few ml of boiled water and consumed to nullify the spread of rabbies germ caused by dog dogbite.

260. *Saccharum spontaneum* L.

Vern. Name: Kha.: Oie on, Ass.: Kahua; Hind.: Kans; Eng.: Thatch grass

Specimen Examined: Sheelawati Monlai, Digaru ghat, Lohit. SMZU 240

Tall, upto 8 m high perennial grass, stem cylindrical, green, powdery at young, internode/culm 20 – 30 cm, covered by leaf sheathing; leaves simple, upto 2 m long, and 3 – 4 cm wide, sheathing narrowly linear, finely acuminate, coriaceous; spikes upto 1.3 m long, large bushy, peduncle green at young, purplish at maturity, spikelte in paires, white or pink purplish, panicles silky, hairy, texture smooth.

Distribution: Cosmopolitan, quite common in abandaned jhum field, secondary forest and open places in study area and in entire Northeast India.

FF: Oct - Dec

ES: H/T/ST/Tm/C

HS: Wild

PPU: Young shoot

Ethnomedicinal uses: Juice extract of young shoots collected in mug is directly consumed in fresh to relieve sensational urination. The young shoots are squeezed with tooth and sucked inorder to relieve high blood pressure and insomnia. It is not recommended for the time of physical hard labour in order to avoid early tiredness and lethargic.

261. *Eleusine indica* L.

Vern. Name: Kha.: Yapakai; Ass.: Bhubusa bon; Eng.: Wild Finger millet.

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 253

Tufted grass, annual; culms ca 15 – 40 cm long, compressed; leaves distichous, linear, flat, sheath ciliate, ligule membranous; inflorescence terminal umbel, 2 - 4 digitate spikes; spikelets 2- seriate, elliptic, 3 - 6 flowered, sessile; glumes unequal, lanceolate; lemma ovate-oblong; palea 2 - keeled; oblong caryopsis.

FF: Mar – Dec.

Distribution: In open places as tufted grasses that cover whole surface of land in playground, backyard in Chongkam, throughout India.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Root/Whole Plant

Ethnomedicinal uses: The roots are crushed and juice is applied over swelling gums and is also used as relieving juice for toothache. Juice extracts of the whole plant is applied to cure dog bite.

262. Coix lacryma-jobi L.

Vern. Name: Singpho.: Rangulam

Specimen Examined: Sheelawati Monlai, Pankhao, Lohit. SMZU 243

Annual under shrub, culms smooth, branching at lower nodes; leaves ca 14 – 35 x 1.8 – 2.5 cm, linear lanceolate, cordate at base, margin spinous, sheath broad; ligule membranous; female spikelets hardened bract; glume lanceolate; caryopsis ovoid, hard, dull white, enclosed in involucre of bract.

FF: Oct – Dec.

Distribution: Mostly found cultivated in Jhum field as substitute crop in entire Lohit Valley and other part of Arunachal Pradesh and Assam at an altitude upto 2500m.

ES: H/T/ST/Tm/C

HS: Cult

PPU: Seed

Ethnomedicinal uses: The seeds are cooked and eaten as food. The paste of raw seeds are used as anti-inflammatory agent, used in rheumatic pain. The powdered seeds are mixed with powder of *Allium sativa* and consumed as vitality medicines.

GROUP: GYMNOSPERM

TAXACEAE

263. *Taxus baccata* L.

Vern. Name: Common Name: Himalayan Yew

Specimen Examined: Sheelawati Monlai, 2 mile, Lohit. SMZU 375

Plate No. 6.d.

Distribution: Nearly throughout Arunachal Pradesh above 1600m to 3000m in temperate zones. Particularly abundant in Tawang, Kameng and Anjaw districts.

ES: T/Tm/R

HS: Wild

PPU: Leaf and Bark

Ethnomedicinal uses: The alkaloid 'Taxol' obtained from the bark of the tree used

GROUP: PTERIDOPHYTES

LYCOPODIACEAE

264. *Lycopodium japonicum* Thunb.,

Vern. Name: Kha.: Kuanmu

Specimen Examined: Sheelawati Monlai, Deobill, Lohit. SMZU 359

Terrestrial fern, stem covered with scale leaves; scale leaves arranged spirally ca 0.1 – 0.2 cm long, linear-lanceolate, dull green, pointed, sparsely hairy; sporangia arranged in strobilli, erect, ca 20 – 30 cm, stalk long; sporophyll deltoid, margin ciliate, irregular, spore dark oval.

FF: Oct - Jan.

Distribution: Commonly grow near stream, under dense forest floor in Namsai forest and entire Arunachal Pradesh at an altitude of upto 2800m.

ES: H/T/ST/Tm/R

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: Powder of whole plants is mixed with the powder of *Marchantia palmata* and applied in joint pain and skin inflammation.

ADIANTACEAE

265. Adiantum capillus-veneris

Vern. Name: Kha: Pukut

Specimen Examined: Sheelawati Monlai, Namsai, Lohit. SMZU 399

Distribution: Fern with palmate small fronds. Distributed widely throughout Anjaw and small pockets of Lohit district especially along downstream areas.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: Whole plant used for cold and cough.

EQUISETACEAE

266. Equisetum diffusium D. Don.

Vern. Name: Kha.: Miyankam; Ass.: Nal-jura

Specimen Examined: Sheelawati Monlai, Digaru river, Lohit. SMZU 171

Small terrestrial or subaquatic tufted herb; stem erect, diffused; aerial shoots jointed, internode ridged, stem hollow; leaves scale like, xerophytic, small, slender, pointed, whorl at joint or ring of node; internode 2 - 4 cm, sheath lose, linear lanceolate; sporangia homosporous, paired; sporophylls on terminal stalked, strobilus oblong, cylindrical.

FF: Oct – Mar.

Distribution: Grow near stream and river bed of the Lohit Valley, throughout NE India.

ES: H/T/ST/Tm/R

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: The powder of whole plants are mixed with boiled water and consumed during chest pain and asthma. It is also taken during mild diarrhea. The pastes of raw stem are applied on scorpion bite.

LYGODIACEAE

267. *Lygodium flexuosum* L.

Vern. Name: Singpho.: Nuang sentu

Specimen Examined: Sheelawati Monlai, Hawaii, Anjaw. SMZU 181

Plate No. 6.e.

Twining fern, rhizome creeping, glabrous; fronds wide spreading, quite glabrous, dull green above, pale beneath, leaflet somewhat curly in some point, pinnate, margin dentate, terminal leaflet forked, acute apex, basal leaflet large, separated or lobed; fertile leaflets narrower than sterile ones; sori pale dark or brownish, protruding from the margin, sporangia large, arranged in 2 rows, shortly stalked.

FF: Feb – Dec.

Distribution: In forest margin, under forest floor and wasteland in study area, throughout NE India.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Whole plant

Ethnomedicinal uses: The powder of whole plants are mixed with bark of

Cinnamomum glanduliferum and consumed during low vitality and general physical weakness.

ANGIOPTERIDACEAE

268. *Angiopteris evecta* Hoffm.

Vern. Name: Kha.: Ton Pukut Kham

Specimen Examined: Sheelawati Monlai, Wakro, Lohit, Tiding- Anjaw. SMZU 196

Terrestrial shrub, caudex erect, brad, massive, fleshy, pink inside, stipe 1.5 m long, smooth green, base swollen with pubescent brown scales and hairs; frond large, 2 – 5 m long, bipinnate, lamina about .7 – 1.4 m length, arised from main rachis, spreading, swollen at base, petiolules ca 0.4 cm, pennules swollen, 8 – 18 x 1 – 4 cm, oblong lanceolate, acuminate, serrate, veins simple, bi-fid, nearly parallel to sori, sori arranged in 2 rows, submarginal, sporangia 7 – 15 in each sorus, spores tetrahedral, hyaline.

FF: August.

Distribution: Near stream slopes and shade forest floor in study area. The plant is widely used as famine food among the Nyishi of Arunachal Pradesh.

ES: Sr/T/ST/Tm/C

HS: Wild

PPU: Rhizome/Rachis

Ethnomedicinal uses: The paste of Rhizome is used as anti-inflammatory agent. Powdered rachis is mixed with raw milk of cow and consumed during jaundice and indigestion.

ATHYRIACEAE

269. *Diplazium esculentum* Retz .

Vern. Name: Kha.Pukut, Ass.: Dekia

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 293

Terrestrial fern, rhizome erect, dark brown; scale broad, dark brown; stipe erect, tufted, sparsely scaly at base; frond large, young frond green, curly, lamina 2 pinnate, pinnae petiolate; penules numerous, sessile, acuminate, truncate or broadly cuneate at base, margin lobed; sori linear, continuous along the veins, brownish; sporangia shortly stalked.

FF: Dec – Jan.

Distribution: Common along wasteland, swampy area and near wetland in entire plain and foothill region of study area. Also occur in entire Northeast India including Arunachal Pradesh at an altitude of upto 3000m.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Young frond

Ethnomedicinal uses: The tender frond are cooked and consumed as vegetable along with rice to cure jaundice, liver pain, yellow urination. The tender frond is consumed in raw during insomnia and high blood pressure.

ASPLENIACEAE

270. Asplenium nidus L.

Vern. Name: Kha.: Yahanka

Specimen Examined: Sheelawati Monlai, Nalung, Lohit. SMZU 103

Plate No.6.f.

Short to medium length, creeping, thick, stout, paleaceous at tip; root very profuse, paleae 20 x 2 mm, basifixed, lanceolate, entire, long acuminate, dark brown, concolorous, heterotoechae, old one ruptured longitudinally; frond ca 60 – 90 x 10 – 14 cm, closely originated, sessile, wing stip 2 – 5 cm long; lamina lanceolate, elliptic, alternate, entire, undulate, suddenly acuminate; Sori oblong elongated, not reaching to margin, indusium entire thick; spore ca 56 x 36 – 40 µm, monolet, brown, perispore

folded, reticulate irregular.

FF: Sori in May – Sept.

Distribution: On tree trunk under forest floor as epiphytes in study area, throughout India.

ES: EH/T/ST/Tm/C

HS: Wild

PPU: Leaf pinnae

Ethnomedicinal uses: The paste of frond leaf is used as components in healing fractured bone. It is also apply in freshly cut wound as antiseptic. The same paste is spreaded on back to relieve bodyache and tiredness.

THELYPTERIDACEAE

271. Amphineuron opulentum Kaulf.

Vern. Name: Kha.: Miangkambon

Specimen Examined: Sheelawati Monlai, Emphum, Lohit. SMZU 149

Rhizomes long creeping; fronds 20-24 cm wide, distant, caudate acuminate, bipinnatipartite; rachis grooved dorsally, hairy throughout; hairs acicular, 0.1 – 1.0 mm long; pinnae largest at the base of lamina, ca 10 – 15 x 2.0 – 2.5 cm, alternate, ca. 20 pairs, oblong – lanceolate, gradually narrowed from base, acuminate; sori round, median, spores ca 35 – 38 x 25 μ m, monolete, brown, perispore separate, irregular and tuberculate; pinnae aromatic but irritant.

FF: Sori in Jul – Dec.

Distribution: In wasteland and open places in study area, throughout NE India, Aruanchal Pradesh.

ES: H/T/ST/Tm/C

HS: Wild

PPU: Leaf pinnae

Ethnomedicinal uses: Dry pinnae are kept in chicken cage to prevent infection from microscopic insect appear in chicken cage or nest during hatching. The leaf extracts are taken in small quantity to relieve skin allergic, severe constipation; used to kill worm in cow wound.

BLECHNACEAE

272. *Blechnum orientale* L.

Vern. Name: Chakma: Kalasona

Specimen Examined: Sheelawati Monlai, Chongkam, Lohit. SMZU 197

Rhizome erect, ca 5 - 10 cm long, small to becoming massive on age, apex densely paleoecous; paleae upto 10 x 1 mm, subulate-lanceolate, long acuminate, lustrous, brown, concolorous, isotachae; fronds, ca 130 – 150 x 25 – 45 cm, tufted, pinnate, caudate acuminate; lamina 120 cm, pinnae ca 25 x 2.2 cm; sori costal elongated, endusium long, spores ca 48 – 52 x 32 – 36 μ m, reniform, black brown, thick perispore present.

FF: Sori in May – Oct.

Distribution: Rare in occurrence, grow near stream side, shade habitat in hill slope and moist area of Lohit Valley, throughout Arunachal Pradesh.

ES: T/ST/Tm/C

HS: Wild

PPU: Rhizome/Young frond

Ethnomedicinal uses: Powder of young frond is used to cure tuberculosis, diabetic, Urine sensation. Paste of rhizome is used anti-inflammatory agent.

6.1 Socio-economic Status

The people adhere to their society and follow their traditional way of life similar to Hindu social life. Except for some local tribes who are Christian convert and have their indigenous faiths. However, the Khamptis and Singphos practices the Theravada Buddhism while the Meyors of Anjaw district follows Mahayana sect of Buddhism and thus peace and tranquility are their basic form of life. They abhorred any form of sacrifices. The economy prevailing is rural economy with primary occupation being agriculture but individual ethnic groups largely are linked to forest ecosystems around timber and non-timber forest products(NTFP) to meet their domestic needs and also for cash income for market. Many are now taking up Horticulture, herbal gardening, Pisciculture, Poultry, plantation of Tea, Muga (as discussed in land use pattern) most of the people also work outside their area as wage laborer in construction of road (BRTF), tea plucking

6.1.i. Village Eco-Systems

The people of all these villages belongs to the indigenous faith except village Chailiang 20th Mile and village Yealiang, where 0.3 per cent and 1.0 per cent respectively, are Christian and the Khamptis, Singpho's and Meyors who are the followers of Buddhism. In four of the villages the Baptist, Missionaries of Christ have been functioning and in two villages Hindu organizations. How ever, the majority Mishmi, especially, in the Anjaw districts follow the indigenous faith culture. These villagers mainly follow a system based on the Magies religions rights and practies to dispel the evils spirits by a peacement. They have apparently developed the conception of high god whom they regarded as as their supreme creator.

The Khamptis, Singphos and Meyors are Buddhist by their religion. The Khamptis believe the attainment of "NIRVANA" or salvation of human soul can be

achieved by the following noble eight fold path. They are deeply influence by the Buddhism, its Ethics and Morality. They also covered major portion of plain area in Lohit district and the Meyors in the higher belt of the study area(Alpine and Temperate region of Anjaw District).

The main festivals celabrated in both the districts of Lohit and Anjaw are Reh, De-Bett, and Tamladu, Yaka for the Mishimis and Sangken and Maiko Chungphai is main festival for the khamptis and Singphos respectively.

The Mishimis also formed a society for their alround development namely culturel and literacy of Mishimis also many other societies are working in the district for the development of the local people like Arunachal Vikash Parishad.

The people of these districts are one of the fore members in various developmental efforts. During the last decade remarkable changes have taken place as for example, progress in various fields such as political, economical and cultural affairs, spread in education. The over all progress in the field has been quite encouraging. The people's participation in the process of coming closer and closer into the main stream of government framework and developmental activities is positive.

6.1.ii. Population

The population of villages varies according to the number of houses, ranging from 15 individuals in three households (village Laboliang) to 1530 individuals in 267 households (Village Chongkham). The total population of village Kibithoo, which is on the border with China, is 64 spread over 12 households. The maximum population in Walong circle is 76 spread over seven households and the lowest is 29 from three households. The maximum total population of the villages within the Hawaii circle is 259 in 19 households and the minimum is 18 spread over three households. The average number of individuals in households is approximately 9.5. the break-up of the number of houses, population, occupation and health centers of the villages are given in

Table 6.1.

6.1.iii. Houses

The houses in the villages are made of wood, bamboo and thatch, intertwined with ropes. All the materials for house-building are gathered from the forests around the villages. Earlier the indigenous tribes did not make use of iron nails in their houses but now they use them. The traditional houses of the Khamptis and the Singphos are constructed in a cluster of huts but raised at least 2 m above the ground to avoid flood water. The side wall and floor is chiefly made of Bamboo. The roof is usually design in circular-conical fashion which is covered with leaves of *Impereta cylindrica*. A house once built does not require any repair for about ten years. The Mishmis houses are long and raised on pillars. A corridor runs along the length of the house on one side while the other side is partitioned off into a number of rooms, with hearths of their own. Each room is about 12- 15 feet long and about 10-12 feet width. Members of the whole family inhabit each house and separate rooms are allotted to married couples and their children.

The residence is patriarchal with the sons bringing in their wives. The pigs are generally kept under the house. Poultry is housed in the rear corridor and goats in the front corridor. The *Mithun* (large semi-domesticated cattle) are left to roam free and come up to houses to eat salt.

Yaks are reared by the Meyors (Zakhrings). The toilet facility is probably rudimentary consisting of a hole in the rear corridor. But the Khampti tribes are more discipline with regards to animal rearing. They always rear their domestic pets (Pigs, goats, cows, buffalos, and fowls) distance away from their residence (refer to **Table 6.1**)

6.1.iv. Cultivation and Forest resources

Lohit district has the lowest share of cultivated land in Arunachal. Majority of the land among these tribes belongs to the community. There is no limit of ownership of cultivable land except those areas close to Assam. Here the method of agriculture is wet cultivation, and not swidens. It is practiced mainly by Khamptis and

Singphos. Land is distributed among the families, according to their needs by *Gaon Bura* and the village council made up of village elder.

The forest products collected by these ethnic tribes include house-building materials like cane, bamboo, thatch, ropes, wood and occasional wild vegetables, berries and leaves. The forest products are kept for self consumption and rarely marketed. This is mainly because large scale collection is not practiced. Although bamboo has always been mentioned as minor forest produce in many areas, it is cultivated and used as income generating resources. The chief source of wealth among the Mishmis, as mentioned by Grewal is the poisonous root of *Aconitum ferox* which grows in higher altitudes. *Coptis teeta* commonly known as 'mishmi teeta' or 'powa', *Illicium gratitii*, *Pseudo ginseng*, *Paris polyphyra* (mitha bach), various species of pipli, *Rubia cordifolia* and *Taxus bacata* are majorly extracted medicinal plants and musk collected from the Musk deer are found in the higher altitudes. These products can be exchanged for great value and here I would suggest the interference of law and government is to be met immediately as illegal exportation is much in progress. However, no details of sale of these products could be gleaned from the surveyed village. They have often been found to migrate in search of cultivable area. There are two main consideration (beside cultivable land), in selecting a village side. The first is the existence of a tableland where house can be constructed and the second consideration is the availability of a perennial source of clean water.

6.1.v. Occupation

The main occupation of the tribe residing in the two districts is agriculture. The resident of Anjaw mainly practice 'jhum' or slash and burn cultivation, which is the traditional method of cultivation, as the terrain is hilly and forested. However, the inhabitant of Lohit has wet cultivation covering 30-80 per cent of their cultivable area. The main crop grown in the villages are paddy, maize, millet and vegetables. In a few

villages ginger, mustard seeds and potatoes are also grown. Wheat is grown only in village Loilang and village Yealiang. Fruits such a guava, pears, banana, jackfruit, orange, mango and betel nut are grown in almost all the villages studied. The yield of these crops varies from 2 quintals per acre to 12 quintals per acre. The yield referred to here is the cumulative yield of each crop and the price is given by the individuals' families.

6.1.vi. Livestock

Livestock comprises of mithun, cow, pig, sheep and goat. Buffaloes and cows are domesticated by the Khamptis in the lower regions. Livestock form the main source of wealth among the Mishmis, who have been traders. They buy cattle from the Assamese too. Mithun has ritual significance among the Mishmis, and is used as bride price too. The present study found that the Mishmi village owned some livestock, but did not use cattle for milk. Cattle were reared only for slaughter on important occasions, festivals and feasts and for appeasing gods and spirits. However, the Khamptis and Singphos, more composed than its counter inhabitants due to their religious attachments to Buddhism and do not believe in slaughtering. Livestock, however, fetches considerable returns and is generally sold (**Table 6.1**).

6.1.vii. Shops

The maximum numbers of shops were found in Lohit District as compared to the Anjaw district (120>35). The indigenous tribes realized that small variety shop offers the possibility of earning an income and are starting shops in every village. A large part of their clientele is the army and Government employees posted in these remote areas of Anjaw district in particular. Besides this asset, villagers in the Lohit district(such in the Khampti and Singpho Villages, Chailiang 19th mile and village Chailiang 20th mile owned Mustard Oil Mile and Rice Mile respectively.

6.1.viii. Health care

The Mishmis believed that ill health and death are caused by evil force that can be appeased through sacrifices except for the Khamptis, Singphos and Zakhrings, who follow Buddhism and those who follow Christianity have different views.

They are known to consume 'Mishmi Teeta' for various diseases and use to be sold cheaply to traders from Assam who would then export it by increasing its value at least 80 times. Over exploitation has reduced its availability. However, opium is the panacea for pain. In the village of Anjaw district medical facilities are hopelessly inadequate and out of date. The chief health problems of the people in the upper valley were fever, cough and cold, chronic dysentery, diarrhea, vomiting, body and stomach pain, only god and luck seen to help those with broken bones and maternity problems. Village such as Sarti, Bhaw, Sung, Changum, Marwoh and Charai reported incidence of malaria, while Hatiduba village reported paralysis. The children often suffer from skin infection and worm related illness, and basic hygiene is not practiced. All villager resort to herbal medicine and traditional medical practitioners are popular. Sanitation is more or less non-existent except in villages occupied by the Khampti and Singphos. Water is available.

Education in the village of lower valley is restricted to school up to class V. only in village Loilang, was there a government secondary school, while in the upper belt each Higher Secondary School caters to a number of villages. In village Laboliang, Wrangam and Nukung, there were no schools while the village such as- Chailiang 19th mile, Suliang and lower Tafrogam and there was only a Primary School. The government secondary school and the Middle School in village Upper Tafrogam cover five villages. In village Dingliang, New Hatiduba and Huicheliang the type of school was not mentioned and the number of students too was not known in village Dingliang and village New Hatiduba. Even where the number of students attending school was reported to be fairly good, the authenticity of the estimate was doubtful as the people

were more concerned about their work in fields than their education. It may be mentioned that the Mishmi house is made up of a number of family units where each unit have to fend for itself. The school has no supplies of stationary and materials except few books. When asked about the number unemployed in a village, every villager gave a different number. But whether the unemployed were educated or were engaged in cultivation and aspiring for government service could not be clarified. The people were enthusiastic about receiving an education, even higher education, and some have even joined an open school.

6.1.ix. Basic amenities

There is lack of basic amenities like electricity and irrigation facilities in almost all villages of Anjaw district but few in the Lohit District. Electricity has not yet been provided in remote villages such as- Dingliang, New Hatiduba, Laboliang, Mekaliang, Paya, Nongtaw, Imphum and upper Tafragam of Lohit district and in the villages those with supply was irregular. In the upper valley of Anjaw, except for villages Kamdi, Ngi, Ruti, Waton, Kharong and Hawaii, there was no electricity. The total installed capacity in Arunachal Pradesh as on 31st March 200 was 39.40 MW of which 23.60 MW is Micro -Hydel Power and 15.80 MW is diesel Power. The installed capacity in the Lohit district is 462.5 KW. The Hyuliang electrical sub-division has 32 electrified villages, Namsai electrical sub-division, 48 villages and Tezu electrical sub-division, 19 electrified villages.

The prospects for generating hydroelectricity are good in village Hatiduba, Laboliang and Suliang and village Chailiang, Duraliang and Lower Tafragam. The Dura Nala Hydel Project requires an efficiency injection. This is true for the 64 crore Halai Pani hydroelectric project as well. Irrigation facilities are available in village such as- Danglat, Khoraliang, Pomliang and Upper Trafragam. Village Yakungand and Tulangkunung practice lift irrigation. Village Sarti has check dams. There is a minor

irrigation channel in village Nukung. Some villages in upper valley stated that they did not need irrigation, although a number of minor irrigation projects had been introduced in Lohit district by the government.

Table 6.1. Status of Socio-economic welfare

DISTRICT	LOHIT	Name of the Circles	Name of the Villages (Five each)	No. of houses	Populati on	Occupation	PHC/S HC/CH C/ HC
		DISTRICT	LOHIT	1. Namsai	Lathaw	325	1865
Manmaw	145				856	Farming/ govt.service	NA
Sulongtoo	67				508	Farming/ govt.service	NA
Sengchap	85				686	Farming/ govt.service	NA
Nanam	64				300	Farming/ govt.service	NA
2. Chongkham	Chongkham			267	1056	Farming/ govt.service	PHC
	Empong			34	100	Farming/ govt.service	NA
	Emphum			28	96	Farming/ govt.service	NA
	Nalung			38	128	Farming/ govt.service	NA

		Momong	83	220	Farming/ govt.service	NA
	3. Piyong	Wingko	67	156	Farming/ govt.service	NA
		Nongtaw	35	28	Farming/ govt.service	NA
		Dayun	103	360	Poultry/farming/ govt.service	NA
		Namong	103	283	Farming/ govt.service	NA
		Piyong	50	140	Farming/ govt.service	PHC
	4. Lekang	Dirak miri	80	620	Poultry/farming/ govt.service	NA
		Mahadevpu r	215	1528	Poultry/farming/ /govt.service	PHC
		Dharampur	18	145	Poultry/piggery/far ming/ govt.service	NA
		Silatoo Khampti	24	190	Farming/ govt.service	NA
		New Mohong	34	208	Farming/ govt.service	PHC
		Medu	106	790	Poultry, farming/ /govt.service	Dispens ery

	5. Wakro	Wakro	143	838	Poultry/farming/ /govt.service	PHC
		Pukhuri	28	160	Poultry/farming/ /govt.service	NA
		Mawai	19	96	Poultry/farming/ /govt.service	NA
		Kamlang	69	345	Poultry/farming/ /govt.service	NA
	6. Tezu	Teluliang	219	1105	Poultry, farming.	NA
		Tafrogam	185	1210	Poultry/farming/ /govt.service	SHC
		Pompliang	178	890	Poultry/farming/ /govt.service	NA
		Danglat	126	536	Poultry/farming/ /govt.service	NA
		Loiliang	255	1530	Farming/ cultivation	PHC
		7. Sunpura	Chaliang(19 th Mile}	23	125	Poultry/farming/ /govt.service
	Chailiang(20 th Mile)		41	258	Poultry/farming/ /govt.service	NA
	Hatiduba		25	217	Poultry/farming/ /govt.service	NA
	Yealiang		72	388	Farmer, Labour.	NA

		Paya	6	40	Poultry/farming/La bour	NA
ANJAW	1. Hayuliang	Chamelang	28	180	Piggery/labour/far mer govt.service	SHC
		Yatong	38	1167	Piggery/labour/far mer govt.service	NA
		Amliang	45	1156	Piggery/labour/far mer govt.service	NA
		Pekiang	32	675	Piggery/labour/far mer govt.service	NA
		Sang	19	354	Piggery/labour/far mer govt.service	NA
	2. Goiliang	Goliang	11	69	Piggery/labour/far mer govt.service	NA
		Sarti	23	103	Piggery/labour/far mer govt.service	NA
		Liongti	13	198	Piggery/labour/far mer govt.service	NA
	3. Manchal	Undam	15	156	Govt. service, farming.	NA
		Tilla/ Quibang	8	50	Poultry, farming.	NA
Manjulang		15	147	Animal Husbandry, cultivation. Selling livestock	NA	

		Hayam	10	55	Poultry, Farming.	NA
		Manchal	9	156	Cultivation, Govt. service	NA
	4. Chaglaga m	Sang	18	102	Piggery/labour/far mer govt.service	PHC
		Chagla	25	143	Animal Husbandry, cultivation. Selling livestock, Govt. service	NA
		Tayeng	14	98	Piggery/labour/far mer govt.service	NA
		Kholiang	9	34	Piggery/labour/far mer govt.service	NA
	5. Hawaii	Samdul	4	32	Cultivation	NA
		Khyong	4	20	Poultry.	PHC
		Sanglang	10	85	Poultry, Farming.	NA
		Shirong	5	27	Cultivation	NA
		Nukung	6	58	Poultry, Farming	NA
	6. Walong	Sarti	7	76	Cultivation	NA
		Yasong	3	29	Farming	NA
		Kalin	5	35	Farming	NA
		Bhaliang	6	62	Poultry, Farming.	NA
		Khalmti	6	41	Poultry, Farming	NA

	7.	Yakung	12	64	Labour, farming/ Yak rearing/govt.service	NA
		Kibithoo	8	58	Labour, farming, yak rearing, / govt.service	NA
		Kibithoo	12	64	Labour, farming, yak rearing, / govt.service	NA

NA= Not available

- where there is no medical or health centers, medication facilities are provided by the members of Angan wadi.

6.2. Community structure and dynamics of major tribal groups across the study sites

Like any first human being on the earth, the indigenous tribes' belief is guided by some myths and legends. The legends and myths governs every aspect of their belief. The myths guide the religious mind set and the legends give sanction to the religious activities. It explained the sacred occasion, the clan, the village and all other conditions and situations which satiate the mind of the indigenous tribes and their belief. The myths pertaining to the origin of these tribes along with their life form, culture and belief which have transformed and govern the every life aspects is presented in (**Table 6.2**).

Their cultural and social activities are displayed in **Table 6.2 & Photo Plate 7 and Plate 8**.

Table 6.2: Community structure and dynamics of major tribal groups across the study sites

Major Tribes	Khampti	Singpho	Mishmi		
			Kmaan (Digaroo)	Taroan (Miju)	Idu (Chulikata)
Population	18,697	10,659	23,995		
Distribution of each tribe (circles)	Namsai, Chongkham, Piyong, Sunpura and Lekang.	Namsai, Wakro, Piyong, Lekang and majority are spreaded in Namsang (changlang district).	Tezu, Sunpura, Wakro, Hawai, Hayuliang, Goiliang, Manchal, Walong and Kibithoo Tezu, Sunpura, Wakro, Hayuliag, Chaglagam.	Tezu of Lohit district and whole of Dibang Valley, Upper portion of L/dibang valley, some portion of Siang District.	
Language/Dialect.		Sinpho	Digaroo	Miju	Idu
Housing pattern	Constructed in a cluster of huts but raised at least 2m above the ground to avoid flood water, side wall and floor is made of Bamboo, roof is usually design in circular-conical fashion which is covered with leaves of <i>Impereta cylidrica</i> , <i>Livistonia jenkinsiana(Toko)</i> , and <i>alamus</i>		House constructions are elongated and raised 1m above the ground to raise Pigs, side walls are and floor is of Bamboo, the roof is of chiefly of Hey and leaves of <i>Impereta cylidrica</i> , <i>Livistonia jenkinsiana</i> (Toko), hardwoods are <i>Morus laevigata</i> (Bola), <i>Dalbergia sisoo</i> (sisoo) or <i>Cedrus deodur</i> and Pine (alpine regions). Modern houses (pucca and RCC) are also constructed.		

	<p><i>erectus</i> while bases are supported by hardwood of <i>Morus laevigata</i> (Bola), modern houses (pucca and RCC) are also constructed.</p>	
<p>Clan/sub clan or social division</p>	<p>Khampti & Singphos are Divided into classes having distinct social status. Chieftain system setup and follow patriarchal family norms. Chief is known as Aw in Tai means king with influential quality. Priests who are second to the chief in rank are also very influential, below them there are classes of freeman who form the bulk of the population. Slaves of the past are at the bottom of the social structure. Polygamy is also recognized in Khampti society. The first wife usually enjoys higher status over others wives in the family.</p>	<p>Clans are existing within the three mishmi tribes. Titles and priesthood are mostly followed. Polygamy is recognized in Mishmi society. The first wife usually enjoys higher status over others wives in the family.</p>
<p>Religion and belief</p>	<p>Theravada Buddhism i. Theravada Buddhism, However, few Singphos do</p>	<p>i. Animism, ii. Naturalism iii. Taboo & iv. Polytheism</p>

	follow Animism.		Idu Mishmis are similar to the Digaroo Mishmis but some follow Christianity	
Inheritance of property	Patriarchal, oldest male member is the head of the family, agnatic descent, the male inherits all the properties and in absence of male child, female child gets the benefit.		Patrilineal and patriarchal, oldest male member is the head of the family, having an agnatic descent, the male inherits all the properties.	
Marriage system	Marriage between people of same status takes place, dowry system is prevalent, marriage usually monogamous. The tribal endogamy and clan exogamy are two basic principles in establishing marital ties in the Khampti society.	Marriage is usually monogamous though polygamy is also common, no dowry system	The Mishmis follow monogamy though polygamy was prevalent earlier. However, they practices the Levirate and surrogate forms of union too. When the husband dies the widow is free to marry the brother of her deceased husband. If the widow does not want to marry her brother-in-law, she is free to marry any parallel cousin of the deceased husband. In case of the widower, he is free to marry the sister of his deceased wife but,	Similar to the Digaroo Mishmis

	<p>Marriage is universal and cross-cousin marriage is the preferential mode and usually first preference is given to ego's MBD (mother's brother's daughter).</p> <p>When bride is selected HO KAA (bride price) has to be paid to her parents about which there are prescribed norm in THAMA SAT (law book of the Khamptis).</p>		<p>it is not compulsory. He is free to choose his partner. Nevertheless, it is conceived by the in-laws that he be provided a surrogate in case of such eventuality purely on obligatory intensions.</p> <p>Like any other society there are numerous ways of acquiring mates in the Mishmi society.</p>	
Agriculture	Subsistence type, Cultivate	Jhum and terrace	The Mishmi tribes practices the shifting cultivation or the Jhum as plain land is not	

	<p>maize, finger millet, legumes, <i>colocasia</i>, tapioca and legumes, apart from cultivating rice in <i>Jhum</i> land for the food security, the major parts cultivable land is usually brought under wet rice cultivation and earn substantial grain for trading in local market apart from self consumption.</p>	<p>cultivation. Fishing and hunting besides operating timber and logging for commercial scale.</p>	<p>available for the wet rice cultivation, they cultivate on some patches, flung here and there all around the hill. However, Idu Mishmis have a plain area and they practice low land cultivation.</p>
Crops grown	<p>Rice, Maize, Pumpkin, Ginger, Peas, Sweet Potato, Yam, Mustard plants, tomato cucumber. Revenue plants are tea, oranges and turmeric.</p>		<p>Maize, Hill Rice, Bajra, Jowar, Ragi, Millets, Orange, Large Cardamom, Banana & Opium. The Mishmis largely cultivate opium for their market revenue.</p>
Use of	<p>Pig excreta, poultry dropping,</p>		<p>Pig excreta, poultry dropping, cow dung, Rice</p>

manure	cow dung, Rice husks, Waste product of local beer, ashes from household burnt, remains of burnt straw, decomposed straw, weeds and stalks.	husks, Waste product of local beer, ashes from household burnt, remains of burnt straw, decomposed straw, weeds and stalks
Implements used	Khampti mit (dao), the agricultural implements such as plough, Hedges, etc. They are good artisans and also works in gold, silver, iron to forge their own weapons.	All the Mishmis use (dao), axe, silver, iron, and also forge their own weapons through woods and natural resources.
Animal husbandry	Khampties rears Elephant, Buffalo, cow, pig, poultry while the Singphos rear Mithun, cow, pig, poultry.	Mithun, cow, Bullock, poultry, Pig & Goat are reared by the Mishmis.
Custom related to animal	Due to Buddhist influence there is no custom relating animal sacrifices among Khampties and Singphos	No marriage, no ritual is complete without the sacrifice or gifting and counter-gifting of the Mithuns and Livestocks. These are required by the Mishmis throughout life time. The religion, custom and the tradition of Mishmis are centred around the Mithun, cow and bull, pig and chicken.
Handicrafts	Confined to the limited use of bamboo, cane and wooden articles. Women are skillful weavers.	All Mishmis are an expert in bamboo-works, matting, basketry, weaving and spinning Different types of Bamboos are used for different objects. Some of the important objects

		manufactured manually by these people with very simple tools.
Ethnic and linguistic affinities	Own distinct script supported by Tai script, closely resembles the northern Shan group of languages, manifest predominantly Mongoloid traits in their physical features.	Mongoloid traits in their physical features.
Literature	Khamptis and Singphos have a rich tradition of written literature. Volumes of taxes all in the form of manuscripts including Abhidhamma, Vijaya and Sutta Pitatakas illustrated manuscripts on havens and ghostly worlds, hand books on tenets and principle of Theravada Buddhism, historical works, Jataka and others tales, some of the household process literature on medicine. The khampti's have a chronicle – 'CHETIYU' similar to 'Ahom buranji', in which their mythical	Due to lack of script the Mishmi dialects did not flourish and no concrete documentation has come up nor could be made. However, the people used figures, signs, etc to denote certain things or objects, used especially in rituals. The most popular one which exists even today is the 'krap'. Krap is a small bunch of long white thread having knots at regular intervals, made by tying it from one end to other. Each knot of the 'krap' represents a day. Krap can be called some kind of calendar. This usually given as alternate to the invitation card in absence of scripts during the rituals. Each day a knot is cut and thrown to the fire to remember the exact date and the last knot will indicate the day of start of the ritual.

	<p>origin, some of past events, their past seats of settlement have been recorded. The Khamptis like other Shaan tribes copy the old taxes and thus have the tradition to keep up the texts through centuries. Khamptis also poems on different themes. The tune of love, romance, patriotism, heroism can be traced in the songs. However most of the poems are composed describing the events in Lord Buddha's life.</p>	
--	--	--

6.3. Documentation of NTFPS

Non timber forest products (NTFPs) which are also termed as special forest products, non-wood forest as Minor forest products, are economically and environmentally important world wide. They include all non-timber products which are extracted from the forest human consumption. NTFP's comprised of fruits, berries, nuts, species, medicinal plants, firewood, fodder, honey, mushroom, resin, other floral products, and dyeing materials and recreation. Traditional knowledge of herbal dyes and dyeing are facing threats from synthetic dyes and acculturation (Terong, R & Borthakur, S. K., 2004). Deb *et al*, 2009, while studying the Nyishi ethnic community of Arunachal Pradesh reported that a large number of traditional crops grown in agro-forestry are valuable for the farmers' everyday life, as they provide a greater diversity of food and also act as a good source of commercial outlets in addition to household consumption. They also reported the importance of plant species like bamboo, *Areca catechu* and *Livistonia jenkinsiana* that are useful for fencing, craft making, house construction and valued for traditional worship as they are associated with ancestral sacrifices

The multi-ethnic tribes residing in the study area are entirely dependent upon their natural bio-diversity for extraction of varied NTFPs for subsistence economy living. Bamboos are extensively used for bringing water from rivulets in steep valleys of Anjaw Districts as storing vessels, making useful crafts such as hand combs, baskets, bows and arrows, Bamboos also play an important role in construction of houses. The floors and walls are plaited out of bamboo. And above all young shoots of bamboos are favorite edible household food items both as fermented and raw. The most commonly extracted NTFPs from the primary/ secondary forests are documented below:-

6.3.i. Collection of wild vegetables

A large number of plant species are collected from the surrounding forests as

housing materials and fuel wood with some other minor products (NTFPs) like vegetable, medicinal plants, mushrooms etc to meet their daily household items and for monetary income. Wild vegetables are immensely important to the forest dwelling ethnic people to serve as a source of protective nutrients, especially, vitamins, minerals, dietary fibers and folic acid. Wild vegetables are rich source of calcium, phosphorus and iron (Chandola, 2004). Wild vegetables play a unique role in nutritional need of the Khampti, Singphos and the Mishmis and help them to cope up with the extreme condition of the hilly environment.

Some commonly collected wild vegetables used by the major tribes of the Lohit and Anjaw district is given below with their local name, botanical name, habitat, plant part use and uses (**Table 6.3**).

Table 6.3. Commonly consumed wild vegetables of the ethnic tribes

S.No	Local Name	Botanical Name/Family	Habitat	Plant Part used	Uses
1.	K- Moon heuo, M-Teleng	<i>Alpinia allughas</i>	Marshy land and in wild	Young central cortex of the stem	Used as vegetables
2.	K- Pulum, M-Khunancha	<i>Amaranthus viridis</i>	Secondary forests, cultivated land Hill rides	Young shoots and leaves	Young shoots are boiled and used as vegetables. While leaves acts against constipation.
3.	K-Maisang, M-Apachu	<i>Bambusa balcooa</i>	Foot hill slopes	Young shoots	Young shoots are eaten fresh or fermented (for long term consumption) by boiling/frying.
4.	K-moon, M-Bekpenem	<i>Calamus tenuis.</i>	Wild	Young central cortex of stem	Used as vegetables
5.	K-Patakhai, M-Pakhum	<i>Chlerodendrum colebrookianum.</i>	Wild	Young shoots and leaves	Leaves is boiled and eaten as vegetable. Young shoots are used against high blood pressure.
6.	K- Mon, M- Haiwa	<i>Colocasia esculenta</i>	Road side and Forest	Young leaves and petioles	Young leaves and petiole are boiled as vegetables. Leaves acts as purifier.
7.	K- raidand	<i>Calamus erectus</i>	Wild	Young central cortex of the stem	Used as vegetables
8.	K- Moon	<i>Calamus rotang</i>	Wild	Young central cortex of the stem	Used as vegetables
9.	K- Pukut M- Kajingna	<i>Diplazium esculentus</i>	Wild and wasteland	Young fonds	Used as vegetable
10.	M- pushing	<i>Elatostema platyphyllum</i>	Wild	Shoots and leaves	Used as vegetable

11.	K- mahaw As/ M- Thekera	<i>Garcinia pedunculata</i>	Wild	Dried Fruit	Used as sour soup and consumed during Dysentery
12.	K-Maksann As/M- O tenga	<i>Dillenia indica</i>	Wild and Cultivated	Fruit	Young are consumed as vegetable and it is used to cure Dysentery
13.	K- Kol dil M- Tapo	<i>Musa balbisiana</i>	Home gardens/ wild	Spadix	Used as vegetable
14.	K- Koe M- Kamoo	<i>Musa ornate</i>	Wild	Spadix	Used as vegetable
15.	K- Koe M- Kamoo	<i>Musa velotina</i>	Wild	Spadix	Used as vegetable
16.	K-patphaii	<i>Piper sylviticum</i>	Wild	Young leaves	Used as vegetable
17.	K-ya shom	<i>Polygonum chinensis</i>	Road side	Young leaves	Used as vegetable
18.	M-seteka	<i>Solanum indicum</i>	Wild/ cultivated	Fruit	Used as vegetable
19.	K- Piti pen M- Kana	<i>Solanum nigrum</i>	Wild/secondar y forest	Young leaves	Used as vegetable
20.	K- ya kheu Mong	<i>Spilenthus acmella</i>	Wild/ secondary forest	Young leaves and flower heads	Used as vegetable, used as anti tooth ache.
21.	K- makat M- manjang	<i>Zanthoxylum oxyphyllum.</i>	Wild	Young leaves	Used as vegetable
22.	K- Kalmausak	<i>Ipomoea aquatica</i>	Wild	Whole plants	Used as vegetable
23.	S- M- Pankholap	<i>Polygonum perfoliatum</i>	Wild/ secondary forest	Leaves and stem	Vegetables
24.	K-Panang	<i>Centella asiatica</i>	Field/ secondary forest	Whole plant	Vegetable & salad
25.	K- Maisang	<i>Dendrocalamus hamiltonii</i>	Wild/ secondary forest	Shoot	Vegetable, pickle and fermentative product.

6.3.ii. Plants used for thatching:

The ethnic tribes have been using varied plant parts for making roofing materials since time immemorial. Some commonly encountered plants are listed as *Caryota urens* L., *Daemonorops jeinkinsianum* Roxb., *Ensete glaucum* Roxb., *Livistona jeinkinsiana* Griff., *Imperata cylindrica* L., *Musa* spp, *Phrynium capitatum* Willd., *Phrynium imbricatum* Roxb., *Phyllostachys bambusoides* Seib. and Zucc, *saccharum spontaneum* L., *Wallichia distichia* T. Andres.

6.3.iii. Plants Used for broom making:

The wild plants used for brooming purposes are *Dendrocalamus* spp., *Calamus* spp., *Caryota urens* L., *Imperata cylindrica* L., *Livistona jeinkinsiana* Griff., *Sida*

acuta burm.f., *Sida rhombifolia* L., *Saccharum spontaneum* L., *Wallici* spp.,

6.4. Medicinal Plants

State of Arunachal Pradesh has a good resources of medicinal plants with an occurrence of over 500 species belonging to various system of medicines. These medicinal wealth are under the state of utilization in different local ways and trade through traders from others parts of the country. However, the systematic management by the involvment of Government and Non-government organizations is still a lacuna in the system. Valuable Medicinal plants such as *Aconitum* spp. & *Coptis teeta*, *Swertia chirayita*, *Taxus baccata*, *Picrorrhiza kurrora*, *Valeriana wallichii*, *Rubia cordifolia*, *Aquilaria agallocha* and *Oroxylum indicum* are frequently being extracted from the forest of different part of the state. State as whole including local people are deprived from the benefit on such valuable wealth. District of Dibang valley is having high potential of *Embelia ribes* whose roots as well as fruits are largely used in variuos ayurvedic formulations, may give better oppurtunity for systematic utilization of *Embelia ribes*. In the same way, systematic propagation of *Piper longum*, *Piper nigrum*, *Piper mullesus*, *Tinospora cordifolia*, *Solanum nigrum*, *Phyllanthus amarus*, *Asparagus racemosus*, *Rouvolfia serpentine* and *Andrographis paniculata* all of which are lower altitude plants like annual or perinneal herbs may be adopted as revenue generating medicinal plants in the foot hill area of the state. Side by side tree species of *Aegle mermelos* and *Saraca asoca* may be selected for the drug. Cultivation of *Picrorrhiza kurroa*, *Swertia chirayita*, *Valeriana wallichii* and *Rubia cordifolia* as herb and *Berberis aristata*, *Embelia ribes* and *Zanthoxylum alatum* as shrub and tree species may be adopted in the high altitudinal hills. Cultivation of *Illicium graffithi*, and *Taxus baccata* in alpine forest as tree species and *Copis teeta* and *Paris polyphyla* as herb is an urgent need of time.

Millions of people throughout the world traditionally make use of natural or

herbal remedy for their primary health care since time immemorial. In fact, these natural products are readily available, environment friendly, cheap and without any side effects. Even now, many of the remote areas of south-east Asia barely have been touched by 'modern' medicine; western health care provision is beyond the reach of many rural people, for whom traveling to urban centers for treatment is difficult, time consuming and costly (Young *et al.*, 1988). Traditional medicine on the other hand, because of its decentralized nature, is generally easy and quickly available (Elliot *et al.*, 1986). Yet again, in recent years, there has been a growth of interest on traditional natural medicines in part driven by the interests in complementary medicine in industrial countries and in part resulting from the interests of the international pharmaceutical industry (Bodekar *et al.*, 1997).

The tribal people live at different economic levels, from food gathering and hunting through shifting cultivation to settled agriculture. They live in hills and dense forests, in a close-knit and self-sufficient communities often isolated from communication routes and from any significant developments in the country.

The present study site is a less explored by researchers, comprises of remote and rich and luxuriant forest. The people largely depend upon the surrounding forests for almost all their daily needs. It becomes an arduous and at times dangerous task requiring time and tact to seek out the way of their lives, customs and culture and the mode of using plants for their day to day needs not only in health but also in illness and every ceremony of these ethnic groups. It is now generally recognized in many parts of the world that ethno botany is an interdisciplinary science which requires the study of the primitive people and the plants of their environment. It is only possible by an on the spot study of the in their natural habits so as to understand the traditional knowledge behind the use and utilization of the varied herbal treatments through the use of medicinal plants by the different ethnic communities living in this less accessible

districts of Lohit and Anjaw in Arunachal Pradesh.

Notwithstanding, inventory of medicinal plants is a large task given the location constraints of the study area and reserved nature of the ethnic communities residing there in. From the previous chapter it becomes evident that the land which lacks exploration and is luxuriant with diverse medicinal plants and NTFP's, minerals etc, needs an ardent scientific study and documentation.

With the above phytogeographical, boicultural and ethnobotanical background, and being a descendant of this less explored region which is bestowed with rich biodiversity, is expected to bring out some useful information based on varied ethno medicinal plant species used by the different tribes inhabiting the two selected districts of Arunachal Pradesh. Although some of the plants used by these tribes might have been reported in elsewhere ethno botanical literature and in some global *materia medica* (Khamptis and Mishmis), but certain modes and applications of the use and diversity distributions of ethno medicinal plants has been less worked on or documented till date. There are many plants which are encountered frequently but their value not put forwarded yet. Few rare plants could remain unreported regarding their uses in the scientific literature. Above all, there is no reliable modern literature on utilization of medicinal plants amongst these tribes of Arunachal Pradesh, except few publications appeared on ethnobotany of *Thai Ahom* of Assam in some journals as mentioned above. Further more, the present work come across with multi-ethnic communities residing in the study site and so a cross-cultural approach has also been documented which would add to prove a boon to the next generation.

The collected plants were consulted using the taxonomic literatures, such as the Floras of Assam, Jewels of India, Flora of India, journal While the botanical nomenclature is based on Latinized names for plant taxa and follows rules established by the International Code of Botanical Nomenclature (Greuter *et al.*, 2000, adopted in

16th IBC Saint Louis 1999). The purpose of the Code is to regulate and maintain the usage of scientific plant names and promote nomenclatural stability. Each taxon has only one correct scientific name. This name consists of three or four parts: the genus, the specific epithet, and the full or abbreviated name of the author (s) who originally described the plant or who later made changes in the plant's classification. The genus and specific epithet together constitute the scientific name; both parts are italicized. The first letter of the genus is uppercase, but the specific epithet is entirely lowercase. Principle of priority was strictly followed as per recent ICBN rules in case of more than one scientific name encountered and available published literature sources on particular taxa were consulted to prove the author who emended the name and synonyms are provided after name in current use (NCU). An author's name placed in parentheses represents the original author. The name following the parentheses is the person(s) who changed the taxon's classification [e.g., *Castanea pumila* (L.) P. Miller]. Carl Linnaeus was the original author for *Castanea pumila*; however, P. Miller changed the name (imended) and such species are known as emendavit species.

Scientific names change for many reasons, but mainly because a taxon has been reclassified or an older, validly published name is rediscovered. However, the best sources of nomenclatural changes followed are recent ICBN Saint Louis Code edited by Greuter *et al.*, (2000). The well known authors name were written in abbreviated form while the name of recent author were written in full form which are in accordance with ICBN St. Louis Code 2000. Beside ICBN 2000 Code, International Plant Nomenclatural Index (IPNI) with most up to date and best reference reflecting recent nomenclatural changes was consulted. Family arrangement and systematic position of genus is as per Bentham and Hooker's *Genera Plantarum* (1862) *Natural System of Classification* with slight modification done by Hutchinson (1926), & Cronquist (1968), Takhtajan (1967), recent *Flora of India* and *Flora of China* series (1993-2000) were

consulted.

With this research work with a collected species of 272 locally used or applied traditional plant (refer chapter-5), we proposed to mark a catalogue of the medicinal plants which appear in Basic taxas and of different thors, classifying the drugs according to its properties and medicinal use and this can be on the later phase worked on for pharmacology properties.

There are very mere documentation on the subjects on traditional drugs, whereas, to make a study which would verify the most useful drugs, it would be neccessery to publish and hemlet all pharma copies and treatises which needs an urgent preservation at the present time. Until now only a small part of these wales leaves been published and translated, although the inmesour majority at present in manuscript, thus unedited.

6.5. Quantity analysis of data (Density, abundance, frequency and IVI)

Life on earth is being processed as it runs with the biological cycle and is alive due to the beautiful magic of biodiversity, which refers to variety within the living world. This infact proves the Darwin's natural selection on life, where the best evoled new species fights the odd to move on successfully to prevail upon the fragile species.

Diversity comprises of two distict aspects namely, species richness and evenness. Species richness refers to the number of species per unit area, and evenness refers to their abundance, dominance or spatial distribution. The focus of biodiversity measurement is typically the species, because they are easily observed and mostly used in the studies of forest ecosystems (Barnes et al., 1998).

Density, abundance, frequency and IVI analysis of Lohit and Anjaw districts are presented in table **6.4(a)**. and **6.4(b)** respectively.

Table 6.4(a). Species diversity (with spl. reference to medicinal plants) in Lohit district

S.No	Plant name	LF	A	F	RD	IVI	H'	D	E	A/F ratio
1	<i>Papaver somniferum</i>	H	2.43	70	1.68	5.10	0.069	0.00029	0.017	0.035
2	<i>Arenaria orbiculata</i>	H	2.00	70	1.39	4.47	0.063	0.00022	0.019	0.029
3	<i>Drymaria diandra</i>	H	1.70	100	1.68	5.21	0.070	0.00030	0.022	0.017
4	<i>Portulaca oleracea</i>	H	1.67	60	0.99	3.60	0.053	0.00014	0.016	0.028
5	<i>Portulaca tuberosa</i>	H	1.38	80	1.09	3.92	0.057	0.00017	0.017	0.017
6	<i>Sida accuta</i>	H	2.10	100	2.08	5.91	0.077	0.00039	0.024	0.021
7	<i>Urina lobata</i>	H	1.40	50	0.69	2.88	0.045	0.00009	0.014	0.028
8	<i>Abelmoschus esculentus</i>	H	2.87	60	2.48	7.00	0.088	0.00054	0.027	0.069
9	<i>Corchorus olitorius</i>	H	1.78	90	1.59	4.95	0.068	0.00027	0.021	0.020
10	<i>Triumfetta rhomboidea</i>	H	2.00	100	1.98	5.73	0.076	0.00037	0.023	0.020
11	<i>Impatiens balsamina</i>	H	2.38	80	1.88	5.48	0.073	0.00033	0.022	0.030
12	<i>Oxalis griffithi</i>	H	3.67	90	3.27	8.07	0.097	0.00072	0.030	0.041
13	<i>Acacia ceasia</i>	H	1.80	90	1.78	5.38	0.072	0.00032	0.022	0.018
14	<i>Entada phaseoloides</i>	H	1.57	70	1.09	3.85	0.056	0.00016	0.017	0.022
15	<i>Mimosa pudica</i>	H	2.43	70	1.68	5.10	0.069	0.00029	0.021	0.035
16	<i>Kalanchoe pinnata</i>	H	1.80	50	0.89	3.38	0.051	0.00013	0.016	0.036
17	<i>Begonia arborensis</i>	H	1.88	80	1.49	4.70	0.065	0.00025	0.020	0.023
18	<i>Begonia roxburghii</i>	H	1.71	70	1.19	4.06	0.058	0.00018	0.018	0.024
19	<i>Centella asiatica</i>	H	5.70	100	5.65	12.23	0.130	0.00166	0.040	0.057
20	<i>Hydrocotyle sibthorpioides</i>	H	1.88	80	1.49	4.70	0.065	0.00025	0.020	0.023
21	<i>Oenanthe javanica</i>	H	1.78	90	1.59	4.95	0.068	0.00027	0.021	0.020
22	<i>Ageratum conyzoides</i>	H	3.50	100	3.47	8.37	0.100	0.00078	0.031	0.035
23	<i>Dichrocephala integeifolia</i>	H	1.57	70	1.09	3.85	0.056	0.00016	0.017	0.022
24	<i>Blumea mysiocephala</i>	H	1.50	100	1.49	4.86	0.067	0.00026	0.020	0.015
25	<i>Blumea fistulosa</i>	H	1.17	60	0.69	2.92	0.045	0.00009	0.014	0.019
26	<i>Xanthium indicum</i>	H	2.57	70	1.78	5.31	0.071	0.00031	0.022	0.037
27	<i>Ecliptica prostrate</i>	H	2.71	70	1.88	5.51	0.073	0.00034	0.023	0.039
28	<i>Spilanthes paniculata</i>	H	3.50	60	2.08	6.09	0.079	0.00041	0.024	0.058
29	<i>Bidens pilosa</i>	H	2.11	90	1.88	5.50	0.073	0.00034	0.022	0.023
30	<i>Artimisia nilaginica</i>	H	2.88	80	2.28	6.26	0.081	0.00043	0.025	0.036

31	<i>Gynura angulosa</i>	H	2.44	90	2.18	6.05	0.079	0.00041	0.024	0.027
32	<i>Calendula officinalis</i>	H	2.10	100	2.08	5.91	0.077	0.00039	0.024	0.021
33	<i>Lectuca gracilis</i>	H	2.50	80	1.98	5.67	0.075	0.00036	0.023	0.031
34	<i>Sonchus arvensis</i>	H	2.20	100	2.18	6.09	0.079	0.00041	0.024	0.022
35	<i>Tagetes erecta</i>	H	2.38	80	1.88	5.48	0.073	0.00033	0.022	0.030
36	<i>Plumbago zeylamica</i>	H	2.44	90	2.18	6.05	0.079	0.00041	0.024	0.027
37	<i>Plumbago nosea</i>	H	2.33	90	2.08	5.87	0.077	0.00038	0.024	0.026
38	<i>Embelia ribes</i>	H	2.00	100	1.98	5.73	0.076	0.00037	0.023	0.020
39	<i>Ardisia pedunculosa</i>	H	2.00	70	1.39	4.47	0.063	0.00022	0.019	0.029
40	<i>Nyethanthes arbor-tristis</i>	H	2.14	70	1.49	4.68	0.065	0.00024	0.020	0.031
41	<i>Otea polygama</i>	H	2.38	80	1.88	5.48	0.073	0.00033	0.022	0.030
42	<i>Cathoranthus roseus</i>	H	2.11	90	1.88	5.50	0.073	0.00034	0.022	0.023
43	<i>Heliotropium indicum</i>	H	1.50	80	1.19	4.11	0.059	0.00019	0.018	0.019
44	<i>Solanum violaceum</i>	H	2.57	70	1.78	5.31	0.071	0.00031	0.022	0.037
45	<i>Solanum ferox</i>	H	1.33	60	0.79	3.15	0.048	0.00011	0.015	0.022
46	<i>Solanum torvum</i>	H	1.63	80	1.29	4.31	0.061	0.00021	0.019	0.020
47	<i>Withania somnifera</i>	H	1.57	70	1.09	3.85	0.056	0.00016	0.017	0.022
48	<i>Datura stramonium</i>	H	1.71	70	1.19	4.06	0.058	0.00018	0.018	0.024
49	<i>Sesamum orientale</i>	H	2.86	70	1.98	5.72	0.076	0.00036	0.023	0.041
50	<i>Eranthemum palatiferum</i>	H	2.00	70	1.39	4.47	0.063	0.00022	0.019	0.029
51	<i>Phlogocanthus thyrsoiflorus</i>	H	2.50	60	1.49	4.73	0.065	0.00025	0.020	0.042
52	<i>Justica jadarussa</i>	H	2.29	70	1.59	4.89	0.067	0.00027	0.021	0.033
53	<i>Staclytarpheta jamicensis</i>	H	1.75	40	0.69	2.92	0.045	0.00009	0.014	0.044
54	<i>Verbena officinalis</i>	H	2.33	60	1.39	4.51	0.063	0.00023	0.019	0.039
55	<i>Datura stramonium</i> L.	H	2.00	50	0.99	3.63	0.053	0.00015	0.016	0.040
56	<i>Nicotiana tabacum</i> L.	H	2.33	60	1.39	4.51	0.063	0.00023	0.019	0.039
57	<i>Torenia asiatica</i> L.	H	2.40	50	1.19	4.14	0.059	0.00019	0.018	0.048
58	<i>Bonnaya reptans</i> Spreng	H	1.50	60	0.89	3.37	0.050	0.00013	0.015	0.025
59	<i>Scoparia dulcis</i> L.	H	2.75	80	2.18	6.06	0.079	0.00041	0.024	0.034
60	<i>Hibiscus syriacus</i>	S	2.11	90	6.93	16.56	0.160	0.00305	0.047	0.023
61	<i>Citrus limon</i>	S	1.80	100	6.57	16.10	0.157	0.00288	0.046	0.018
62	<i>Hibiscus sinensis</i>	S	1.86	70	4.74	12.70	0.134	0.00179	0.039	0.027
63	<i>Murraya paniculata</i>	S	1.25	40	1.82	6.77	0.086	0.00051	0.025	0.031
64	<i>Murraya koenigii</i>	S	1.00	80	2.92	9.60	0.110	0.00102	0.032	0.013

65	<i>Zanthroxylum accanthopodium</i>	S	1.83	60	4.01	11.35	0.124	0.00143	0.036	0.031
66	<i>zanthroxylum nitidum</i>	S	1.25	40	1.82	6.77	0.086	0.00051	0.025	0.031
67	<i>Ziziphus oenoplia</i>	S	1.43	70	3.65	10.68	0.119	0.00127	0.035	0.020
68	<i>Ziziphus mauritiana</i>	S	1.67	60	3.65	10.62	0.118	0.00125	0.035	0.028
69	<i>Cassia accidentalis</i>	S	1.40	50	2.55	8.39	0.100	0.00078	0.029	0.028
70	<i>Cassia alata</i>	S	1.29	70	3.28	10.01	0.113	0.00111	0.033	0.018
71	<i>Mezonevron cucullatum</i>	S	1.67	30	1.82	7.10	0.089	0.00056	0.026	0.056
72	<i>Melastoma malabatricum</i>	S	1.25	80	3.65	10.87	0.120	0.00131	0.035	0.016
73	<i>Osbekia repalensis</i>	S	1.40	50	2.55	8.39	0.100	0.00078	0.029	0.028
74	<i>Lagerstroemia India</i>	S	1.67	60	3.65	10.62	0.118	0.00125	0.035	0.028
75	<i>Punica granatum</i>	S	1.60	50	2.92	9.18	0.107	0.00094	0.031	0.032
76	<i>Carica papaya</i>	S	1.50	60	3.28	9.90	0.113	0.00109	0.033	0.025
77	<i>Schefflera venulosa</i>	S	1.60	50	2.92	9.18	0.107	0.00094	0.031	0.032
78	<i>Trevesia palmate</i>	S	2.33	30	2.55	9.25	0.107	0.00095	0.032	0.078
79	<i>Sumbucus hookeri</i>	S	1.20	50	2.19	7.60	0.093	0.00064	0.027	0.024
80	<i>Murssaenda roxburghii</i>	S	1.75	40	2.55	8.57	0.102	0.00082	0.030	0.044
81	<i>Rauvolfia densiflora</i>	S	1.80	50	3.28	9.98	0.113	0.00111	0.033	0.036
82	<i>Plumania acutifolia</i>	S	1.80	50	3.28	9.98	0.113	0.00111	0.033	0.036
83	<i>Tabernaemontana divaricata</i>	S	1.67	60	3.65	10.62	0.118	0.00125	0.035	0.028
84	<i>Nerium indicum</i>	S	1.50	60	3.28	9.90	0.113	0.00109	0.033	0.025
85	<i>Allamanda neriifolia</i>	S	1.20	50	2.19	7.60	0.093	0.00064	0.027	0.024
86	<i>Calotropis gigantean</i>	S	1.43	70	3.65	10.68	0.119	0.00127	0.035	0.020
87	<i>Adhatoda zeylanica</i>	S	1.20	50	2.19	7.60	0.093	0.00064	0.027	0.024
88	<i>Zantana indica</i>	S	1.67	60	3.65	10.62	0.118	0.00125	0.035	0.028
89	<i>Solanum torvum</i>	S	1.63	80	4.74	12.77	0.134	0.00181	0.039	0.020
90	<i>Cissampelos pareira</i>	C	1.25	40	1.36	5.51	0.073	0.00076	0.021	0.031
91	<i>Stephania glandulifera</i>	C	1.33	60	2.18	7.46	0.092	0.00139	0.026	0.022
92	<i>Parabaena sagittata</i>	C	2.00	50	2.72	8.66	0.102	0.00187	0.029	0.040
93	<i>Tinospora cordifolia</i>	C	1.50	80	3.27	9.83	0.112	0.00242	0.032	0.019
94	<i>Papaver somniferum</i>	C	1.43	70	2.72	8.67	0.102	0.00188	0.029	0.020
95	<i>Vitis barbata</i>	C	1.75	80	3.81	10.81	0.120	0.00292	0.034	0.022
96	<i>Tetrastigma serrulatum</i>	C	1.60	50	2.18	7.42	0.092	0.00138	0.026	0.032

97	<i>Cissus repens</i>	C	1.40	50	1.91	6.81	0.086	0.00116	0.025	0.028
98	<i>Tetrastigma lanceolarium</i>	C	1.50	40	1.63	6.21	0.080	0.00096	0.023	0.038
99	<i>Leea crispa</i>	C	1.67	60	2.72	8.58	0.102	0.00184	0.029	0.028
100	<i>Cordiospermum helicacatum</i>	C	2.00	80	4.36	11.78	0.127	0.00347	0.036	0.025
101	<i>Abrus precacoirias</i>	C	2.33	60	3.81	10.82	0.120	0.00293	0.034	0.039
102	<i>Mastersia assamica</i>	C	1.25	40	1.36	5.51	0.073	0.00076	0.021	0.031
103	<i>Quisqualis indica</i>	C	1.25	80	2.72	8.86	0.104	0.00196	0.030	0.016
104	<i>Adenia trilobata</i>	C	1.33	30	1.09	4.88	0.067	0.00060	0.019	0.044
105	<i>Momordica cochinchinensis</i>	C	2.22	90	5.45	13.75	0.141	0.00473	0.040	0.025
106	<i>Cocumis sativa</i>	C	1.80	100	4.90	12.98	0.136	0.00421	0.039	0.018
107	<i>Cucurbita maxima</i>	C	1.80	50	2.45	8.04	0.097	0.00162	0.028	0.036
108	<i>Hydyotis scandens</i>	C	1.25	40	1.36	5.51	0.073	0.00076	0.021	0.031
109	<i>Paedaria scandens</i>	C	1.67	30	1.36	5.73	0.076	0.00082	0.022	0.056
110	<i>Eupatorium odoratum</i>	C	2.78	90	6.81	16.07	0.157	0.00646	0.045	0.031
111	<i>Micania micrantha</i>	C	2.20	100	5.99	14.76	0.148	0.00545	0.042	0.022
112	<i>Parabarium micranthum</i>	C	1.20	50	1.63	6.19	0.080	0.00096	0.023	0.024
113	<i>Allamanda catharica</i>	C	1.75	40	1.91	6.91	0.087	0.00119	0.025	0.044
114	<i>Cryopopsis buchmanii</i>	C	1.50	60	2.45	8.02	0.097	0.00161	0.028	0.025
115	<i>Hemidesmus indicus</i>	C	1.60	50	2.18	7.42	0.092	0.00138	0.026	0.032
116	<i>Holostemma annulare</i>	C	1.38	80	3.00	9.35	0.108	0.00218	0.031	0.017
117	<i>Holarrhena pubescens</i>	C	1.67	60	2.72	8.58	0.102	0.00184	0.029	0.028
118	<i>Cordia diclotoma</i>	C	1.71	70	3.27	9.70	0.111	0.00235	0.032	0.024
119	<i>Argyrea nervosa</i>	C	1.25	40	1.36	5.51	0.073	0.00076	0.021	0.031
120	<i>Ipomoea aquatica</i>	C	2.44	90	5.99	14.68	0.148	0.00539	0.042	0.027
121	<i>Cuscuta reflexa</i>	C	4.50	60	7.36	18.09	0.169	0.00818	0.048	0.075
122	<i>Thunbergia grandiflora</i>	C	1.75	40	1.91	6.91	0.087	0.00119	0.025	0.044
123	<i>Dipterocarpus macrocarpus</i>	T	2.14	70	4.51	13.41	0.102	0.00184	0.030	0.047
124	<i>Terminalia myriocarpus</i>	T	1.38	80	3.31	13.48	0.095	0.00153	0.028	0.027
125	<i>Ailanthus grandis</i>	T	1.44	90	3.91	15.36	0.105	0.00202	0.031	0.019
126	<i>Duabanga sonner</i>	T	1.50	80	3.61	13.78	0.098	0.00166	0.029	0.022
127	<i>Terminalia Citrina</i>	T	1.67	60	3.00	10.64	0.082	0.00103	0.024	0.028
128	<i>Dillenia indica</i>	T	1.86	70	3.91	12.81	0.096	0.00157	0.028	0.027
129	<i>Annona squamosa</i>	T	1.50	40	1.80	6.89	0.058	0.00041	0.017	0.038
130	<i>Gynocardia odorata</i>	T	1.83	60	3.31	10.94	0.085	0.00114	0.025	0.031

131	<i>Garcinia anomala</i>	T	1.67	30	1.50	5.32	0.049	0.00026	0.014	0.056
132	<i>Mesua ferrea</i>	T	2.10	100	6.31	19.03	0.130	0.00367	0.038	0.021
133	<i>Steculia villosa</i>	T	1.33	30	1.20	5.02	0.045	0.00021	0.013	0.044
134	<i>Petrospermum acerifolium</i>	T	1.50	60	2.70	10.34	0.079	0.00093	0.023	0.025
135	<i>Azadirachta indica</i>	T	1.33	60	2.40	10.04	0.076	0.00084	0.022	0.022
136	<i>Aesculus assamica</i>	T	1.75	80	4.21	14.38	0.103	0.00193	0.030	0.022
137	<i>Meliosma sinilifolia</i>	T	1.50	40	1.80	6.89	0.058	0.00041	0.017	0.038
138	<i>Rhus javanica</i>	T	2.00	60	3.61	11.24	0.088	0.00125	0.026	0.033
139	<i>Spondias pinnata</i>	T	1.29	70	2.70	11.61	0.084	0.00110	0.025	0.018
140	<i>Moringa oleifera</i>	T	1.75	40	2.10	7.19	0.062	0.00048	0.018	0.044
141	<i>Bauhinia purpurea</i>	T	1.43	70	3.00	11.91	0.087	0.00121	0.026	0.020
142	<i>Tamaindus indica</i>	T	1.80	50	2.70	9.07	0.074	0.00078	0.022	0.036
143	<i>Albizia procera</i>	T	2.17	60	3.91	11.54	0.091	0.00137	0.027	0.036
144	<i>Terminalia arjuna</i>	T	1.29	70	2.70	11.61	0.084	0.00110	0.025	0.018
145	<i>Terminalia bellerica</i>	T	1.43	70	3.00	11.91	0.087	0.00121	0.026	0.020
146	<i>Terminalia chebula</i>	T	2.00	60	3.61	11.24	0.088	0.00125	0.026	0.033
147	<i>Psidium quajava</i>	T	1.43	70	3.00	11.91	0.087	0.00121	0.026	0.029
148	<i>Syzygium cumini</i>	T	1.75	40	2.10	7.19	0.062	0.00048	0.018	0.044
149	<i>Lengstroemia reginae</i>	T	1.57	70	3.31	12.21	0.090	0.00133	0.027	0.029
150	<i>Alstonia scholaris</i>	T	1.40	50	2.10	8.46	0.067	0.00061	0.020	0.036
151	<i>Millingtonia hortensis</i>	T	1.71	70	3.61	12.51	0.093	0.00145	0.027	0.033
152	<i>Oroxylum indicum</i>	T	1.63	80	3.91	14.08	0.101	0.00179	0.030	0.020

Table 6.4(b). Species diversity (with spl. reference to medicinal plants) in Anjaw district

S.No	Plant name	LF	A	F	RD	IVI	H'	D	E	A/F ratio
1	<i>Aconitum ferox</i>	H	1.60	50	1.65	5.45	0.073	0.00074	0.019	0.032
2	<i>Aconitum palmatum</i>	H	1.25	40	1.03	4.03	0.058	0.00041	0.015	0.031
3	<i>Coptis teeta</i>	H	2.50	20	1.03	4.73	0.065	0.00056	0.017	0.125
4	<i>Papaver somniferum</i>	H	1.17	60	1.44	5.12	0.069	0.00065	0.018	0.019
5	<i>Drymaria diandra</i>	H	1.50	60	1.85	5.92	0.077	0.00088	0.020	0.025
6	<i>Portulaca tubarosa</i>	H	1.14	70	1.65	5.68	0.075	0.00081	0.020	0.016
7	<i>Urina lobata</i>	H	1.25	40	1.03	4.03	0.058	0.00041	0.015	0.031
8	<i>Impatiens pulchua</i>	H	2.00	70	2.88	7.92	0.096	0.00157	0.025	0.029
9	<i>Oxalis griffithi</i>	H	1.50	40	1.23	4.53	0.063	0.00051	0.017	0.038
10	<i>Mimosa pudica</i>	H	3.38	80	5.56	12.59	0.133	0.00396	0.035	0.042
11	<i>Ralauchoe pinnata</i>	H	1.50	60	1.85	5.92	0.077	0.00088	0.020	0.025
12	<i>Begonia roxburghii</i>	H	1.60	50	1.65	5.45	0.073	0.00074	0.019	0.032
13	<i>Centella asiatica</i>	H	2.10	100	4.32	10.63	0.118	0.00283	0.031	0.021
14	<i>Hydrocotyle sibthorpioides</i>	H	1.33	60	1.65	5.52	0.073	0.00076	0.019	0.022
15	<i>Oenanthe javanica</i>	H	1.43	70	2.06	6.43	0.082	0.00103	0.022	0.020
16	<i>Ageratum conyzoides</i>	H	2.10	100	4.32	10.63	0.118	0.00283	0.031	0.021
17	<i>Dichrocephala integeifolia</i>	H	2.25	40	1.85	6.03	0.079	0.00091	0.021	0.056
18	<i>Blumea fistulosa</i>	H	1.50	60	1.85	5.92	0.077	0.00088	0.020	0.025
19	<i>Blumea mysiocephala</i>	H	2.33	30	1.44	5.33	0.072	0.00071	0.019	0.078
20	<i>Xanthium indicum</i>	H	1.60	50	1.65	5.45	0.073	0.00074	0.019	0.032
21	<i>Ecliptica prostrate</i>	H	2.11	90	3.91	9.85	0.112	0.00242	0.029	0.023
22	<i>Spilanthes paniculata</i>	H	1.67	30	1.03	4.14	0.059	0.00043	0.015	0.056
23	<i>Bidens pilosa</i>	H	2.86	70	4.12	10.16	0.115	0.00258	0.030	0.041
24	<i>Artimisia nilaginica</i>	H	1.25	40	1.03	4.03	0.058	0.00041	0.015	0.031
25	<i>Gynura angulosa</i>	H	1.40	50	1.44	5.01	0.068	0.00063	0.018	0.028
26	<i>Calendula officinalis</i>	H	1.50	80	2.47	7.31	0.090	0.00133	0.024	0.019
27	<i>Lectuca gracilis</i>	H	1.86	70	2.67	7.55	0.093	0.00142	0.024	0.027
28	<i>Sonchus arvensis</i>	H	1.60	50	1.65	5.45	0.073	0.00074	0.019	0.032
29	<i>Plumbago zeylamica</i>	H	1.50	40	1.23	4.53	0.063	0.00051	0.017	0.038
30	<i>Plumbago nosea</i>	H	1.83	60	2.26	6.72	0.085	0.00113	0.022	0.031

31	<i>Ardisia pedunculosa</i>	H	2.60	50	2.67	7.65	0.094	0.00146	0.024	0.052
32	<i>Nyctanthes arbor-tristis</i>	H	2.33	30	1.44	5.33	0.072	0.00071	0.019	0.078
33	<i>Catharanthus roseus</i>	H	3.35	50	3.91	10.29	0.116	0.00265	0.030	0.076
34	<i>Heliotropium indicum</i>	H	1.75	40	1.44	5.03	0.069	0.00063	0.018	0.044
35	<i>Solanum violaceum</i>	H	1.83	60	2.26	6.72	0.085	0.00113	0.022	0.031
36	<i>Solanum ferox</i>	H	1.67	30	1.03	4.14	0.059	0.00043	0.015	0.056
37	<i>Solanum torvum</i>	H	2.00	40	1.65	5.53	0.074	0.00076	0.019	0.050
38	<i>Withania somnifera</i>	H	1.14	70	1.65	5.68	0.075	0.00081	0.020	0.016
39	<i>Datura stramonium</i>	H	2.00	40	1.65	5.53	0.074	0.00076	0.019	0.050
40	<i>Justica jadarussa</i>	H	1.29	70	1.85	6.05	0.079	0.00092	0.021	0.018
41	<i>Phlogocanthus thyrsiflorus</i>	H	2.20	50	2.26	6.77	0.086	0.00115	0.022	0.044
42	<i>Datura stramonium</i> L	H	1.86	70	2.67	7.55	0.093	0.00142	0.024	0.027
43	<i>Nicotiana tabacum</i> L	H	3.25	80	5.35	12.24	0.131	0.00375	0.034	0.041
44	<i>Torenia asiatica</i> L	H	1.33	60	1.65	5.52	0.073	0.00076	0.019	0.022
45	<i>Bonnaya reptans</i>	H	1.57	70	2.26	6.80	0.086	0.00116	0.022	0.022
46	<i>Scoparia dulcis</i> L	H	2.00	60	2.47	7.12	0.089	0.00127	0.023	0.033
47	<i>Hibiscus rosa-sinensis</i>	S	1.57	70	12.79	33.75	0.246	0.02848	0.099	0.022
48	<i>Citrus limon</i>	S	2.00	50	11.63	31.45	0.236	0.02473	0.095	0.040
49	<i>Zanthoxylum nitidum</i>	S	1.50	40	6.98	22.28	0.193	0.01241	0.078	0.038
50	<i>Rhumnus nepalensis</i>	S	1.40	50	8.14	24.65	0.205	0.01519	0.083	0.028
51	<i>Melastoma malabatricum</i>	S	1.33	60	9.30	27.20	0.218	0.01849	0.088	0.022
52	<i>Osbeckia repalensis</i>	S	1.75	40	8.14	24.83	0.206	0.01541	0.083	0.044
53	<i>Carica papaya</i>	S	1.40	50	8.14	24.65	0.205	0.01519	0.083	0.028
54	<i>Myrica esculenta</i>	S	1.50	40	6.98	22.28	0.193	0.01241	0.078	0.038
55	<i>Sumbucus hookeri</i>	S	1.25	40	5.81	19.74	0.179	0.00974	0.072	0.031
56	<i>Musaenda roxburghii</i>	S	1.40	50	8.14	24.65	0.205	0.01519	0.083	0.028
57	<i>Adhatoda zeylanica</i>	S	1.00	40	4.65	17.19	0.164	0.00739	0.066	0.033
58	<i>Lantaina indica</i>	S	2.00	40	9.30	27.37	0.218	0.01873	0.088	0.050
59	<i>Stephania glandulifera</i>	C	1.80	50	4.59	15.37	0.152	0.00590	0.054	0.036
60	<i>Tinospora cordifolia</i>	C	2.17	60	6.63	19.59	0.178	0.00959	0.063	0.036
61	<i>Tetrastigma serrulatum</i>	C	1.33	60	4.08	14.17	0.144	0.00502	0.051	0.022
62	<i>Tetrastigma lanceolarium</i>	C	1.33	60	4.08	14.17	0.144	0.00502	0.051	0.022
63	<i>Leea crispa</i>	C	1.25	40	2.55	10.52	0.117	0.00277	0.041	0.031
64	<i>Mastersia assamica</i>	C	1.60	50	4.08	14.17	0.144	0.00502	0.051	0.032

65	<i>Cucurbita maxima</i>	C	1.88	80	7.65	21.44	0.189	0.01149	0.067	0.023
66	<i>Hydyotis scandens</i>	C	1.40	50	3.57	12.97	0.136	0.00421	0.048	0.028
67	<i>Eupatorium odoratum</i>	C	1.50	90	12.76	30.52	0.233	0.01329	0.082	0.025
68	<i>Micania micrantha</i>	C	1.80	100	9.18	24.55	0.205	0.01506	0.072	0.018
69	<i>Hostemma annulare</i>	C	1.20	50	3.06	11.77	0.127	0.00347	0.045	0.024
70	<i>Holarrhena pubescens</i>	C	1.60	50	4.08	14.17	0.144	0.00502	0.051	0.032
71	<i>Cordia diclotoma</i>	C	1.80	50	4.59	15.37	0.152	0.00590	0.054	0.036
72	<i>Argyreia nervosa</i>	C	1.50	60	4.59	15.25	0.151	0.00582	0.053	0.025
73	<i>Ipomoea aquatica</i>	C	1.88	80	7.65	21.44	0.189	0.01149	0.067	0.023
74	<i>Cuscuta reflexa</i>	C	2.89	90	13.27	31.45	0.236	0.02473	0.083	0.032
75	<i>Thunbergina grandiflora</i>	C	1.17	60	3.57	13.09	0.137	0.00428	0.048	0.019
76	<i>Quercus dilatata</i>	T	2.17	60	12.38	21.20	0.187	0.01124	0.071	0.036
77	<i>Stephania glandulifera</i>	T	1.43	60	3.52	19.82	0.229	0.00882	0.087	0.020
78	<i>Gynocardia odorata</i>	T	1.43	70	9.52	19.82	0.229	0.00982	0.087	0.020
79	<i>Garcinia anomala</i>	T	1.60	50	7.62	14.97	0.194	0.00560	0.074	0.032
80	<i>Rhumnus nepaltensis</i>	T	1.50	40	5.71	11.60	0.165	0.00336	0.063	0.038
81	<i>Aesculus assamica</i>	T	1.40	50	6.67	14.02	0.186	0.00491	0.071	0.028
82	<i>Rhus javanica</i>	T	1.67	60	9.52	18.35	0.219	0.00842	0.083	0.028
83	<i>Albizia procera</i>	T	1.40	50	6.67	14.02	0.186	0.00491	0.071	0.028
84	<i>Psidium quajava</i>	T	1.60	50	7.62	14.97	0.194	0.00560	0.074	0.032
85	<i>Syzygium cumini</i>	T	1.50	40	5.71	11.60	0.165	0.00336	0.063	0.038
86	<i>Pinus wallichiana</i>	T	1.50	60	8.57	17.39	0.212	0.00756	0.080	0.025
87	<i>Millingtonia hortensis</i>	T	1.25	40	4.76	10.64	0.156	0.00283	0.059	0.025
88	<i>Oroxylum indicum</i>	T	1.50	40	5.71	11.60	0.165	0.00336	0.063	0.038

LF– Life Form; **A**– Abundance; **F**– Frequency; **IVI** – Important Value Index; **H'** –

Shannon Weiner Index; **D** – Simpson Dominance Index;

E – Species Evenness

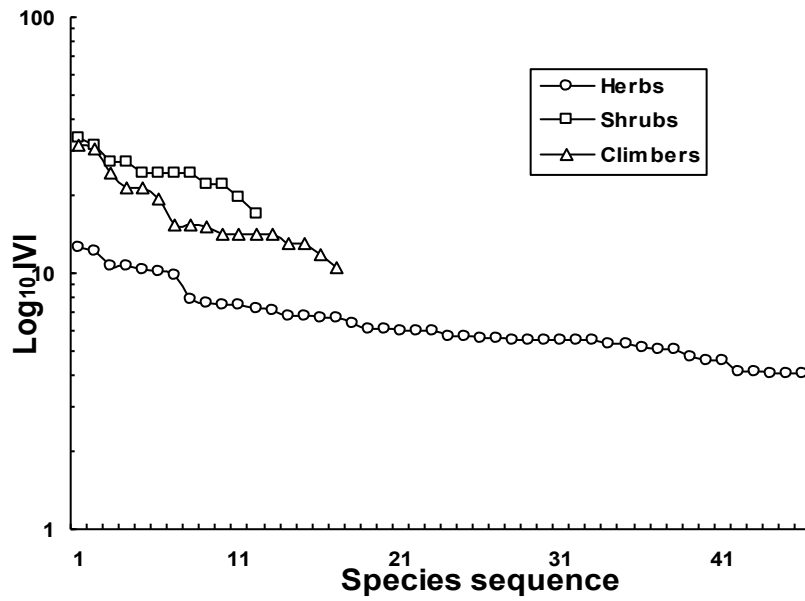


Figure: 6.1 (a). IVI curve for Lohit District

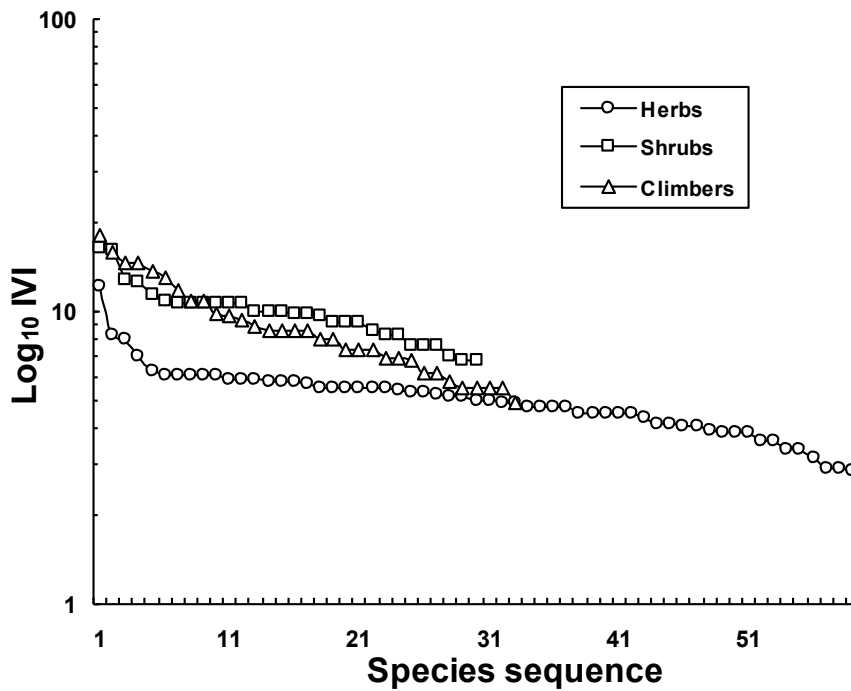


Figure: 6.1 (b). IVI curve for Anjaw District

The readings regarding the plant quantitative data analysis under Lohit district produced the following results with regards to the above parameters(**Table 6.4.a**):

1. Tree

Albizia procera is abundantly distributed. *Mesua ferrea* showed 100% frequency while density showed **2.10/m²**.

2. Shrub

Abundance = *Trevesia palmata*

Frequency = *Citrus limon* (100 %)

Density = **2.33/m²**

3. Climber

Abundance = *Eupatorium odoratum*,

Frequency = *Cucumis sativa* (100 %), *Mikania micranta* (100 %)

Density = **2.70/m²**

4. Herbs

Abundance = *Spilenthus paniculata* & *Ageratum conyzoides*

Frequency = *Centella asiatica*, *Embelia ribes*, *Sida acuta* and *Ageratum conyzoides* with 100% population

Density = **9.50/m²**

The readings regarding the plant quantitative data analysis under Anjaw district produced the following results with regards to the above parameters(**Table 6.4.b**)

1. Tree

Albizia procera is abundantly distributed. *Mesua ferrea* showed 100% frequency while density showed **9.52/m²**.

2. Shrub

Abundance = *Citrus limon*

Frequency = *gynorcodia odorata* (70 %)

Density = **2.33/m²**

3. Climber

Abundance = *Cuscuta reflexa*,

Frequency = *Mikania micranta* (100 %)

Density = **2.80/m²**

4. Herbs

Abundance = *Ageratum conyzoides*,

Frequency = *Centella asiatica* & *Ageratum conyzoides* (100 %)

Density = **12.59/m²**

The IVI diversity curve for tree, herbs, climber and shrub species showed a gentle slope for the selected forests of Lohit district while that of Anjaw district showed varying degree of differentiation in the district. The probable reason for this might be due to the moderate intensity of previous land use and proximity of the site to the primary forests. The site is also in close proximity to the other secondary forest stands.

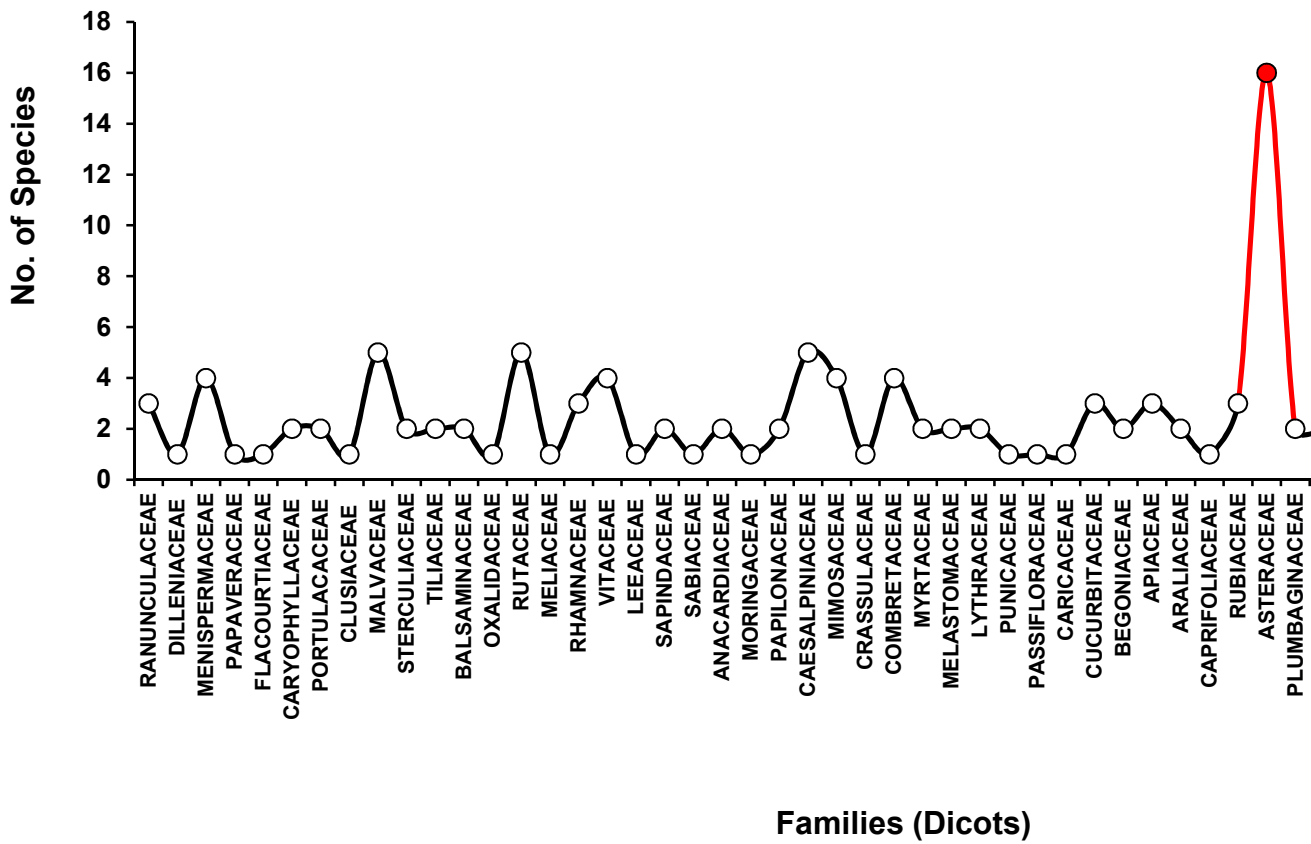


Figure: 6.2. Number families and species of Dicots

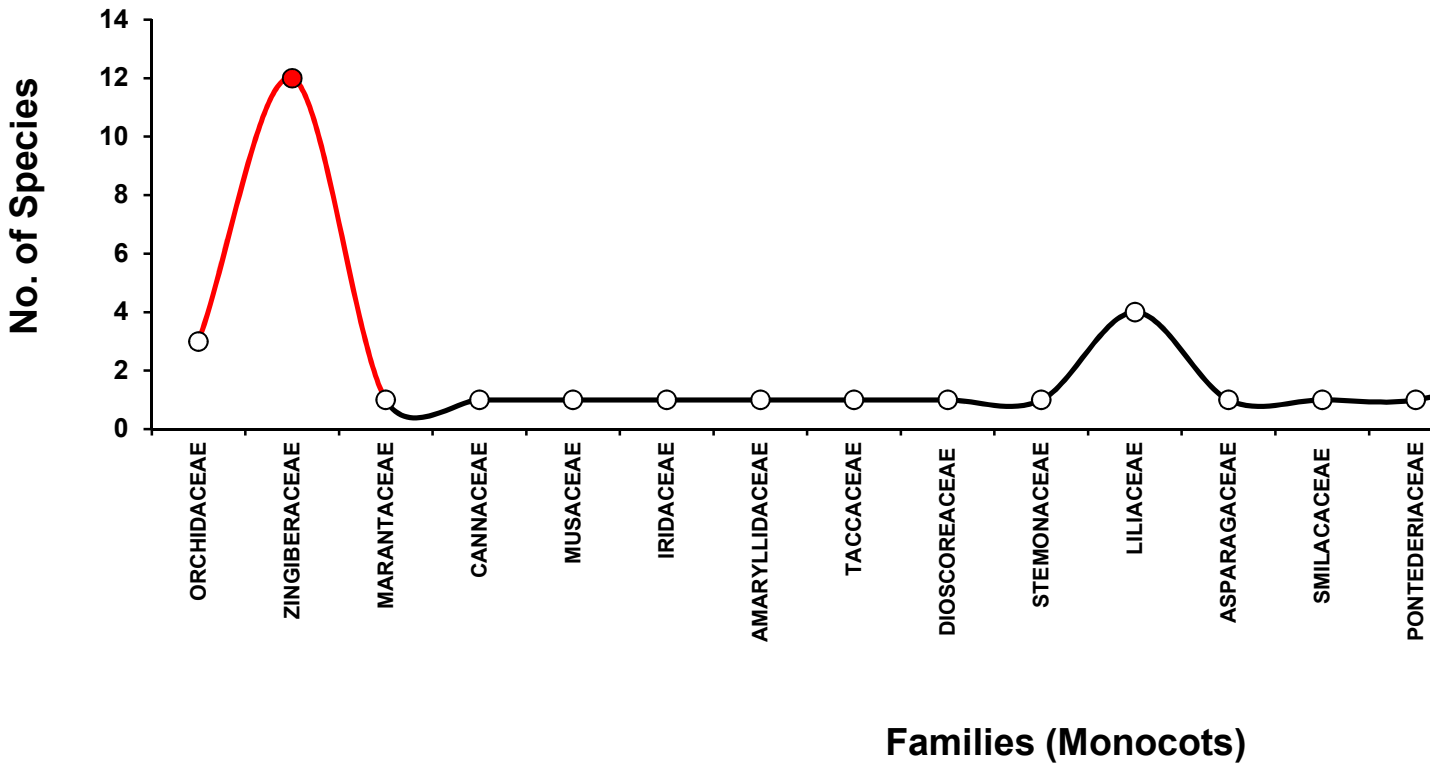


Figure: 6.3. Number families and species of Monocot

So far different authors have reported 1350 species of plants used in ethnomedicinal preparations, 665 species of food plants and 899 species for miscellaneous uses from the entire North East India (Dutta and Dutta, 2005). During our investigations, among total of 272 medicinal plant species used by the local inhabitants (irrespective of monocots, dicots and pteridophytes) belongs to 98 family and 115 genera were well described in our present study (**Table 6.5**). These medicinal plant species were distributed across 69, 19, 1 and 9 families of dicots, monocots, Gymnosperm and pteridophytes respectively. In terms of number of medicinal plant species, among dicots, Asteraceae was the most dominant family (16 species, belongs to 15 genera) of medicinal plants, followed by Apocynaceae and Asclepidaceae (**Figure 6.2**). Among monocots, Zingiberaceae was the dominant family with 12 species belongs to 8 genera which is followed by. The invention of maximum number of uses of Asteraceae by the different tribes in Lohit the families like Poaceae and Araceae (**Figure 6.3**). and Anjaw District of Arunachal Pradesh reveals that the dominance of Asteraceae in and around their landscape. Evidently, Asteraceae is the most dominant family of medicinal plants across the North Eastern States of India (Saklani and Jain, 1994; Kala, 2005). There was a significant positive correlation ($R^2 = 0.947$, $p > 0.01$) between the number of genera and number of species used as medicine by the different tribes in the Lohit and Anjaw district of Arunachal Pradesh (**Figure 6.4**). Among the monocot and dicots, Astraceae and Zingiberaceae families were found to be dominant with 12 and 16 species representing respectively

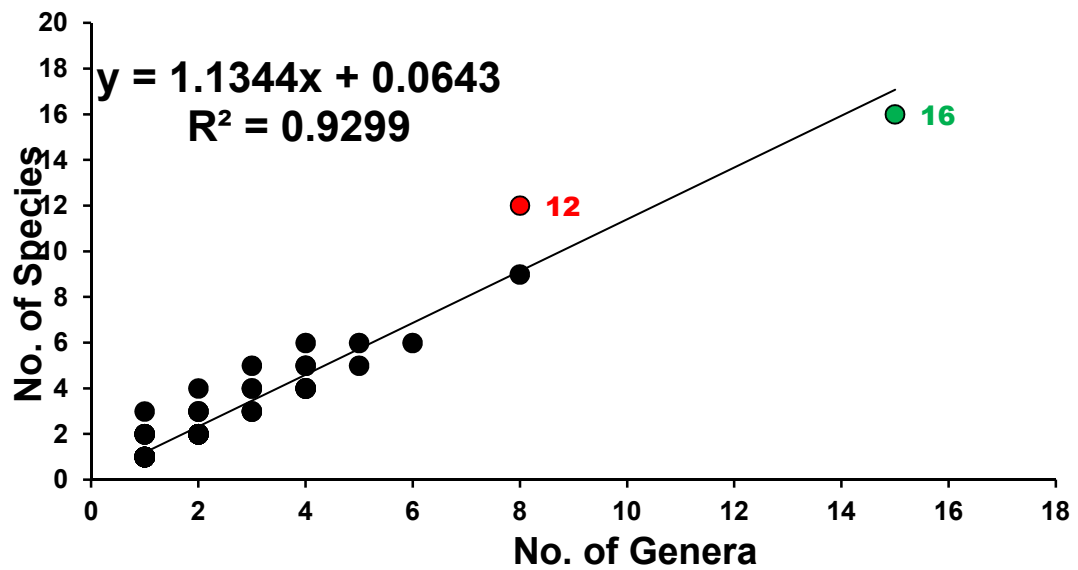


Fig.6.4 Relationship between Species and Genera in Anjaw and Lohit District

Table 6.5. Total number of family, Species and Genera represented by Dicots, Monocots, Gymnosperm and Pteridophytes.

Division	No. of Family	No. of Species	No. Genus
Dicots	69	210	62
Monocots	19	52	43
Gymnosperm	1	1	1
Pteridophytes	9	9	9
Total	98	272	115

6.6 Rare, Endangered and Endemic species

Some of the red listed rare, endangered and endemic plant species were encountered in selected study site. The total number of Rare species encountered was around 55 and under Rare and Endangered 3 plant species. *Aconitum ferrox*, *Acanthus leucostachys*, *Coptis teeta* wall, *Musa velutina*, *Taxus bacata*, *Hedychium spicatum*, *Panax-pseudoginseng*, *Paris polyphylla* sm, *Swertia chirata*, *Tagetes minuta*, *Taxus baccata*, *Valeriana wallichii* and *Zanthoxylum rhesuta*, etc.

In the present study, species represented above individuals were considered rare and endangered while *Coptis teeta* wall which is screened as rare and is endemic to Chaglogam and wild forest of Walong area of the Anjaw District.

6.7. Utilization and Conservatives perspective of the Medicinal Plants

The rate of forest loss today is alarming and the subsequent implications of this include the loss of plant species and potential that are valuable to medicinal development and rural livelihood. This study there for accessed the diversity and relative abundance of lesser known plant species with food and ethno medicinal values in tropical and sub tropical forests to alpine of Lohit and Anjaw districts, respectively. Data were collected from **14** circles in the two districts. Systematic cluster sampling technique was adopted for sample plot location identification of all tree species with a diameter at breast height (**dbh**)>**10** cm were carried out at each plot. Frequency of all species identified was computed and the species were also classified into families. Relative density was obtained with the total number of species and numerous of families encountered per hectare (**ha**). Shannon-Wiener biodiversity index (**H'**) was used for biodiversity assessment and Evenness index (**E'**) for species distribution. Habited occupancy was also used to study the distribution of all species across the different communities. Percentage of plant species with potential for food-medicinal values was

calculated. It was discovered that most of the plant species (**60%**) had food and medicinal values. The relative density and frequency of these species shows that most of them are rare while others are threatened with extinction. Since the role of these plant species can not be dispersed with appropriate management strategies that will make them sustainable are recommended.

In the present study, herbs contributed highest (**38%**) number of species in terms of medicinal uses followed by climber (**23%**), tree (**20%**) and shrubs (**19%**) (**Fig.6.5**). The plant parts used for medical preparations were leaves, stem, root/rhizomes, stem and root barks, flower/inflorescence and seeds/pod(**Fig.6.6**). In some cases whole plants including root were used in medical remedies. Roots generally contain a high concentration of bioactive compounds (Robinson, 1974; Moore, 1994 and Basualdo et al., 1995). Hence, it is important to note that the removal of roots can have significant detrimental effects on plant survival and regeneration (Dhillion and Amundsen, 2000). The utilization pattern of the plant species presented in **Fig.6.2**. It showed that among plant parts used, leaves (**43%**) are highly exploited for the preparation of ethnomedicine followed by stem/stem bark (**24%**), root (**12%**) and flower/inflorescence (**11%**). The present invention further reveals that **7%** of Seed/pod and **3%** of whole plants utilized by the ethnic people for the treatment of various diseases.

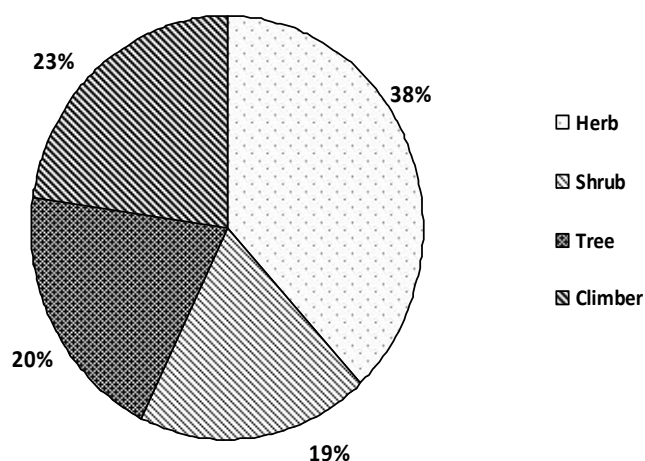


Fig. 6.5 Pie-digram showing plants habits/form

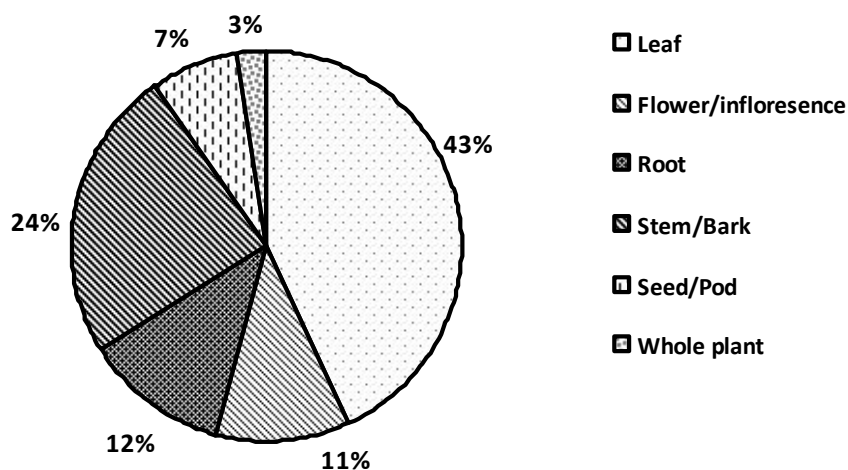


Fig. 6.6 Pie-digram showing plant part used.

Coptis teeta is endemic to Chaglogam and Walong circles of Anjaw district. It grows naturally and extensively in wilderness. It grows well at above the elevation of 2000 metres. It has very high demand in the market. Therefore, the people of the district are to be organized and motivated to take up the cultivation of this particular medicinal plant in a more organized way and awareness regarding of illegal collection/ harvesting must be discouraged. The other medicinal plants include *Gloriosa superba* (Above 1000 m), *Hedychium spicatum* (Above 1000 m), *Illicium grifithii* (Upto 3000 m), *Nardostachys jatamansi* (Above 2000 m),

Panax-pseudoginseng and *Paris polyphyla* (Above 2000 m), *Podophyllum hexundrum* (Above 2000 m), *Swertia chirata* (Above 2000 m), *Tagetes minuta* (Above 1000 m), *Taxus baccata* (Above 2000 m), *Valeriana wallichii* (Above 2000 m) and *Zanthoxylum rhesta* (Upto 2000 m). These species are highly valued and are among the top 20 medicinal plants of India (Amruth).

We all are aware that the tribal communities are heavily dependent on various NTFPs for their income and sustenance. The study also reflects it clearly that many of the forest produces have a great market potential especially with value addition which will boost the economic development of the people in the study area. As most of the commercially important natural traditional medicinal plants and NTFPs going to be extinct due to unsustainable harvest, proper conservation strategies must be introduced to the locals. Infact, one of the major ills afflicting these natural resources is the institutional neglect related to the policy, strategy and plans, legal arrangements, incentives, development of skills, access to and availability of information and support from public administration. Well planned institutional system may provide an atmosphere conducive for development. Training and awareness programmes relating to sustainable harvest and value addition on the tradidinal medicinal plants and NTFPs to the locals and traditional practionals & healers is essential. For the upliftment of economy of these indigenious tribes, keeping alive these resources would be the most important resource. We must avoid the exploitation to our people by other middlemen while purchasing these natural medinal plant resources collected by the innocent inhabitants. We must give a look to the various factors and reasons that is given below if we want to conserve and preserve our resources from being diminish.

- Changing patterns of landuse system and agricultural activities have resulted in the increasing clearance of wild forest lands for crops and also the abandonment of older

fields used for declining crops. This in turn impacts on local plants and traditional patterns of collecting.

- Changing cultural values and beliefs also affect the wild medicinal plant distribution.
- There are also external factors that have huge influence on the traditional patterns of harvesting. In recent days there is an increase in tourism and the export of handicrafts from the villages.
- The destructive harvesting of plants from the wild has the greatest impact and options for ameliorating this impact such as removing part of the root or replanting root buds into the hole need to be explored.

The most important is good market networking for the local plants made available at the remotest corner of the state so that the interests to the local inhabitants of the study sites will be protected from the middlemen who are the maximum beneficiaries. There should be a price support mechanism for the products and marketing facilities should be given preference.

6.8. Ex-situ conservation

Unsustainable harvesting and illegal collections along with recent anthropogenic pressure on selected rare and endemic natural medicinal plants mentioned above have caused a major threat to their growth and availability. We must take an initiative to conserve these species in the ex-situ conditions. Some of the selected medicinal plants such as *Acorus calamus*, *Andrographis paniculata*, *Citrus sp.*, *Costus speciosus*, *Clerodendron*, *Coptis teeta*, *Pseudo-ginseng*, *Taxus bacata* have been planted for further study. Germplasm of some important species are collected and preserved.

6.9. Utilization value Index of the medicinal Plants

The distribution of the medicinal plant is very scattered within the study area. As mentioned above the dependency of the plants and other forest products is immensely

utilized for various purposes. There are many medicinal plants which are used for varied purposes amongst these residing ethnic tribes. Some of them are mentioned under socio-economic status, while some of the plants are frequently used for curing particular ailments and forms the base of the Used Value Index (UVI). The UVI is tabulated as below (**Table 6.7**)

Table 6.7. Utilization Value index

S. No.	Plant Taxa/ Botanical Name	RM	C	N	UVI= $\sum RM * C / N$
1.	<i>Aconitum ferox</i>	1	5	15	0.33
2.	<i>Abelmoschus esculentus</i>	4	23	10	9.20
3.	<i>Abrus precaoirias</i>	2	11	8	2.75
4.	<i>Acacia ceasia</i>	3	9	7	3.86
5.	<i>Aconitum palmatum</i>	1	3	10	0.30
6.	<i>Adenia trilobata</i>	1	5	11	0.45
7.	<i>Adhatoda zeylanica</i>	3	21	14	4.50
8.	<i>Aesculus assamica</i>	2	7	10	1.40
9.	<i>Ageratum conyzoides</i>	1	13	9	1.44
10.	<i>Albizia procera</i>	2	9	11	1.64
11.	<i>Allamanda catharica</i>	2	5	10	1.00
12.	<i>Allamanda nerifolia</i>	3	9	10	2.70
13.	<i>Alstonia scholaris</i>	2	9	8	2.25
14.	<i>Ardisia pedunculosa</i>	4	12	10	4.80
15.	<i>Arenaria orbiculata</i>	4	22	15	5.87
16.	<i>Argyreia nervosa</i>	2	9	12	1.50
17.	<i>Artimisia nilaginica</i>	3	9	13	2.08
18.	<i>Azadirachta indica</i>	3	23	10	6.90
19.	<i>Bauhinia purpurea</i>	3	7	12	1.75
20.	<i>Begonia arborensis</i>	3	10	8	3.75
21.	<i>Begonia roxburghii</i>	2	5	8	1.25
22.	<i>Bidens pilosa</i>	2	9	10	1.80
23.	<i>Blumea fistulosa</i>	1	11	15	0.73
24.	<i>Blumea mysiocephala</i>	1	9	15	0.60
25.	<i>Calendula officinalis</i>	2	8	11	1.45
26.	<i>Calotropis gigantean</i>	3	17	10	5.10
27.	<i>Carica papaya</i>	2	10	13	1.54
28.	<i>Cassia accidentalis</i>	3	7	9	2.33
29.	<i>Cassia alata</i>	2	13	9	2.89
30.	<i>Cathoranthus roseus</i>	2	8	12	1.33
31.	<i>Centella asiatica</i>	4	17	12	5.67
32.	<i>Cissampelos pareira</i>	2	22	15	2.93
33.	<i>Cissus repens</i>	2	9	12	1.50
34.	<i>Citrus limon</i>	2	15	9	3.33
35.	<i>Cucumis sativa</i>	2	12	10	2.40
36.	<i>Coptis teeta</i>	1	20	15	1.33

37.	<i>Corchorus olitorius</i>	1	9	10	0.90
38.	<i>Cordia diclotoma</i>	4	12	15	3.20
39.	<i>Cordiospermum helicacatum</i>	1	16	11	1.45
40.	<i>Crypolepsis buehanani</i>	1	4	9	0.44
41.	<i>Cucurbita maxima</i>	3	19	10	5.70
42.	<i>Cuscuta reflexa</i>	1	12	10	1.20
43.	<i>Datura stramonium</i>	2	15	12	2.50
44.	<i>Dichrocephala integeifolia</i>	1	5	10	0.50
45.	<i>Dillenia indica</i>	3	10	15	2.00
46.	<i>Dipterocarpus macrocarpus</i>	1	10	12	1.00
47.	<i>Drymaria diandra</i>	4	25	12	8.33
48.	<i>Duabanga sonner</i>	2	15	13	4.00
49.	<i>Ecliptica prostrate</i>	2	11	10	2.20
50.	<i>Embelia ribes</i>	3	15	10	4.50
51.	<i>Entada phaseoloides</i>	2	10	9	2.22
52.	<i>Eranthemum palatiferum</i>	1	5	7	0.71
53.	<i>Eupatorium odoratum</i>	1	12	10	1.20
54.	<i>Garcinia anomala</i>	2	22	8	5.50
55.	<i>Gynocardia odorata</i>	3	14	10	4.20
56.	<i>Gynura angulosa</i>	1	7	12	0.58
57.	<i>Heliotropium indicum</i>	2	6	10	1.20
58.	<i>Hemidesmus indicus</i>	2	8	13	1.23
59.	<i>Hibiscus rosa-sinensis</i>	2	25	12	4.17
60.	<i>Hibiscus syriacus</i>	2	21	14	3.00
61.	<i>Holarrhena pubescens</i>	2	4	9	0.89
62.	<i>Hostemma annulare</i>	2	7	12	1.17
63.	<i>Hydrocotyle sibthorpioides</i>	3	7	9	2.33
64.	<i>Hydyotis scandens</i>	1	5	9	0.56
65.	<i>Impatiens balsamina</i>	2	12	10	2.40
66.	<i>Impatiens pulchua</i>	2	16	9	3.56
67.	<i>Ipomoea aquatica</i>	2	12	10	2.40
68.	<i>Justica jardarussa</i>	1	7	12	0.58
69.	<i>Kalanchoe pinnata</i>	2	13	9	2.89
70.	<i>Lantena indica</i>	2	15	10	3.00
71.	<i>Lectuca gracilis</i>	3	10	9	3.33
72.	<i>Leea crispa</i>	2	8	13	1.23
73.	<i>Lagerstroemia indica</i>	2	14	10	2.80
74.	<i>Lengerstroemia reginae</i>	2	9	12	1.50
75.	<i>Mastersia assamica</i>	3	10	13	2.31
76.	<i>Melastoma malabatricum</i>	2	9	7	2.57
77.	<i>Meliosma sinilifolia</i>	2	11	9	2.44
78.	<i>Mesua ferrea</i>	3	20	12	5.00
79.	<i>Mezonevron cucullatum</i>	2	8	10	1.60
80.	<i>Micania micrantha</i>	1	5	9	0.56
81.	<i>Millingtonia hortensis</i>	4	15	12	5.00
82.	<i>Mimosa pudica</i>	2	7	9	1.56
83.	<i>Momordica cocchinclinesis</i>	2	16	10	3.20
84.	<i>Moringa oleifera</i>	2	6	11	1.09

85.	<i>Murraya koenigii</i>	2	11	15	1.47
86.	<i>Murraya paniculata</i>	2	13	10	2.60
87.	<i>Murssaenda roxburghii</i>	2	4	8	1.00
88.	<i>Nerium indicum</i>	2	7	10	1.40
89.	<i>Nyethanthes arbor-tristis</i>	2	7	11	1.27
90.	<i>Oenanthe javanica</i>	4	9	15	2.40
91.	<i>Oroxylum indicum</i>	2	5	10	1.00
92.	<i>Osbekia repalensis</i>	2	10	9	2.22
93.	<i>Otea polygama</i>	2	4	9	0.89
94.	<i>Oxalis griffithi</i>	1	18	10	1.80
95.	<i>Paedaria scandens</i>	2	5	9	1.11
96.	<i>Papaver somniferum</i>	2	26	10	5.20
97.	<i>Parabaena sagittata</i>	2	9	15	1.20
98.	<i>Parabarium micranthum</i>	2	6	9	1.33
99.	<i>Petrospermum acerifolium</i>	3	8	9	2.67
100.	<i>Phlogocanthus thyrsoiflorus</i>	2	6	10	1.20
101.	<i>Plumania acutifolia</i>	2	5	9	1.11
102.	<i>Plumbago nosea</i>	3	6	10	1.80
103.	<i>Plumbago zeylamica</i>	3	10	12	2.50
104.	<i>Portulaca oleracea</i>	4	23	10	9.20
105.	<i>Portulaca tubarosa</i>	4	16	10	6.40
106.	<i>Psidium quajava</i>	3	8	12	2.00
107.	<i>Punica granatum</i>	2	24	10	4.80
108.	<i>Quisqualis indica</i>	2	5	9	1.11
109.	<i>Rauwolfia densiflora</i>	3	14	10	4.20
110.	<i>Rhumnus nepalensis</i>	2	13	8	3.25
111.	<i>Rhus javanica</i>	2	9	11	1.64
112.	<i>Schefflera venulosa</i>	4	6	10	2.40
113.	<i>Scoparia dulcis</i>	2	5	9	1.11
114.	<i>Sesamum orientale</i>	2	17	11	3.09
115.	<i>Sida accuta</i>	3	24	13	5.54
116.	<i>Solanum ferox</i>	1	4	10	0.40
117.	<i>Solanum torvum</i>	2	9	10	1.80
118.	<i>Solanum violaceum</i>	1	5	9	0.56
119.	<i>Sonchus arvensis</i>	2	7	12	1.17
120.	<i>Spilanthes paniculata</i>	4	18	10	7.20
121.	<i>Spondias pinnata</i>	2	7	10	1.40
122.	<i>Stacytarpbeta jamicensis</i>	2	5	8	1.25
123.	<i>Steculia villosa</i>	3	9	13	2.08
124.	<i>Stephania glandulifera</i>	2	17	15	2.27
125.	<i>Sumbucus hookeri</i>	3	6	10	1.80
126.	<i>Syzygium cumini</i>	2	10	8	2.50
127.	<i>Tabernaemontana divaricata</i>	3	5	10	1.50
128.	<i>Tagetes erecta</i>	2	6	10	1.20
129.	<i>Tamaindus indica</i>	2	11	9	2.44
130.	<i>Terminalia myriocarpus</i>	2	5	9	1.11
131.	<i>Terminalia arjuna</i>	2	7	10	1.40
132.	<i>Terminalia bellerica</i>	3	12	6	6.00

133.	<i>Terminalia chebula</i>	4	9	12	3.00
134.	<i>Texus bacata</i>	2	8	10	1.60
135.	<i>Tetrastigma lanceolarium</i>	2	12	11	2.18
136.	<i>Tetrastigma serrulatum</i>	2	9	11	1.64
137.	<i>Thunbergia grandiflora</i>	1	5	10	0.50
138.	<i>Tinospora cordifolia</i>	2	27	15	3.60
139.	<i>Torenia asiatica</i>	1	5	10	0.50
140.	<i>Thevesia palmate</i>	3	9	11	2.45
141.	<i>Triumfetta rhomboidea</i>	1	6	10	0.60
142.	<i>Uraria lobata</i>	3	18	12	4.50
143.	<i>Verbena officinalis</i>	1	4	9	0.44
144.	<i>Vitis barbata</i>	2	8	14	1.14
145.	<i>Withania somnifera</i>	2	10	13	1.54
146.	<i>Xanthium indicum</i>	2	5	8	1.25
147.	<i>Zanthroxylum accanthopodium</i>	2	13	10	2.60
148.	<i>Zanthroxylum nitidum</i>	3	15	12	3.75
149.	<i>Ziziplus mauritiana</i>	2	8	10	1.60
150.	<i>Ziziplus oenoplia</i>	3	11	10	3.30

Utilization value indices (UVI) of different species in the present study summarised in the Table7.1 above. A majority of the taxa exhibited high utilization value indices (UVI > 1). In the present research, the UVI suggests that *Portulaca oleracea* (9.20), *Spilanthes paniculata* (7.20), *Sida accuta* (5.54), *Papaver somniferum* (5.20), *Uraria lobata* (4.50), and *Sesamum orientale* (3.09) among herbs; among shrubs; *Azadirachta indica* (6.90) *Terminalia bellerica* (6.00), *Mesua ferrea* (5.00) and *Terminalia chebula* (3.00) among trees; *Tinospora cordifolia* (3.60) among climbers are the most important to users.

Abelmoschus esculentus showed a high UVI (9.20) followed by *Drymaria diandra* with 8.33. The UVI reflects the relative importance of a species keeping in view the users concern (*i.e.* pharmaceutical industry). Frequency of use and quantum of use contributes to determine the UVI and thereby reduces the bias. It could be said that wide use of *Abelmoschus esculentus* for culinary purposes as well as for medicinal use might had led to the high UVI values. The high utilization value indices (UVI > 1.00) indicate threats imposed by users to the wild populations.

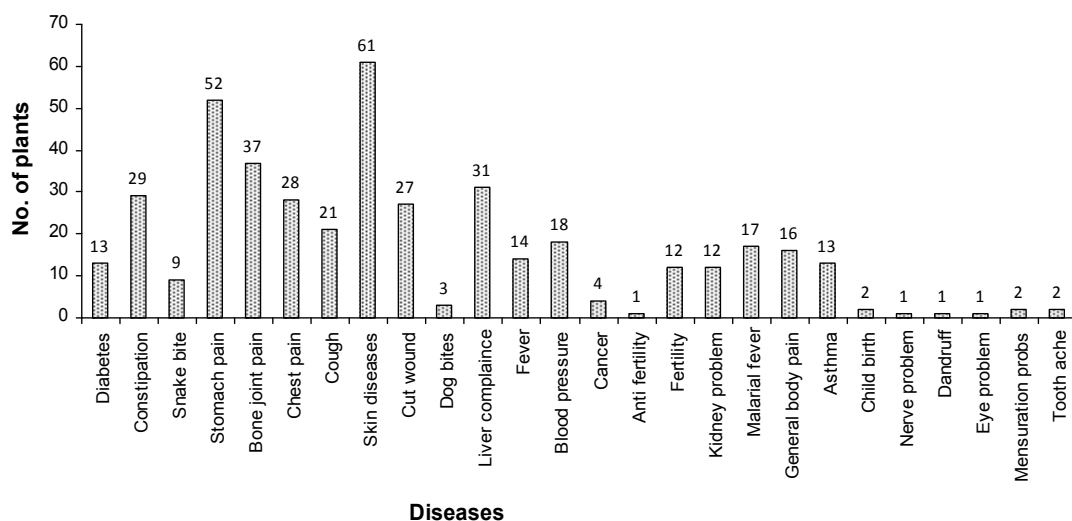


Fig.6.7. Histogram showing diseases against no. of plants used.

Different kind of Skin diseases, Stomach related problems, bone joint pain which is followed by liver compliance were the most frequent ailments treated with medicinal plants (**Fig.6.7**). Further, most of the plant species were found to having multiple remedial uses. Among 191 medicinal plant species were used in treating about 70 different types of ailments, of which the highest numbers of plant species (61 species) were used for the treatment of skin diseases (**Fig.6.7**). About 52 medicinal plant species were used in curing stomach disorders, 37 medicinal plant species were used for healing bone related problems, 31 plant species were used for the treatment of liver compliances, 28 plant species were used in curing chest allied disorders (**Fig.6.7**). In the present study sites, about 12 plant species each were used to cure fertility and kidney related compliances, 13 plants species were used for treating diabetes, 17 plant species were used for malarial fever and 29 medicinal plant species were used to cure constipation.

Figure 6.8(a), shows that habitat of particular plant species and plant parts exploited for the medical remedies. It reveals that most of the medicinal plants species parts (leaves followed by bark and root) were collected from the wild state.

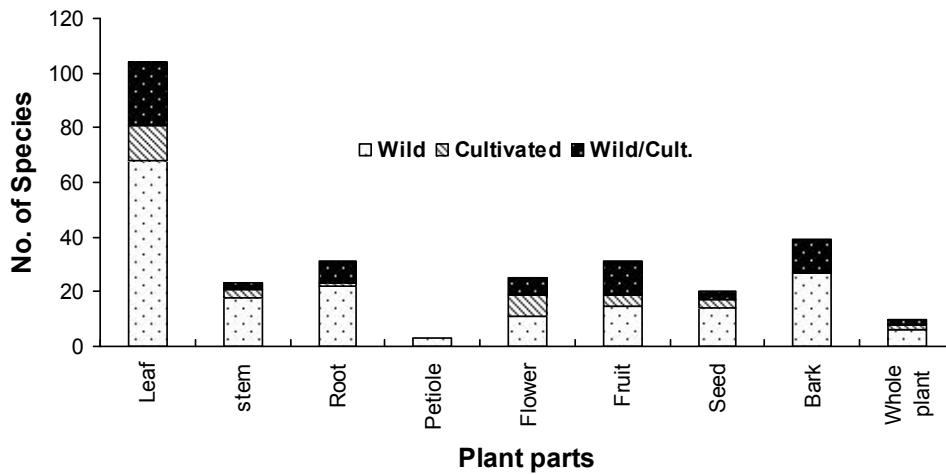


Fig.6.8(a) Plant species and Plants parts used as medicine

Various parts of the medicinal plants are used by the ethnic people in the present study area. Doley et al 2010, reported a unique medicinal plant uses among the Nyishi community. Among the plant parts, leaves are largely exploited for curing numerous diseases (77 diseases) followed by root/root barks which are used to cure 47 diseases. Further, fruits, stem/stem bark, inflorescence/flower and seed/pod are used to cure 31, 23, 22 and 20 diseases respectively. **Fig. 6.8(b)**. There are 17 diseases treated by using whole plants.

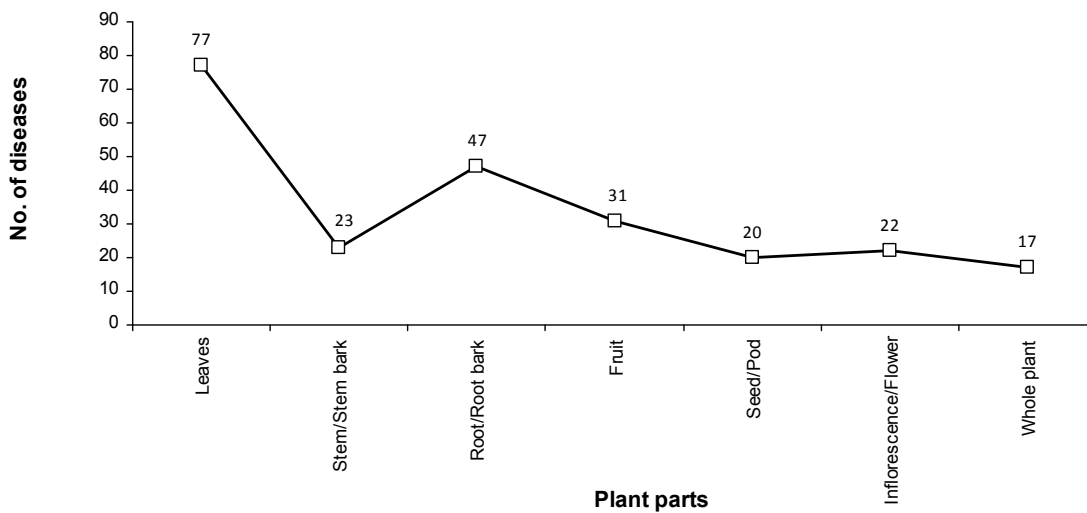


Fig. 6.8(b). Plant parts used in relation to diseases.

The linkage between biodiversity and human health is now well established (Bodeker, 2005). Conservation areas like protected area apart from their other conservation values contributing significantly to medicinal plants conservation. Yet again, people living in and around these conservation areas rely extensively on these areas to meet their primary health care needs like other subsistence requirements (*i.e.* fuelwood, fodder, weaving and building materials, bushmeat, etc). Our study was aimed to assess the diversity and ditribution of medicinal plants in and around the easternmost region of the two districts (Lohit and Anjaw) of Arunachal Pradesh, a biodiversity rich area of the state and their traditional usage for primary healthcare needs amongst the ethnic people living in and around that area. The study will be helpful to reassess the invaluable role of conservation areas in medicinal plant conservation and to realize the local dependency and healthcare pattern through these natural medicinal products.

Chapter-7

Summary and Conclusion

7.1. Summary

We are well aware that the total forest cover of Arunachal Pradesh has been estimated to be 83% of the total geographical area. It is the eastern most part of hot spot area of the Himalayan region, having 5000 species of floral diversity. While my study area falling towards the eastern most region of the state, rich for its luxuriant and diverse medicinal plants and NTFP's becomes a hub for the inquisitor explorers and researchers. Every one of us prefer to have a better access to the local inhabitants for fruitful result of the findings. Infact, my survey made in these area during the course of field work, could reveal the vast knowledge of these local people that they have immense indigenious knowledge on the use of the traditional herbal medicinal plants. An attempt has been made to document and disseminate this information in a systematic manner which could be used profitably by many industrial processing units and pharmaceutical industries.

There was a remarkable uniformity in the identification and use of the plants recorded from the two districts in the survey (80%). The vast majority of the interviewed practioners were male as compared to female counter parts. However, the women practitioners were found to have an excellent work experience as birth attendant and female internal problems. In Mishmi dominated areas, use of medicinal plants was lesser as compared to the Khampti tribes and the reason supporting this is due animism and shamanism. The prevalence of male herbalist interviewed may also be a reflection of the fact that all of the interviewers were male. Women practioners may well have been put-off by this and held back from offering themselves for interview.

The study shows that herbs contributed the highest (38%) number of species of medicinal plant uses followed by climber (23%), tree(20%) and shrubs (19%) respectively.

Leaves and roots were most commonly extracted plant part used with **43% & 24%** each (**fig. 6.6**) and this is of particular concern. The destructive harvesting of plants from the wild has the greatest impact and options for ameliorating this impact such as removing part of the root or replanting root buds into the hole need to be explored.

It is evident from the review of literature in **Chapter - 2** that the present study area reveals a high diversity of medicinal plants works and its previous records from various sources proves to be a rich natural home for the indigenous practices in ethno medicinal plant knowledge. Despite gradual socio-cultural transformation, local communities still possess substantial knowledge of plants and their uses. The reliance on folk medicines for health care is associated with the lack of modern medicines and medication, poverty and the traditional belief of its effectiveness.

The multi-ethnic tribes residing in the study area are entirely dependent upon their natural bio-diversity for extraction of varied NTFPs for subsistence economy living. Wherein it was found that the bamboos are extensively used for bringing water from rivulets in steep valleys of Anjaw Districts as storing vessels, making useful crafts such as hand combs, baskets, bows and arrows, etc. It is also used as building material construction of house along with *Livistonia jeinkinsiana* Griff., *Phrynium imbricatum* Roxb. Lots of cane species are also used as binding materials, furniture making and vegetables.

In **Chapter- 6**, the **socio-economic** data works reveals a prominent differences within the two selected districts of the study area. The average number of families in the villages of Lohit was 4 times more than that in the Anjaw district. Whereas the average number of BPL (below poverty line) families in Lohit district is more than two times that of Anjaw district (median 18 : 8). It was also noticed that the district Lohit had more primary pass out girls (average = 10 girls/village) to that of Anjaw district(average = 3 girls/village). A similar trend was observed for boys. The economical generating revenue in Anjaw district is majorly

from opium (70 %) cultivation as compared to Lohit district where its economic revenue is from cash crops such as tea gardens, oranges, ginger and opium to some extent (30 %).

The most commonly extracted NTFPs from the primary/ secondary forests are; Collection of wild vegetables, thatching plants, broom making and other religious practices (prevalent among the Mishmis and Singphos). There are around 25 wild vegetables that are commonly collected and few are sold in the local markets which in turn acts as a revenue generating substance for the local inhabitants.

It is also evident from the study that this area lacks exploration though it is luxuriant with diverse medicinal plants and NTFP's and thus needs an ardent scientific study and documentation.

The plants such as herbs and shrubs encountered within the two study sites (Lohit & Anjaw) were almost common showing the same quantitative readings (**Chapter-6, Table 6.4 a & b**).

In our study, we have documented **272 species** (Dicots – 210; Monocots – 52; Gymnosperm-1 and Pteridophytes – 9) which belongs to **115 Genus** (Dicots – 62; Monocots – 43; Gymnosperm-1 and Pteridophytes – 9), **98 family** (Dicots – 69; Monocots – 19; Gymnosperm-1 and Pteridophytes – 9)

Among dicots Asteraceae was the predominant family with 16 species belongs to 15 Genus, while **Zingiberaceae** was the dominant family in **monocots** comprises 12 species belonging to 8 Genus.

In Pteridophyte groups 9 species represented by 9 genus and a family each.

One species i.e., ***Taxus baccata* L** belongs to Taxaceae was documented from the Anjaw district. ***Coptis teeta* Wall** was naturally seen to grow in patches in Chaglagam and along of Anjaw District. Among 272 medicinal plants reported, 213 plants are common and widely distributed in both the district (Ex. *Drymaria diandra*, *Gynocardia odorata*,

Tinospora cordifolia), 52 plants are under Rare condition (Ex. *Garcinia anomala*, *Zanthoxylum acanthopodium*, *Cardiospermum helicacabum* etc.)and 3 plants are categorized under Rare and Endangered (*Aconitum ferox*, *Aconitum palmatum*, *Coptis teeta* and *Paris polyphylla*).

Many medicinal plants which are used for varied purposes amongst different residing ethnic tribes in the present study area as shown in **chapter 5**. Some of them are mentioned under socio-economic status, while few of the plants are frequently used for curing particular ailments and forms the base of the **Used Value Index (UVI)**.

In the present research, the UVI (**Table 6.6**) shows a high utility of some medicinal plants more to that of all prescribed in the paper. For instance, *Portulaca oleracea* (9.20), *Spilanthes paniculata* (7.20), *Sida accuta* (5.54), *Papaver somniferum* (5.20), *Urina lobata* (4.50), and *Sesamum orientale* (3.09) among herbs; among shrubs; *Azadirachta indica* (6.90) *Terminalia bellerica* (6.00), *Mesua ferrea* (5.00) and *Terminalia chebula* (3.00) among trees; *Tinospora cordifolia* (3.60) among climbers are the most important to users.

Abelmoschus esculentus showed a high UVI (9.20) followed by *Drymaria diandra* with 8.33.

7.2. Conclusion

Manifesting a change without disrupting the current order is a very big challenge to plant conservation within the arena of ethnomedicinal plant practices. Maintaining control of both information and the means to practice i.e. knowledge of resources prevents non-practitioners, such as the researchers, policy makers or the conservationist taking a leading role. However, raising of awareness as regards to putting in some responsibilities in sustainable utilization of natural plant/animal products are perhaps the best option to pursue. As both practitioner and non practitioner are all too aware, the availability of medicinal plant species has become a matter of concern both because of time lost in travel to collect them and expense of purchase and prescription. In this, the practitioners and the

conservationist can become allies. The sustainable collecting of material, with a view to returning to a natural site again and again and the options for home gardens, compound-shared resources and even the development of new minor medicinal crops for cultivation is an area that can be usefully explored.

The overall economic conditions can be pulled from the accessed data in socio-economic portion in the chapter

The out come result on ethno-medicinal use of different plant parts for treating various ailments as illustrated in the **Chapter - 5** reveals a rich and vast knowledge of the traditional usage of the plants for curing various common and uncommon ailments/diseases of the man. However, the traditional herbal application was most common amongst the ethnic tribes of the Khampti and the Singphos, whereas it is comparatively lesser in other Mishmi belt. Perhaps, this is due the rich ethno-cultural background and forest dwelling nature of the respective community. Throughout the study it was also found that, the elder persons (above 45 years of age) of the family possess more knowledge regarding medicinal plants use and identification than that of younger generations. This could be a severe danger of knowledge loss. Similar observation is also evident from the study of Uniyal *et al.* (2006); Ladio and Lozada (2003) in various regions of the world. Data also showed that, females knew more about the usage of medicinal plants than that of male. Most of the age-old female in our study area were found to familiar with the traditional uses of medicinal plants growing in forest and in their vicinity.

The study also shows that the ethnic tribes or the communities still maintains relevant knowledge and prefer the usage of wild medicinal plants inspite of allopathic/ modern medicines available easily in the town. It was also seen that traditional knowledge of the medicinal practice is passed down through fore fathers to its present generation only manually and orally. No written records are maintained for that matter a written

documentation is necessary. Almost all the interviewees utilize and gather atleast one or two medicinal plants from their Herbal Kitchen Gardens(HKGs) and others do the honour to collect the same from the forest. This traditional knowledge is on the verge of loss as heavy deforestation is happening and over exploitation of these natural resources cold ultimately diminish the natural practices of the medicinal plant treatments.

Lohit and Anjaw district have a great potential for the development of ethno-medicinal based sector. This could be an important source of employment and income generation for the local inhabitants. A good networking of marketing the herbal/ traditional medicinal plants should be developed to benefit the actual collectors rather than the middle men who usually exploit the rightfull resource owners. Appropriate strategy for conservation and sustainable utilization and management of these natural and endemic resources is very essential. Government can support research on new prospect and diversifying production from NTFPs to meet the changing demand in the market. Its true that State Govt put in efforts through Forest and Environment offices to encourage the protection and preservation of the state medicinal raw resources, but as always it ends up half way due to improper survey and lack of specialized field experts. In order to come out successfully, forest officers must encourage NGOs(specialized in the respective field) and the local common mass participation just as they manage it through JFM.

Measure should also be taken to protect the interest of the local traditional knowledge on the natural medicinal plant resources and their uses from any out of biopiracy.

There are several species of natural medicinal plants which can be domesticated or commercialized in Arunachal Pradesh. Medicinal plants like *Coptis teeta*, *Tinospora cordifolia*, *Paris polyphlla*, *Homoleana aromatica*, *Gynocardia odorata*, *Cardiospermum helicacabum*, *Aconitum ferox*, *Aconitum palmatum*, *Taxus baccata*, *Spilanthus acmilla*,

Dillenia indica. etc can be considered for commercial cultivation as these species are preferred by the local inhabitants.

7.3. Recommendations

- Documentation and proper assessment of the status of wild and domesticated medicinal plants along with sustainable utilization practices needs to be adopted.
- High priority to be accorded to in-situ conservation as well as resource augmentation of medicinal plant species in high volume trade, being obtained wholly or largely from the forests and the state forest departments be supported to undertake these tasks.
- Immediate assessment of the status of wild populations of medicinal plant species in high consumption, which are also of high conservation concern, and appropriate management interventions for building up populations of such species be worked out.
- A system of backward linkage of the raw material consumed by the herbal manufacturing units to their source of production be developed and put in place.
- The existing system of coding of Plant materials in trade (HS codes) be critically evaluated and improved to establish clear linkage of traded materials with their plant sources Support studies for reviewing the plant identities in respect of raw drugs obtained from more than one/ controversial plant sources.
- Support the setting up of 1 national and 4-5 regional Repositories of Plant Raw Drugs in Trade to act as reference centres for authentication of raw drugs in trade and consumption.
- Review and rationalize current schemes for incentive based promotion of commercial cultivation so that the species of conservation concern and facing acute supply shortage could be accorded to focus.

- The transition to sustainable reforestation should be as rapid as possible to allow the conservation of natural old growth forest which is very valuable for biodiversity.
- Cultivation or commercialization of highly valued and threatened medicinal plants should be encouraged by the local community in order to relieve pressure on these plants in wild condition.
- Chemical analysis and screening of medicinal plants needs to be done to determine possible correlation between the chemical constituents and the disorders treated by the herbalists. This information is not available adequately in Arunachal Pradesh for which collaborative investigations with national and international level institutions may be looked for.

In all we can say that with setting up of effective policies and management plans for their extraction and conservation, these medicinal resources can provide for both subsistence needs and income. This, however, requires detail assessment of resource quantities, productivity potential, sustainable harvesting methods, domestication possibilities, and market value of potentially promising species, and importantly, equitable benefit sharing regimes between the local villagers and the pusueing party.

It is hoped that this study will provide useful information about conservation and sustainable use of the natural resources of the area.

References

1. Abbas, J.A., EL-Oqlah, A.A. and Mahasneh, A.M., 1992. Herbal plants in the traditional medicine of Bahrain. *Econ. Bot*, 46:158-163.
2. Agrawala, S. K., Chatterjee, S. and Misra, S. K. 2001 Immunepotential activity of a polyherbal formulation 'Immu-21' (research name). *Phytomedica*, 2, 1–22.
3. Akerele, O. 1988 Medicinal plants and primary health care: an agenda for action. *Fitoterapia*, 59: 355–363
4. Akerele, O., Heywood, V. and Synge, H. (Eds.), 1991. Conservation of Medicinal Plants, Cambridge University Press Ltd., Cambridge, UK, p. 362.
5. Agrawala, S. K., Chatterjee, S. and Misra, S. K. 2001 Immunepotential activity of a polyherbal formulation 'Immu-21' (research name). *Phytomedica*, 2, 1–22.
6. Ainslie, W. 1813. *Materia Medica of Hindoostan*. Madras: Government Press.
7. Alcorn, J. B., 1981. Huastec noncrop resource management: Implications for prehistoric rain forest management. *Human Ecology* 9(4): 395-417.
8. American Cancer Society, 2006 A biotechnology company dedicated to cancer treatment, (www.cancervax.com/info/index.htm).
9. Anderson, E.F. 1985 Ethnobotany of Hill tribe of North Thailand-I. Medicinal plants of Akha. *Econ. Bot.* 40(1): 38-53.
10. Anonymous, 1990 *Ethnobiology in India: A Status Report*. Ministry of Environment & Forest. Government of India. New Dehli, pp.1-68.
11. Anonymous, 1997. Indian medicinal plants: a sector study. Exim Occasional paper 54, March 1997, Export-Import Bank of India Publisher, p. 163.
12. Anonymous, 2001 Medicinal Plants of Arunachal Pradesh. In *State Forest Research Institute Bulletin*. Itanagar, Arunachal Pradesh.
13. Anon., 1992. Convention on Biological diversity, RIO.

14. Arora, R.K., M.L. Maheswari, K.P.S. Chandel & R. Gupta 1980. *Mano* (Inularacemoso); Little known aromatic plants of Lahual valley, India. *Econ. Bot.* 34: 175-180.
15. A dream of globalizing the TCM market, 2003. Report of the Ministry of Commerce of the People's Republic of China.
16. Associated Chambers of Commerce and Industry of India (ASSOCHAM), 2007. Create EPZs, Push Up Herbal Export to Rs.12, 000 Cr. by 2012- ASSOCHAM. *ASSOCHAM Press Release*. June 2007.
17. Ayensu, E.S.1978, Medicinal plants of West Africa. Reference publications, Michigan.
18. Balakrishnan, N. P., 1981-1983. Flora of Jowai and vicinity, Meghalaya. Vol. I-II. BSI, Howrah, India.
19. Balick, M.J.1994.Transforming Ethnobotany for the new Millennium. *Ann. Missouri Bot. Gard.* **83**: 58-66.
20. Barnes, B.K. Zak, D.R., Denton, S.R. and spur, S.H.,1998. Forest Ecology(4th edition). John Wiley & Sons, Inc. USA, pp.588-611, 225-278, 362-386.
21. Berlin, B., Breedlove, D. E. and Raven, P. H., 1974. Principles of Tzeltal plant classification. Academic Press, New York.
22. Berlin, B.1992. *Ethnobotanical Classification: Principle* of categorization of plants & animals in traditional societies. Princeton University Press. Princeton, New Jersey.
23. Bhatta Rai, N.K. 1990. Herbal folk-medicine of Kabhrepalanchok district, Central Nepal *Int. J. Crude drug Res.* **28**: 225-231.
24. Bhuyan,D.K.1989.Medicinal flora of Lohit district of Arunachal Pradesh with special Reference to Ethnobotany. Ph.D. Thesis, Univ. Guwahati.
25. Bodeker.G. 2005. Medicinal plant biodiversity and local health care: Sustainable use and livelihood development. *International Forestry review*.

26. Boisia C.L. & R. Majumdar 1980. Folk lore claims from the Brahmaputra valley (Assam). *Ethnomedicine* 6: 139-145.
27. Botanical Survey of India, 1983. *Flora and Vegetation of India - An Outline*. Botanical Survey of India, Howrah. 24 p.
28. Borthaku, S.K. 1976. Less known medicinal uses among the tribals of Mikir Hills. *Assam. Bull. Bot. Surv. India*. **18**: 66-171.
29. Borthakur 1981 b. studies in Ethnobotany of Karbis (Mikirs): Plant Masticatories and Dyestuffs. In : S. K. Jain (Ed) *contribution to Ethnobotany* (3rd ed 1997), pp. 271-276.
30. Borthkur 1996. Postnatal care of women in traditional system in Assam. *Ethnobotany* **8**: 51-53.
31. Borthkur, K. Nath & P. Gogoi 1996. Herbal remedies of the Nepalese of Assam. *Fitoterapia* 67 (3): 231-237.
32. Banerjee Bikash, Khamba, 1999, In: Tribal Village Council of arunachal Pradesh. edited by Pandey BB, Duarah DK & Sarkar N. (Directorate of Research. Govt. of Arunachal Pradesh, Itanagar). 285-294.
33. Basualdo, I., Zardini, E. M. and Ortiz, M., 1995. Medicinal plants of Paraguay: underground organs: II. *Economic Botany*, 49: 387-394.
34. Bentham, G. & Hooker, J.D., 1862. *Genera Plantarum*. Vol. I. Weldon & Westley, Ltd. And Verlag von J. Gramer, New York.
35. Champion, H.g. and S.K. Seth, 1968. *A revised survey of the forest types of India*. Manager of Publications, Delhi, p. 245.
36. Chaturvedi, S. K. and Jamir, N. S. 2007. Some Ethnomedicinal Plants of Nagaland, India. **In**: *Advances in Ethnobotany*, Das, A.P. and Pandey, A. K. (Eds.), Bishen Singh Mahendra Pal Singh Publications, Dehradun, India, pp. 83-93.

37. Cronquist, A., 1968. The evolution & classification of flowering plants. Houghton mifflin. Boston.
38. Cunningham, A.B. 1993. African medicinal plants. Setting priorities at the interface between conservation and primary health care. UNECO, Paris. France, pp. 1-14.
39. Champion, G & Seth, 1968. A revised forest types of India. Nataraj Publishers, Dehra Dun, 404 p.
40. Chadwick, D. J. and Marsh, J. (Eds.), Ethnobotany and the Search for New Drugs, Ciba Foundation Symposium 185, John Wiley and Sons, Chichester, UK, p. 280.
41. Contamm. G. & Curtis, J.T., 1956. The use of distance measures in Phytosociological sampling. *Ecology*, 37: 451-60.
42. Cox P.A. 1994. The ethnobotanical approach to drug discovery: strengths and limitations. **In:** Ethnobotany and the search for new drugs. Prance, G. and Marsh J. (Eds.), Ciba Foundation Symposium 185. Academic Press, London, pp. 25-41.
43. Curtis, J.T., 1959. The vegetation of Wisconsin. An ordinary of plant communities. University of Wisconsin pres, Madison. W 1 657p.
44. Dam DP & Hajra PK.1997 Observation on Ethnobotany of *Monpas* of Kameng district of Arunachal Pradesh. *In: Contribution to Indian Ethnobotany*. Vol.-1,2nd edn. edited by Jan SK. (Scientific Publisher, Jodhpur pp. 153-160.
45. Das,1999. Less known medicinal uses among the tribals of Mikir Hills. *Bull. Bot. Surv. India* 18: 66-171.
46. Dangol, D. R. and Gurung, S. B., 1991. Ethnobotany of the Tharu tribe of Chitwan District, Nepal. *Intl. J. Pharmacong.*, 29(3): 203-209
47. De Smet, P. A., 2002. Herbal remedies. *New Engl. J. Med.*, 347: 2046–56.

48. Dhar, U., Manjkhola, S., Joshi, M., Bhatt, I. D., Bisht, A.K., and Joshi, M. 2002. Current status and future strategy for development of medicinal plants sector in Uttaranchal, India. *Current Science*, 83 (8): 956-964.
49. Dikshit, V.K., 1999. Export of Medicinal Plants from India: Need for Resource Management. **In:** Biodiversity - North - East India Perspectives: People's Participation in Biodiversity Conservation, Kharbuli B, Syem D. & Kayang H, (Eds.), NEBRC North - Eastern Hill University, Shillong pp 5-88.
50. Deb, S., Arunachalam, A., Das, A. K., 2009. Indigenous knowledge of Nyishi tribes on traditional agroforestry systems. *Indian Jour Trad Knowledge*. 8:41–46.
51. Dhillion, S. S. and Amundsen, C., 2000. Bioprospecting and the maintenance of biodiversity. **In:** Svarstad, H. and Dhillion, S. S. (Eds.), *Responding to Bioprospecting: From Plants in the South to Medicines in North*. Spartacus Forlag, Oslo, pp. 103–131.
52. Dutta, B. K. and Dutta, P. K., 2005. Potential of ethnobotanical studies in North East India: an overview. *Indian Journal of Traditional Knowledge*, 4(1): 7-14.
53. Deb S, Arunachalam A, Das A.K, 2009. Indigenous Knowledge of Nyishi Tribes on Traditional Agroforestry Systems. *Indian Jour Tad Knowledge*, 8: 41 - 46.
54. Devi, D.L.1989. Ethnobiological studies of studies of Monipur valley with reference to Museological Aspects. Ph.D, Thesis, Monipur University.
55. Devi, D.L.1990. Folk Medicines of *ethno biological* importance in Manipur, vol.1 Dhanapati, Imphal.
56. Doley B, Gajurel PR, Rethy P, Singh B, Buragohain R, Potsangbam S, 2010. Lesser known Ethno medicinal Plants Used by the Nyishi community of Papum Pare District, Arunachal Pradesh. *Jour Biol Sci Res*, 1:34-36.
57. Dhyani, P. P. and kala, C. P., 2005. Current research on Medicinal plants: Five lesser known but valuable aspects, *Current Science*, vol. 88, no. 3, 10.

58. Elisabetsky, E., 1986 . New directions in ethnopharmacology. *J. Ethnobiol.*, 6: 121–128.
59. El Rayah Mohammed, E.A.1993. On some medicinal plants of Sudan. Glimpses in Plant Research 10 (p-1): 139-146.
60. Etkin, N. L., 1988. Cultural constructions of efficacy. **In:** The context of medicines in developing countries. Van der Geest, S. and Whyte, R. (Eds.), Kluwer Academic Publishers, pp. 299-326.
61. Faulks, P.J.1958. An introduction to ethnobotany. Moredale, London.
62. Fleming, J. 1810. A catalogue of *Indian Medicinal Plants and Drugs*.
63. Gadgil, M., and Meher-Homji, V. M., 1986. Localities of great significance to conservation of India's biological diversity. *Proc. Indian Acad. Sci. (Anim. Sci. Plant Sci. Suppl.)*, 165–180.
64. Gangwar, A.K., P.S. Ramakrishnan 1990. Ethnobotanical notes on some tribes of Arunachal Pradesh, North-Eastern India. *Econ. Bot.* 39(4): 94-105.
65. Gajurel, P.R. Rethy P., Singh B & Angami, A.2006. Ethnobotanical studies of *Adi Tribes* in Dehang-Debang Biosphere Reserve in Arunachal Pradesh, eastern Himalaya, *Ethnobotany*, 18(1-2) 114-118.
66. Gerhartz, W., Y.S. Yamamota, F.T. Campbell, R. Pfefferkorn and J.F. Rounsaville, 1985. Ullmann's Encyclopedia of Industrial.
67. Gogoi, P. & S.K. Borthakur 1991. Plants of Religio-cultural belief of tai Khamptis of Assam(India. *Ethnobotany* 3 (1&2): 89-95.
68. Gorman, C., 1992. The Power of Potions, *Time*, April 20, p. 52 – 53.
69. Goswami P, Soki D, Jaishi A, Das M, Sarma HN, 2009. Traditional healthcare practices among the Tagin tribe of Arunachal Pradesh. *Indian Jour Trad Knowledge*, 8: 127 –

130.

70. Hajra, P.K. 1977. On some medicinal Plants from Kameng district, Arunachal Pradesh. *Bull. Megh. Sci. Soc.*2: 16-20.
71. Handa, S. S. 2004. Indian efforts for quality control and standardization of herbal drugs/products. In: *Proceedings of the 1st Joint Workshop on Quality control and Standardization of Traditional Medicine—Indo-China Experience*, Jan 8–10.
72. Hajra PK. DM Verma & GS Giri, *Materials for the flora of Arunachal Pradesh*, Vol 1(BSI, Calcutta).1996.
73. Hersberger, W., 1895, A study of plants by the aborigines of the red Indians.
74. Harshberger, J. W., 1896. The purpose of ethnobotany. *Bot. Gaz.*, 21: 146-158.
75. Haridashan, K., I.R. Bhuyan & M.I. Deori 1990. Wild edible plants of Arunachal Pradesh. *Arunachal Forest News* **8 (1&2)**: 1-8.
76. Haridasan, K. 2001. Ethnobotanical studies in Arunachal Pradesh- A status report. *Ethnomedicine of North East India*. (Gian Singh, H.B. Singh & T.K. Mukherjee Eds.) pp.154-167. NISCAIR, CSIR, New Delhi.
77. Haridasan, K, Anupam S, Bhuyan L R, Bisht N S, 2003. Medicinal Plants sector in Arunachal Pradesh: an overview. *Indian Forster*, 129: 37 – 47.
78. Hankey A., 2005. CAM modalities can stimulate advances in theoretical biology. *Evidence Based Complement Alternative Medicine*, 2: 5–12.
79. Hegde, S. N. 1988. Coptees teeta Wall. (Mishmi teeta)- A rare medicinal plant from Arunachal Pradesh. *Arunachal Forest News* 6(1):27-29.
80. Hooker, J. D., 1872-1887. *The flora of British India*. Vol. 1-7. London Ivorra, MD.
81. Holmstedt, B. R., 1995. Historical perspective and future of ethnopharmacology. In: *Ethnobotany: Evolution of a discipline*, Schultes, R. E. and von Reis S. (Eds.), Dioscorides Press, Portland, OR, pp. 320-337.

82. Hutchinson, J., 1926-1934. The families of flowering Plants. I. Dicotyledons, XIV + 328pp. Mac-Millan & Co., London.
83. IUCN, 1987. Centres of Plant Diversity: A Guide and Strategy for their Conservation (An outline of a book prepared by the Joint IUCN-WWF Plants Conservation Programme and IUCN Threatened Plants Unit).
84. Jain S.K. 1963. The origin and utility of some vernacular plant names. *Proc. National Acad. Sci. India, Sec. B.* **33**: 525-530.
85. Jain, A.K. 1992. Ethnobotanical studies on "Sahariya" tribes of M.P. with special reference of medicinal plants. *J. Econ. Tax. Bot. addl. Ser.* **10**: 227-232.
86. Jain, S.K., 1965. Medicinal Plants Lore of the Tribals of Bastar, *Eco. Bot.*, **19**: 236-250.
87. Jain, S. K. and Rao R. R. 1997. *Handbook of Field and Herbarium Methods*. (Today's and Tomorrow's Printer & Published New Dehli).
88. Jamir, N.S. 1997. Ethnobiology of Naga Tribe in Nagaland. I-Medicinal Plants. *Ethnobotany* **9**: 101-104.
89. Janaki Ammal, E.K. 1956. Introduction to the subsistence economy of India. In: L.T. William Jr.(Ed). *Man's role in changing face of the earth*. Univ. of Chicago Press, Chicago, pp. 324-335.
90. Janardhanan, K.P. 1963. An enumeration of the medicinal plants of Khed Taluka, (Maharashtra State). *Bull. Bot. Surv. India.* **5**: 363-374.
91. Jha, A. K., S. Jha & L.N. Mishra 1989. Some folk Medicine of Madhubani, North Bihar, *Vegetos* **2** (1): 104-104.
92. John, T., J.O. Kokward & E.K. Kimanani 1990. Herbal remedies of the Luo of Siaya district, Kenya: Establishing quantitative criteria for consensus. *Econ. Bot.* **44** (3): 369-381.

93. Josheph, J. & P. Kharkongor 1981. A preliminary Ethnobotanical survey in Khasi & Jaintia hills, meghalaya. In. S.K. Jain (Ed.), (3rd ed. 1997). *Contribution to Indian Ethnobotany*, pp. 161-168.
94. Josheph A.R. & J.M. Edington 1990. The use of Medicinal plants by two village communities in the Centrel development Region of Nepal. *Econ. Bot.*44(1):P 372-373.
95. Joshi, A. R. and Edington, J. M., 1990. The uses of medicinal plants by two village communities in the Central Development Region of Nepal. *Econ. Bot.*, 44(10): 17-83.
96. Joy, P. P., Thomas, J., Mathew, S. and Skaria, B. P. 2001. Medicinal Plants. **In:** *Tropical Horticulture* Vol. II, (Eds.) Bose, T. K., Kabir, J., Das, P. and Joy, P. P.). Naya Prokash, Calcutta, pp. 449-632.
97. Kala, C. P. 2000. Status and conservation of rare and endangered medicinal plants in the Indian Trans-Himalaya. *Biological Conservation* 93: 371-379.
98. Kala, C. P., 2005. Ethnomedicinal botany of the Apatani in the Eastern Himalayan region of India, *Journal of Ethnobiology and Ethnomedicine*, 1: 11.
99. Kagyung, R., Gajurel P. R, Rethy P., Singh B., 2010. Ethnomedicinal plants used for gastro-intestinal diseases by Adi tribes of Dehang-Debang Biosphere Reserve in Arunachal Pradesh. *Indian Jour Trad Knowledge*, 9:496-501.
100. Kanjilal, U. N., Kanjilal P. C., Das, A and Purkayastha, C., 1934. *Flora of Assam*. Volume I to V.
101. Kapahi, B.K. 1990. Ethnobotanical investigation in Lahul (H.P.) *J. Econ. Tax. Bot.* 14(1) 49-55.
102. Katzung, B. G.,1995. *Basic and Clinical Pharmacology*, ed 6, London: Prentice Hall International (UK) Limited.

103. Khan, M. A., Khan, M.A., Hussain, M. and Mujtaba, G, 2010. An Ethnobotanical Inventory of Himalayan Region Poonch Valley Azad Kashmir (Pakistan). *Ethnobot. Res. Appl.*, 8: 107-123.
104. Khanna, K.K., G. Shukla & V. Mugdal 1996. New traditional medicinal uses of plants from Jaluan district, Uttar Pradesh. *J.Econ. Tax. Bot. Addl.ser.* 122: 108-111.
105. Koduru, S., Grierson, D. S. and Afolayan, A. J.2007 Ethnobotanical information of medicinal plants used for treatment of cancer.
106. Kraisintu, K. 1997. Industrial exploitation of indigenous medicinal and aromatic plants: Formulation and industrial utilisation. In UNDP Report, 1997.
107. Kroschwitz, J.I. and M. Howe-Grant, 1992. Kirk-Othmer *encyclopedia* of chemical echnology, **2**: 893.
108. Lad V., 1985. The human constitution. **In:** *Ayurveda: The Science of Self-Healing*. Wilmot: Lotus Press, pp. 26–36.
109. Lalnundanga, U.K. Sahoo & L.K. Jha 1997. Ethnobotanical flora in the humid sub-tropical semi-evergreen forest of Mizoram Proc. National Conference on Health Care and developments of Medicines, raipur, pp. 46-47.
110. Lalramnginglova, J.H. 1996. Ethnobotany of Mizoram-A Preliminary Survey. *J.Econ. Tax. Bot. Addl. Ser.* 10; 439-459.
111. Lalramnginglova , H.2003, Ethnomedicinal plants of Mizoram. Bishem Singh Mahendra Pal Singh, Dehra Dun, 333 p.
112. Lalramhninglova, H.1999 Ethnobotany: A Review. *J. Econ. Tax. Bot.* **23** (1)-27.
113. Laloo, R. C., Kharlukhi, L., Jeeva, S. and Mishra, B. P., 2006. Status of medicinal plants in the disturbed and the undisturbed sacred forests of Meghalaya, northeast India: population structure and regeneration efficacy of important tree species. *Curr. Sci.*, 90: 225-232.

114. Lipp, F. J., 1989. Methods for Ethnopharmacological field work. *J. Ethnopharmacol.*, **25**: 139-150.
115. Lozoya, X.. 1994. Two decades of Mexican ethnobotany and research on plant derived drugs. **In**: Ethnobotany and the search for new drugs. Chadwick, D. J. and Marsh, J. (Eds.), John Wiley and Sons, Chichester, UK, pp. 130-163.
116. MacKinnon, J. and MacKinnon, K. 1986. Review of the Protected Areas System in the Indo-Malayan Realm. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland and Cambridge, U.K. 284 pp.
117. Magurran, A., 1988. Ecological diversity & its measurement, Princeton University Press, Princeton.
118. Mahunnah, R. A. L., 1991. Some medicinal plants of Southern highlands of Tanzania. *J. Econ. Tax. Bot.*, 15(3): 557–563.
119. Masood, E., 1998. A formula for indigenous involvement. *Nature*, 392: 539.
120. Meyer, J. J. M., Afolayan, A. J., Taylor, M. B. and Engelbrecht, L. 1996. Inhibition of herpes simplex virus type I by aqueous extracts from shoots of *Helichrysum aureonitens*. *J. Ethnopharmacol.*, **52**, 41–43.
121. Mohiddin, M. Y. B. H., Chin, W. and Worth, D. H. 1992. Traditional Medicinal Plants of Brunei Darussalam Part III. Sengkurong, *Pharmaceutical Biol.*, 30(2): 105-108.
122. Moore, P. D., 1994. Trials in bad taste. *Nature*, 370: 410–411
123. Mudgal V, Pathak MK & Bhaumik M., 2002. Dihang-Dibang Biosphere Reserve. In: Floristic Diversity and Conservation Strategies in India Vol. V. edited by Singh NP & Singh KP. (Botanical Survey of India. Ministry of Environment and Forest). 2457-2494.
124. Namsa, N.D., Hui, T., Mandal M, Das, A. K, Kalita P., 2009. An ethnobotanical study of traditional anti-inflammatory plants used by the Lohit community of Arunachal Pradesh, India. *Jour Ethnopharmacol*, **125**:234-245.

125. Nath, S. C. and Bordoloi, D. N., 1989 Ethnobotanical observation on some medicinal folklores of Tirap district, Arunachal Pradesh. *J. Econ. Taxon. Bot.*, 13: 321-325.
126. Nayar, M. P. & A.R.K. Sastry. 1987. Red data book of Indian Plants. Vol. I. Botanical Survey of India, Calcutta.
127. Newman, D.J., G.M. Cragg and K.M. Snader, 2000. The influence of natural products upon drug discovery. *Nat. Prod. Res.*, 17: 215-234.
128. Palmer, E. (1869-1910), Medicinal plants in Northern Mexico: Ethno-historical file of Dr. Edward Palmer. **In:** Proceedings of the First Meeting on Traditional Medicine in Northern Mexico, National Institute of Anthropology and History, Chihuahua. (In Spanish).
129. Pal, D. C., 1984. Observations on ethno-botany of tribals of Subansiri, Arunachal Pradesh. *Bull. Bot. Surv. Ind.*, 26:26-37.
130. Pandey, Govind and Madhuri, S. 2006 Medicinal plants: better remedy for neoplasm. *Indian Drugs*, 43, 869–874.
131. Patwardhan, B., Warude, D., Pushpangadan, P. and Narendra Bhatt, N., 2005. Ayurveda and Traditional Chinese Medicine: A Comparative Overview. *eCAM.*, doi:10.1093/ecam/neh140.
132. Pezzuto J. 1996 Taxol production in plant cell culture comes of age. *Nature Biotechnol.* 14: 1083.
133. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

134. Puri, H. S., 1983. Medicinal plants of Tezpur (Assam). *Bull. Medico Ethno-Bot. Res.*, IV (1-2): 1-13.
135. Rao, K. V. K., Schwartz, S. A., Nair, H. K., Aalinkeel, R., Mahajan, 2004. Book "Turmeric: The Genus *Curcuma*". CRC press, Taylor & Francis Group.
136. Rao, P.V., Ushabala, P., Seshiah, V., Ahuja, M.M., Mather, H.M. 1989. The Eluru survey: prevalence of known diabetes in a rural Indian population. *Diabetes Research and Clinical Practice* 7 (1), 29-31.
137. Rao, R. R. and Neogi, B., 1980. Observations on the ethnobotany of the Khasi and Garo tribes in Meghalaya, India. *J. Econ. Tax. Bot.*, 1: 157-162.
138. Rama Shankar and M.S. Rawat. 2004. Medico-ethno-botanical observation of Changlang and Lohit districts of Arunachal Pradesh. *Bull Medico Ethnobot Res*, 25:64-78
139. Rawat MS & Chaudhary S. *Ethno-medico-botany of Arunachal Pradesh (Nyshi and Apatani Tribes)*. Bishen Mahendra Pal Singh, New Delhi).1998.
140. Rheed, H.V., 1678-1703. *Hortus Indicus Malabaricus*, Amsterdam, 12 Volumes.
141. Robinson, T., 1974. Metabolism and function of alkaloids in plants. *Science*, 184: 430–435.
142. Roberts MF.1988 Medicinal products through plant biotechnology. In: Robins RJ, Rhodes MJC. (eds). *Manipulating Secondary Metabolism in Culture*. Cambridge: University Press, pp 201-16.
143. Rogers, D.J., 1980. Lakota Names and Traditional Uses of Native Plants by Sicangu (Brule) People in the Rosebud Area, South Dakota. Rosebud Education.11 Society, SI. Francis, South Dakota.
144. Saklani, A. and Jain, S. K., 1994. Cross cultural ethnobotany of Northeast India. New Delhi: Deep Publications.

145. Sarma R, Arunachalam A, Malkania M, Majumdar M & Adhikari D.,2006, Ethno-medico-botany of *Chakmas* of Arunachal Pradesh, India, *Indian Forester*,132(4) 474-484.
146. Sarmah R., Adhikari, D., Mazumder, M, Arunachalam A, 2008. Traditional medicobotany of Chakma community residing in the northwestern periphery of Namdapha national Park in Arunachal Pradesh. *Indian Jour Trad Knowledge*, **7**:587-593.
147. Schultes, R. E.1960. Topping our heritage of ethnobotanical lore. *Econ. Bot.*, 14:257–262.
147. Schultes, R.E. 1962.The role of the ethnobotanist in the search for new medicinal plants. *Lloydia.*, 25: 257–266.
148. Schultes and von Reis, S. (Eds.), 1995. Ethnobotany: Evolution of discipline. Dioscorides Press, Portland, OR. Part VI.
149. Sen, P., Dollo, M., Choudhury, M. D, Choudhury, D. 2009. Documentation of traditional herbal knowledge of *Khamptis* of Arunachal Pradesh. *Indian Jour Trad Knowledge*. **7**:438-442.
150. Singh, J., Singh, A. K. and Khanuja, S. P. S., 2003. Medicinal plants: India's opportunities. *Pharma Bioworld*. 1:59–66.
151. Singh, B. K. H., 1996. Plants Used in Medico-sexual Purposes by Meitei Community in Manipur state, India. *J. Econ. Taxon. Bot.*, (Addl. Series) 12: 364.
152. Silva, V. A., 1997, Ethnobotany of Xucuru Indians with emphasis on species from the Sierra Brejo Ororoba (Fishing-EP), M.Sc., Thesis, Department of Botany, University of Pernambuco, Recife, Pernambuco.

153. Srivastava, R. C, Singh, R. K, Mukherjee, T. K, 2010. Indigenous biodiversity of Apatani plateau: Learning on biocultural knowledge of Apatani tribe of Arunachal Pradesh for sustainable livelihoods. *Indian Jour Trad Knowledge*, **9**:432-442.
154. State Population Census Report, 2001. Department of Economics and Statistics, Lohit District, Government of Arunachal Pradesh Publication.
155. Statistical Hand Book of Lohit & Anjaw District of the year 2003-2004.
156. Stockwell, C., 1988. Nature's pharmacy. London, United Kingdom. Century Hutchinson Ltd
157. Suffness, M., Cragg, G. M., Grever, M. R., Grifo, F. J., Johnson, G., Mead, J. A., Schepartz, S. A., Venditti, J. M. and Wolpert, M., 1995. The National Cooperative Natural Products Drug Discovery Group (NCNPDDG) and International Cooperative Biodiversity Group (ICBG) programs. *Intl. J. Pharmacong.*, **33**: 5-16.
158. Thomson, W.A.R., 1978. Medicines from the Earth. Maidenhead, United Kingdom. McGraw-Hill Book Co.
159. Thomas, J., 1997. Medicinal and aromatic plants research in India. **In**: Proceedings of Training course on Industrial Exploitation of Indigenous Medicinal and Aromatic Plants. UNDP, Beijing, China. June 17-27, 1997.
160. Tag, H. and Das, A. K., 2004. Ethnobotanical notes on the *Hill Miri* tribe of Arunachal Pradesh. *Ind. J. Trad. Know.*, **3**: 80–85.
161. Tag, H., Das, A. K & Kalita, P. 2005. Plants used by *Hill Miri* of Arunachal Pradesh in Ethnofisheries, *Indian J Traditional Knowledge*, **4**(1) :57-64.
162. Teron, R. & Borthakur, S. K., 2004. Herbal dyes & Cultural Significance of Colors among the Karbis Ethnic Tribe in Noreast India. [www.ethnobotanyjournal.org/ vol 10/I 1547-3465-10-593. pdf](http://www.ethnobotanyjournal.org/vol10/I1547-3465-10-593.pdf).

163. Tiwari, K. C. Majumder, R. and Bhattacharjee, S., 1978. Some Medicinal Plants from District Tirap of Arunachal Pradesh: *Ind. J. Pharmaceutical Sci.*, 40(6): 206-208.
164. Tiwari, K. C. and Tiwari, V. P., 1996. Some important medicinal plants of the tropical, subtropical and temperate region of Siang, Subansiri and Tirap districts of Arunachal Pradesh. *J. Econ. Taxon. Bot.*, (Additional Series), 12: 359-363.
165. UNESCO, 1996. Culture and Health, Orientation Texts – World Decade for Cultural Development 1988 – 1997, Document CLT/DEC/PRO – 1996, Paris, France, p. 129.
166. UNESCO, 1998. Promotion of Ethnobotany and the Sustainable Use of Plant Resources in Africa, FIT/504-RAF-48 Terminal Report, Paris, p. 60.
167. Uniyal, S.K., Sigh, K.N., Jamwal, P and Brijlal, 2006. Traditional use of medicinal plants among the tribal of Chhota Bangal, Western Himalay. *Journals of Ethnobiology and medicine*.pp.2-14.
168. Van Zeist, W. and Casparie, W. A., 1983. Plants and ancient man: studies in palaeoethnobotany. **In:** Poceedings of the Sixth Symposium of the International Work Group for Palaeoethnobotany, Groningen, 30 May-3 June.
169. Vecchia, C. L. and Tavani, A.1998 Fruits, vegetables, and human cancer.*Eur. J. Cancer*, 7: 3- 8.
170. World Bank, 1997. Medicinal Plants – Rescuing a Global Heritage. Lambert, J., Srivastava, J. and Viemeyer, N. (Eds.), Technical Paper No. 355, p. 61.
171. Worth, D. H. 1991, Traditional medicinal plants of Rarotonga, Cook Islands. Part II. *Intl. J. Pharmacong.*, 29(1): 71-79
172. World Health Organization, 2000.Report of the inter-regional workshop on intellectual property rights in the context of traditional medicine, Bangkok, Thailand Dec 6–8, <http://www.who.int/medicines/library/trm/who.edu.trm-2001-I/who-edutrm-2001-1.pdf>.

173. Yang, S. and Walter, T.W., 1992. Ethnobotany and economic role of the Cucurbitaceae of China. *Eco. Bot.*, 25: 23-29.
174. Yobin YSH. Ethnobiological studies of Arunachal Pradesh: the Yubins of changlang district. *Biodiversity: North east India perspective*. 1999.116-120.

Annexure I

PERFORMA FOR ETHNOBOTANICAL INFORMATION

Visit Detail

Name:

Purpose of Visit:		
Date:	Place of visit:	
State:	District:	Altitude:
Community/Tribe contacted:		

Ethno medicinal Plant Collection Data

Botanical Name:	Family:						
Local Name(s):	Trade Name:						
Habit:	Habitat:						
Phenology(Flowering/fruitletting):							
Part Used:	Collection No.:						
Availability: <input type="checkbox"/>	Wild: <input type="checkbox"/>	Cultivated: <input type="checkbox"/>	Protected: <input type="checkbox"/>				
Produced from vendors/markets: <input type="checkbox"/>							
Occurrence: <input type="checkbox"/>	Available throughout year: <input type="checkbox"/>	Seasonal (from.....to.....)					
Abundance: <input type="checkbox"/>	Abundant: <input type="checkbox"/>	Common: <input type="checkbox"/>	Frequent: <input type="checkbox"/>	Sporadic: <input type="checkbox"/>	Rare: <input type="checkbox"/>		
Quantity available (approx.): Nos.			Mass:				
Threat Status (IUCN category): CR/EN/VU/NT/LC/DD/NE							
Price (if purchased):	Rs./kg	Banned?	Yes <input type="checkbox"/>	No <input type="checkbox"/>			
Details of vendor(s):							
Field Identification Characters: How Local people identify it? (organoleptic etc.)							
Collection Methods							
Time & season of collection:			State of Maturity:				
Harvesting methodology:							
Whether used fresh/semi-dried/dried:							
Storage techniques:							
Drying method: <input type="checkbox"/>					Shade method: <input type="checkbox"/>	Sun drying: <input type="checkbox"/>	Heat drying: <input type="checkbox"/>
Other(specify):							
Photograph enclosed: <input type="checkbox"/>					Habit: <input type="checkbox"/>	Habitat: <input type="checkbox"/>	Close up of plant parts: <input type="checkbox"/>
None: <input type="checkbox"/>							

Paper published

under

Pleione 7(2): 469 - 472. 2013. ISSN: 0973-9467

© East Himalayan Society for Spermatophyte Taxonomy

Traditional Tai-Khampti medicinal plants to cure fractured bones

Sheelawati Monlai¹, H. Lalramnghinglova^{1,3} and A. Arunachalam²

1. Department of Environmental Science, Mizoram University, Aizawl – 796004, Mizoram, India

2. Indian Agriculture Research Institute (IARI), New Delhi 110012, India

3. *Corresponding author*: lalram.mzu@gmail.com / febesmzu@yahoo.co.in

[Received 12.04.2013; accepted 14.12.2013]

Abstract

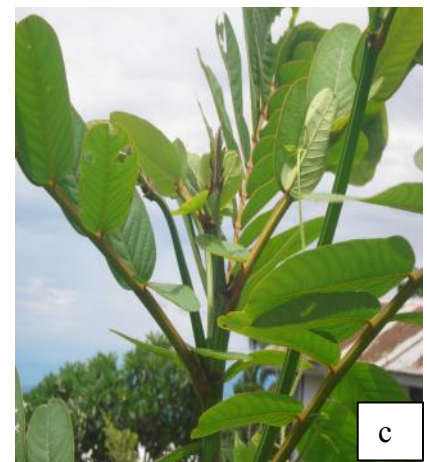
This paper tries to document the traditional wealth of medicinal plants used to cure the fractured bones by the Khampti tribe of Arunachal Pradesh. The Tai-khampti have settled themselves in the Eastern circle, under Lohit district of Arunachal Pradesh covering mainly three circles- Chongkham, Namsai & Piyong, while some of them are found to have made their homes in the neighboring Assam State. They are mainly famous as traditional herbal doctors. The usage of wild plants with the right day of their calendar along with their enchantments adds to the fast recovery. The plant parts used varies from different plant healers to healers. Some use the above parts while some use the below parts. Thus, the present paper documented 23 medicinal plants which are important ingredient to cure the fractured bones of the patients. These traditional medicinal plant species were distributed across 13 families and 21 genera. Asclepiadiaceae, Zingiberaceae and Vitaceae were the most dominant family with 3 genera and 3 species of medicinal plants each from the respective families. The other families in the race were Chloranthaceae, Taccaceae and Araceae, followed by Caprifoliaceae, Plumbaginaceae, Rubiaceae, Bignoniaceae, Orchidaceae, Arecaceae, Cyperaceae and Aspleniaceae.

Key words: Khampti tribe, Traditional healers, Ethnomedicinal plants, Bone fracture, Arunachal Pradesh.

Plate No. 1

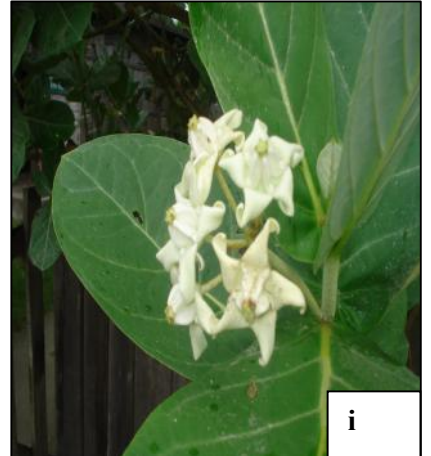
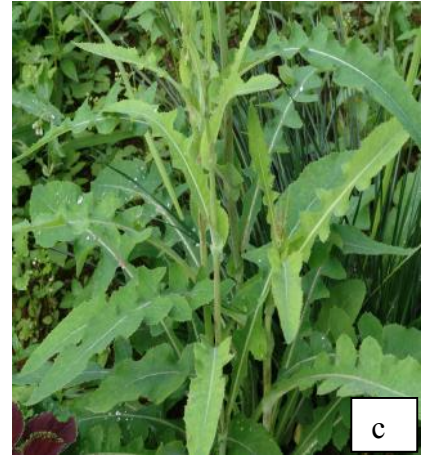


a-Aconitum ferox, Wall., b-Coptis teeta, Wall., m. c-Parabaena sagittata, Miers., d-Tinospora cordifolia, Willd, e- Sterculia villosa, Roxb., f- Impatiens pulchra, Hook., g- Zathoxylum acanthopodium, Wall., h- Leea cripa, L. i- Aesculus assamica, Griffit.,

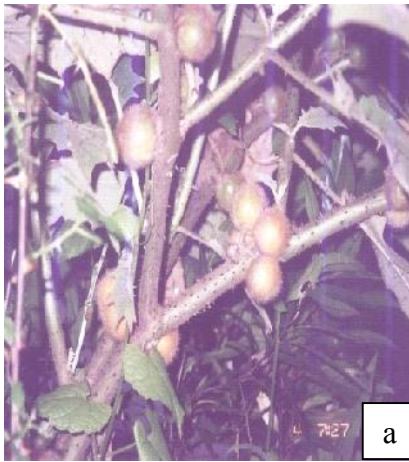


a- Moringa olifera L., b- Abrus precatorius L., c- Cassia occidentalis L., d- Kalanchoe pinnata, Kurz., e- Melastoma malabathricum L., f- Begonia roxburghii, Miq., g- Schefflera venulosa Wight & Arn, .h-Trevesia palamata Roxb., i- Hedyotis scandens Roxb..

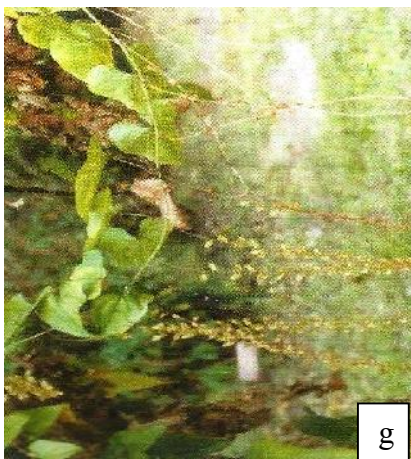
Plate No.3



a- *Dichrocephala integerifolia* L.f., b. *Bidens pilosa* L., c. *Sonchus arvensis* L., d. *Plumbago rosea* L., e. *Ardisia pedunculosa* wall., f. *Embelia ribe* Burm., g *Alstonia scholaris* L., h. *Allamanda cathartica* L., i. *Calotropis gigantea* L.



a. *Solanum ferox* L., b. *Millingtonia hortensis* L., c. *Thunbergia grandiflora* L.,
d. *Stachytarpheta jamaicensis* L., e. *Clerodendrum serratum* I f. *Clerodendrum viscosum* Vent
g. *Pogostemon benghalensis* kuntz h. *Mentha piperita* L i. *Salvia coccinea* L



*a. Aristolochia indica L b. Haughtuynia cordata Thunb. C.Euphorbia nerifolia L
d. Glochidion multiloculare Voight e. Croton roxburghii Balak . f. Khaemferia
galangal L., g. Dioscorea floribunda h. Hemerocallis fulva L i. Paris
polyphylla Smith*

Plate No.6

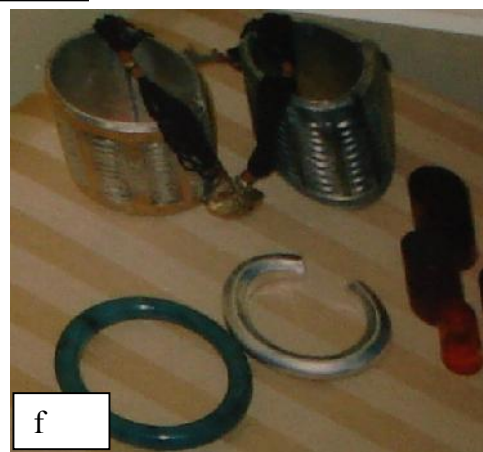
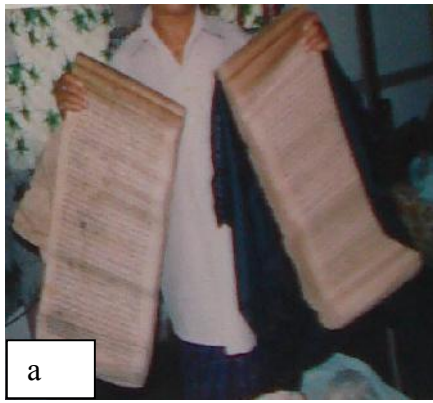


a. *Arisaema tortuosum* Var. b. *Lasia spinosa* L., c. *Alocasia microrhiza* Scot.,
d. *Taxus bacata*, e. *Lygodium flexuosum* L., f. *Asplenium nidus* L

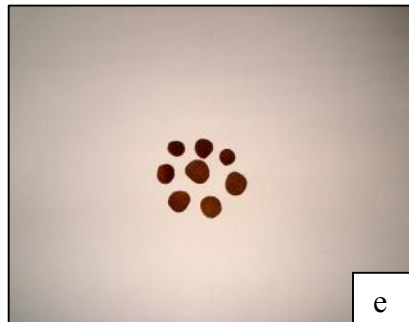


a. Khampti couple with traditional dresses b. Mishmi Traditional Healer c & f. Typical Mishmi House d. Dead animal Heads, e. Singpho Couple with traditional dresses g. Mishmi Pray house cum Sacrificed room.

Plate No. 8



a. Traditional Old Tai Script, *b.* a drum, *c.* Tai Gong, *d.* Traditional water Turbine, *e.* Armour, *f.* traditional Jewellery, *g.* Traditional Sword.



A to c Local traditional healers, *d-* dried bark of *Heterocarpus*, *e-* prepared dried pills, *f-* dried root of *aconitum ferox* (Wall), *g-* dried roots of *Coptos teeta* (Wall).