CROSS CULTURAL ETHNOBOTANY OF TAGIN AND APATANI TRIBES OF ARUNACHAL PRADESH

A thesis submitted in partial fulfilment of the requirement for the award of the Degree of Doctor of Philosophy in Botany under the Faculty of Life Science,
Rajiv Gandhi University

Submitted By

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2024

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To

The Controller of Examination
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Sub: Submission of Ph.D. thesis titled "Cross cultural Ethnobotany of Tagin and Apatani Tribes of Arunachal Pradesh" by Ms. Rubu Rinyo, Ph.D Scholar, Department of Botany.

Sir,

I have much pleasure in forwarding this Ph.D. thesis titled "**Cross cultural Ethnobotany of Tagin and Apatani Tribes of Arunachal Pradesh"** submitted by Ms. Rubu Rinyo, Ph.D. Scholar, Registration No. RGU/RS-976/2021, Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India for examination by the subject experts and for award of the Degree of Doctor of Philosophy in Botany.

Ms. Rinyo has conducted her research work under my supervision and the information presented by her in this thesis is declared as original by the candidate herself (declaration letter of candidate enclosed) which is based on extensive field carried out by her over a period of three years from 2021 – 2024. This thesis has not been submitted before in part or full at this university or any other university for any degree and diploma.

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Yours Sincerely

Prof. Hui Tag
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CERTIFICATE

This is to certify that the Ph.D. thesis titled "**Cross cultural Ethnobotany of Tagin and Apatani Tribes of Arunachal Pradesh"** is being submitted by Ms. Rubu Rinyo, Ph.D. Scholar, Registration No. RGU/RS-976/2021 Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India.

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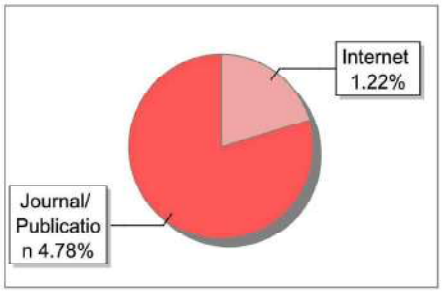

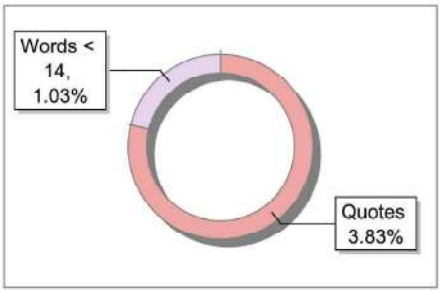

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Pre-PhD Seminar Certificate

The Pre-PhD Seminar of **Ms. Rubu Rinyo,** Research Scholar (Reg. No. RGU/RS-976/2021) in Botany working under the supervision of Prof. Hui Tag was held in the Department of Botany at 3:00 pm on 5th April, 2024. The candidate presented her work on the topic "**Cross Cultural Ethnobotany of the Tagin and Apatani Tribes of Arunachal Pradesh**". The research work done by the candidate fulfils all objectives mentioned in her synopsis. The Departmental Board of Studies is satisfied with her presentation and recommends for submission of her thesis to the University for adjudication.

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DECLARATION

I, Ms Rubu Rinyo, hereby declare that the Ph.D title "**Cross cultural Ethnobotany of Tagin and Apatani Tribes of Arunachal Pradesh" is an original work submitted by me bearing registration number** RGU/RS-976/2021, Department of Botany , Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India for the partial fulfilment of the degree of Doctorate in Philosophy in Botany Department.

I have conducted this work under the supervision of Prof. Hui Tag, Department of Botany, Rajiv Gandhi University. I further declare that the work presented in this thesis is an original which is based on extensive field survey done by me in the Tagin and Apatani dominating area of Upper Subansiri and Lower Subansiri district of Arunachal Pradesh from 2021-2024.

I declare that the name of the plants were verified using online website Plant of the World Online (https://powo.science.kew.org/), hosted by kew science, Royal Botanical Garden, Kew UK. Voucher specimens were submitted to Herbarium of Arunachal Pradesh, Department of Botany, Rajiv Gandhi University.

I further declare that this work has not been submitted before in part or full at this university or any other university for any degree and diploma.

Further this dissertation has been checked for plagiarism content through online Drillbit Plagiarism Detection Software and found only 6% of plagiarism content which is safe and below the UGC recommended level of plagiarism (Plagiarism certificate enclosed).

I declare that I have properly acknowledge all the data sources, institutes, competent authority and funding sources and all the concern persons who have directly or indirectly contributed in successful submission of this thesis.

Date:8th April 2024
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THIS THESIS IS DEDICATED

TO

MY SUPPORTIVE FAMILY AND PH.D GUIDE

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CROSS CULTURAL ETHNOBOTANY OF TAGIN AND APATANI TRIBES OF ARUNACHAL PRADESH

ABSTRACT

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ABSTRACT

Ethnobotany is a multidisciplinary science which serve as a doorway to many disciplines, together with anthropology, medicine, chemistry, agriculture, horticulture, forestry, agro forestry, archaeology, economics, religious study, linguistics, and systematic. Documentation rooted in ethnobotany has the potential to support the preservation of regional plant variety, culture, and relationships. Ethnobotanical research that documents traditional knowledge may serve as the foundation for the identification of novel components for allopathic drugs and formulations.

The cross-cultural ethnobotanical studies were parsimoniously studied before 1998, but nowadays, they are increasingly being analyzed. So, cultural factors appear to be more important in understanding both the durability of plant resources and community knowledge of plant collecting and usage. As more and more data about plant usage are being collected and analyzed, the field of quantitative ethnobotany is becoming more and more important in order to support the scientific validity and rigour of ethnobotany.

The floras of Arunachal Pradesh are distributed in over 20 different forest types according to categorization. The rich traditional knowledge of the region is preserved in Arunachal Pradesh due to its diverse geographical, climatic, and cultural features. Since the state of Arunachal Pradesh is rich in ethnocultural and biological diversity, each tribe, clans and phratris have their own age old ethnobotanical knowledge bases and ethnotaxonomical methods which include traditional classification, identification and nomenclature of forest types and its constituent bioresource for effective management and sustainable utilization since time immemorial. Majority of the local communities living in Arunachal Himalayan region are devoid of written script due to which their traditional knowledge bases are mostly transfer to the next generation through folklore and oral tradition. The ethnobotanical knowledge of the local communities is proven as holistic and sustainable which contributes to conservation and sustainable utilization of local bioresources. There is an urgent need for documentation of those valuable ethnobotanical knowledge bases of the communities through cross cultural approaches which could contribute to future holistic management and sustainable utilization of local biodiversity wealth.

The present study focuses on Tagin and Apatani tribes of Arunachal Pradesh and aim to unveil rich folklore and oral traditions. The Tagin community is an indigenous population belongs to mongoloid race, migrated from Tibet that lives along the Subansiri

River in Arunachal Pradesh and Daporijo in Upper Subansiri District is home to the Tagin tribes, who are also sporadically dispersed across West Siang District while the Apatani's are of Tibeto-Mongolid ancestry. The Apatani people continue to follow their old ecological knowledge of resource management together with their ceremonies, customs, cultures, etc. The proposed quantitative cross cultural ethnobotanical study on the Tagin and Apatani community of Upper and Lower Subansiri District of Arunachal Pradesh aims to unveil rich folklore and oral traditions related to sustainable utilization of plant diversity of their the traditional ecological landscape.

The current cross-cultural ethnobotanical investigations were done on 300 informants (156 Male and 144 female) during the year 2021-2023 which involved a total of thirty villages [15 from the Tagin and 15 from the Apatani] localities. Present Cross-cultural ethnobotanical study conducted in the Tagin and Apatani localities of Upper and Lower Subansiri district revealed 333 species of ethnobotanical significance belonging to 245 genera and 107 plant families distributed along different altitudinal gradients. The study reported 10 species from Pteridophytes group, 4 species of Gymnosperm group, 315 species of Angiosperm group and the DAFOR analysis revealed a very less percentage of species under Dominant category and highest number of species under frequent category. Based on the study, leaves and fruits have high concentration of use among the selected tribes. Similarly, most of the plants are economically significant followed by medicinal and wild edible vegetables and fruits. From a total of 101 medicinal uplants, most plants are found to have ailment property of gastrointestinal and simple injury, wound and swelling. Among Apatani, *Phyllostachys manii* and *Pinus wallichiana* have higher use value and the *Dendrocalamus hamiltonii* was found to have high use value among agin tribes. The highest ICF was recorded in Oral and Dental among Apatani tribe whereas the highest ICF recorded in Mammary & gynecological and Oral & Dental in Tagin tribe. *Acmella oleracea and Houttuynia cordata* in Apatani inhabitant area and *Ageratum conyzoides* and *Paederia foetida* in Tagin inhabitant areas indicates high RFC score. The high fidelity level (FL%) for certain species such as *Houttuynia cordata and Zingiber officinale* in Apatani and *Rheum nobile* and *Zingiber officinale* in Tagin indicates strong tribal agreement on their medicinal benefits. A less percentage of similarity indices i.e. 30.63% (Jaccard’s index) and 18.82% (Rahman’s index) was recorded in the study are. Most of the plants have significant used in magico-religious practices, and constructing traditional handcraft and agricultural tools and a total of 27 plant species (19 from Tagin and 8 from Apatani) are newly recorded of

having ethnobotanical uses. The study recorded 103 no. of species, having frequent commercial practice and mostly wild-harvested which highlighted the economic relevance of these plants among the tribes. The Study revealed that the Tagin and Apatani tribes of Arunachal Pradesh have a deep connection with plant kingdom, which are integral to their culture, spirituality, and livelihood. Their close association with ethnobotanical resources emphasizes the importance of preserving indigenous knowledge and practices for sustainable development and livelihood.

CHAPTER 1
INTRODUCTION

1.1. Concept of Ethnobotany

The term "*ethnobotany*" was first coined by John William Harshberger, an American botanist in 1895 and he defined it as "*the investigation of plants utilized by aborigine people*". However, it was Richard Evan Schultes who commenced his ethnobotanical trip in the Amazon and after that, the ethnobotany started to assume as independent branch of science. Schultes (1962) further broadened the concept of ethnobotany as "*the study of the relationship which exists between people of ancient societies and their plant environment*". Ethnobotany is a multidisciplinary science which serves as a doorway to many disciplines, together with anthropology, medicine, chemistry, agriculture, horticulture, forestry, agroforestry, archaeology, economics, religious study, linguistics, and systematic. The interdisciplinary idea of ethnobotany has offered ascend to various sub-disciplines, where the first subject is organic science i.e., plants used by folkloric tribes. Some sub-disciplines of ethnobotany are ethnoalgology, ethnomycology, ethnobryology, ethnopteridology, economic botany, ethnotaxonomy, ethnoecology or spritiual ecology (Jain, 1981; Jain, 1991; Martin, 2008; Maheswari, 2000). Ethnobotanist have previously formed strong associations with chemistry as such mention in the work of Schultes & Holmstedt, 1968; Schultes et al., 1969, 1977a, 1977b; River and Lindgren, 1972; Buckley 1973 (Prance, 1991).

1.2. Current trends in ethnobotanical research

Documentation rooted in ethnobotany has the potential to support the preservation of regional plant variety, culture, and relationships (Haq et al., 2023). The knowledge gathered via ethnobotanical research enables us to verify the popular plants and how various ethnic groups utilize them (Boro et al., 2023). Understanding ethnobotany is essential to maintaining the integrity of the natural world and may offer priceless insights for bioprospecting efforts to find novel food and medicinal plants (Yao et al., 2018). Ethnobotanical research that documents traditional knowledge may serve as the foundation for the identification of novel components for allopathic drugs and formulations (Wali et al., 2019). According to several studies (Sánchez-Mata et al., 2012; Pereira et al., 2011), the majority of wild edible plants have medicinal qualities or are

rich in nutrients because they contain bioactive chemicals. As a result, they may be regarded as nutraceutical agents. According to Angami et al., (2006), wild edible plants, particularly those utilized as green vegetables, significantly contribute to revenue production.

The cross-cultural ethnobotanical studies were parsimoniously studied before 1998, but nowadays, they are increasingly being analyzed (Kunwar et al., (2018). Prance (1973) reported on a comparative study of the ethnobotany of four Amazonian tribes. Knowledge about the usage of plants is also influenced by many subgroups of socio-cultural characteristics, including population, occupation, education, wealth, gender, age, ethnicity, and household size (Phillips & Gentry, 1993). So, cultural factors appear to be more important in understanding both the durability of plant resources and community knowledge of plant collecting and usage (Maffi, 2005). As more and more data about plant usage are being collected and analyzed, the field of quantitative ethnobotany is becoming more and more important in order to support the scientific validity and rigour of ethnobotany (Bletter, 2007). When conducting a quantitative ethnobotany study, quantitative methods are applied to directly analyze data on plant utilization and the quantitative techniques put forth by Philips raised awareness of ethnobotanical study (Venkatesan et al., 2022).

1.3. Ethnobotanical research opportunities in Northeast India

Northeast India, part of the Indo-Burma hotspot, is home to 145 indigenous ethnic groups, making approximately 12% of the country's total tribal population. It of seven sister states (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura) and one brother state (Sikkim). (Siram & Associates, 2023). The State of Arunachal Pradesh is the largest among the eight states of North East India covering a geographical area of 83,743 Sq. Km with total forest coverage of almost 80% (FSAP, 2008). Geographically, the entire state is part of Eastern Himalayan range with few areas of plain land near the border of Assam. The state is located within the geographical coordinates between the latitude 26˚28' N to 29˚30' N and longitude 91˚30' E to 97˚30 E. The state represents the best examples of India’s unity in diversity as the state is inhabited by 26 districts, 28 major tribes and 110 sub-tribes with more than 130 dialects which is spoken by its 13,82,611 lakhs population. The population density of the state is 17 persons per square kilometer distributed in over 19 districts that is lowest in India (Census, 2011). The floras of Arunachal Pradesh are distributed in over 20 different

forest types according to categorization done by Champion & Seth (1968) and Kaul & Haridasan (1987). In each vegetation zone, different group of plants species are found to be occurring which are largely exploited by indigenous communities of the State as food, medicinal and cultural materials. The rich traditional knowledge of the region is preserved in Arunachal Pradesh due to its diverse geographical, climatic, and cultural features (Srivastava et al., 2009). Since the state of Arunachal Pradesh is rich in ethnocultural and biological diversity, each tribe, clans and phratris have their own age old ethnobotanical knowledge bases and ethnotaxonomical methods which include traditional classification, identification and nomenclature of forest types and its constituent bioresource for effective management and sustainable utilization since time immemorial.

1.4. Current trends and scopes for ethnobotanical studies in Arunachal Pradesh

As one of the biggest states in Northeast India, Arunachal Pradesh is populated by 28 major tribes, which include the Adi, Apatani, Bugun, Galo, Monpa, Sherdukhpan, Miji, Aka, Mishimi, Khampti, Nocte, Tangsa, Wangcho, Singpho, Tagin, Nyishi, and Shertang, among others (Government of India, 2013). They are mostly agrarian by occupation that invariably are dependent on wild and cultivated plant resources to sustain their local economy and livelihood (Haridasan et al., 2006; Muthu et al., 2006; Tag et al., 2015). From their festivals to their agricultural labour, all societies rely entirely on the resources found in forests (Doley et al., 2011). Each tribe has their own rich indigenous botanical knowledge on diverse uses of the wild plants and animal resources (Pal, 1984, 1992, Nag, 1988). Majority of the local communities living in Arunachal Himalayan region are devoid of written script due to which their traditional knowledge bases are mostly transfer to the next generation through folklore and oral tradition. The ethnobotanical knowledge of the local communities is proven as holistic and sustainable which contributes to conservation and sustainable utilization of local bioresources (Tag et al., 2015). Although the Arunachal Himalayan region is rich in cultural and biological diversity but traditional knowledge is rapidly eroding in some districts due to westernization and acculturation processes which has occurred during last 20 years. There is an urgent need for documentation of those valuable ethnobotanical knowledge bases of the communities through cross cultural approaches which could contribute to future holistic management and sustainable utilization of local biodiversity wealth. To this effect, few ethnobotanical works has been pioneered in the state by Das (1986), Das

& Tag (2006), Pal (1984), Murtem (2000, 2005), Tag (2008) on *Adi* of East Siang, *Nyishi* of Upper Subansiri and *Khamti* Tribes of Lohit Districts in Arunachal Pradesh.

The Tagin community is an indigenous population belongs to mongoloid race, migrated from Tibet that lives along the Subansiri River in Arunachal Pradesh and Daporijo in Upper Subansiri District is home to the Tagin tribes, who are also sporadically dispersed across West Siang District (Goshwami et al., 2008). The four primary belts that make up the Upper Subansiri area are home to the Tagin, Galo, and Nyishi tribes. However, a recent physical border and the announcement of a newly constituted district have divided the region, placing the Nyishi tribe within the Kamle area, named for the Kamle river (Wangpan et al., 2019). The festivals, customs, and religious beliefs of the Tagin people are fundamental to their culture. Along the slopes, they engage in shifting agriculture, commonly referred to as jhum farming. Si-Donyi is one of the major celebrations observed by the Tagin people is principally concerned with honouring the earth (Si) and the sun (Donyi). In addition, the Tagins are well-known for their proficiency in cane and bamboo crafts, which constitute an essential part of their everyday existence and customs.

As per Heimendorf (1962), the Apatani's are of Tibeto-Mongolid ancestry. The Apatani people continue to follow their old ecological knowledge of resource management together with their ceremonies, customs, cultures, etc. Taking note of these special qualities, UNESCO formally nominated the Apatani cultural landscape as a World Heritage Site in 2014 (Yakang & Gajurel, 2015). The Apatani people celebrate a multitude of festivals, the most significant of which is Dree, which is marked by communal feasting, ceremonial offerings, and sacrifices made in hopes of a bountiful crop. The primary source of their fundamental necessities, rather than the forest, are their well-maintained crops. Apatani's are meticulous land managers (Sundriyal et al., 2002). Their unique way of life and social structure are characterised by this practice, which sets them apart from the majority of the state's tribes (Kumar & Ramakrishnan, 1990). Furthermore, well-known are the Apatani's distinctive handloom patterns, bamboo handicrafts, and social and religious customs.

1.5. Need for cross cultural ethnobotanicals studies on Abotani tribes

The proposed quantitative cross cultural ethnobotanical study on the Tagin and Apatani community of Upper and Lower Subansiri District of Arunachal Pradesh aims to unveil rich folklore and oral traditions related to sustainable utilization of plant diversity of the traditional ecological landscape. Although belongs to the same Tani group of tribes of Arunachal Pradesh, both the tribes undoubtedly differ in many respects such as language and cultural belief system based on plant human relationship which is interesting and worth learning (Tag & Das, 2004; Kala, 2005; Murtem & Chaudhury, 2016). Given the rich traditional knowledge and rich plant diversity of the two tribes, a cross-cultural ethnobotany focused on traditional knowledge and plant resources of Tagin and Apatani biocultural landscape would yield valuable knowledge and insights which would help in effective conservation and sustainable management of bioresources in long run. Understanding the cultural variety or similarity of the ethnic communities in the studied region requires an investigation of the intra- and intercultural use of plants.

1.6. Objectives

1. Exploration, collection and documentation of ethnobotanical resources and associated traditional knowledge heritage of the Tagin and Apatani tribes of Arunachal Pradesh.
2. Taxonomic authentication of voucher specimens for museum preservation.
3. Quantitative evaluation of ethnobotanical knowledge of two communities (Tagin and Apatani) in cross cultural approaches.
4. Prioritization of economically and culturally significant plant resources for conservation and utilization.

CHAPTER 2
LITERATURE REVIEW

2.1. Cross-cultural Ethnobotany: Importance

Ethnobotany explores the intricate connections between flora and culture, examining how plants are utilized in various human societies, including nutritional consumption, medication, foretelling, cosmetics, textiles, building, tools, currency, clothing, rituals, and social life (Rehman, 2009). According to Nolan & Turner (2011), there is a strong correlation between ethnobotany and taxonomy, nutrition, pharmacognosy, phytochemistry, palynology, ecology, and conservation biology. Ethnobotany has gained prominence in recent years, with 6,69,000 Google search results in October 2008, 33,000 more than in March 2005, indicating a significant increase in its popularity (Nolan & Turner, 2011). In the last 10 years, ethnobotanists have directed their attention on the preservation of plant-based knowledge in its original context-local communities, where it is given particular significance (Thompson, 2004).

The history of intelligent applications of plants dates back in AD 77 soon after a Greek ethnomedicobotanist *Pedanio Dioscorides* published his book *"De Materia Medica"*, which contains a list of 600 medicinal plants of the Mediterranean region. The volume comprised of the plants used by Greek people, especially for medicinal purpose and also contained poisonous and edible uses (Lily, 2017). In 1753, Carl Linnaeus published *"Species Plantarum",* which comprised of about 5,900 plants including the medicinal plants wherein binomial nomenclature system was introduced for the first time. Later, Power (1875) used the term '*aboriginal botany*' while describing the plants of the Bear river (California), used by the Neeshenan Indians. It was in fact Dr. John William Harshberger of the University of Pennsylvania who coined the word ''*ethnobotany*'' in 1895. He defined ethnobotany as "*the study of interactions of primitive people with plants"* and also described it as "*the study of plants used by aboriginal people*". The 19th century had witnessed the rapid advancement in ethnobotanical exploration across the world. Later, Faulks (1958) described the scopes of ethnobotany in his book "*An introduction to Ethnobotany"*. This was followed by Duke (1968) with his publication "*Dariene Ethnobotanical Dictionary"*, *The nature and Status*

of Ethnobotany by Ford (1978) and *Ethnobotany: A Methods Manual* by Martin (1995, 2008).

Cross-cultural ethnobotany is a multidisciplinary field that studies the interactions and utilization of plants across different cultures for medicinal, food, spiritual, and material purposes. It examines relationships between people and plants across different societies, the transmission of traditional knowledge and practices related to plants through generations. The concepts of cross-cultural ethnobotanical research have gained a lot of recognition as they encompass the traditional knowledge of cross-culturally unique cultures, which improves the measurement and use of plant resources for food, medicine, and cultural artifacts (Tag, 2008). There are several publications which clearly reflected the benefits of the cross-cultural approaches in ethnobotanical research across America, Europe, Africa and Asia (Reyes-Garcia, 2007; Pieroni et al., 2011). One of the several benefits emanating from the cross-cultural ethnobotanical study in the 21st Century is the visible improvement and advancement of ethnobotanical field methods which includes applications of mathematical models and ecological tools and techniques for quantification and rapid evaluation of ethnobotanical resources and associated traditional knowledge system of the local communities for economic benefits (Reyes-Garcia, 2007; Martin, 1995, 2008; Tag, 2008; Tag et al., 2012). In the recent decades, the cross-cultural approaches in ethnobotanical research has been advanced by Reyes-Garcia (2007), Pieroni et al., (2005), Tag (2008), Tag et al., (2012), and Pieroni et al., (2011). Mustafa et al., (2015) documented the cross-cultural ethnobotany on traditional plants utilized by different ethnic tribes residing in south Kosovo, Europe. Asia is the oldest continent rich in ancient civilizational knowledge with practical applications history of ethnobotany which dates back to several millions of centuries. The China and Indian sub-continent is the richest spots on the globe in terms of ethnic and cultural diversity, ancient traditional knowledge and plant diversity (Kirtikar & Basu, 1935; Chopra et al, 1956; Zhao, 2004; Tag et al., 2012; Hong et al., (2015). Kazanc et al., (2020) conducted a cross-cultural comparison of medicinal plant species in the Georgia-Turkey border, highlighting significant species and highlighting community variations. Mir et al., (2022) recorded 109 ethnomedicinal plants from the northern areas of Jammu and Kashmir in a cross-cultural research involving four ethnic groups. Haq et al., (2023) conducted and documented the crosscultural study of medicinal flora utilized by the ethnic group living in Kashmir. The cross-cultural investigation on the use of plants by two distinct ethnic groups residing in the districts of Baitadi and Darchula in Nepal was documented by

Kunwar et al., (2018). Jan et al., (2023) studied the genus of wild *Berberis* used by ethnic populations living on the Indo-Pak border in Kashmir for medicinal purposes in a cross-cultural way. Siram et al., (2023) conducted cross-cultural research on an essential medicinal plant used by four ethnic communities: the Monpa, Miji, Aka, and Bugun West Kameng area. Cross-cultural ethnobotanical research on the therapeutic and culinary uses of the genus Lycium was assessed by Yao et al., (2021). Benítеza et al., (2021) documented the knowledge on the medical use of plants in two adjacent regions: Eastern Morocco and Eastern Andalusia (Spain).Thomas (2012) conducted and documented a cross-cultural study on plant utilization of two Societies residing in the Bolivia, Amazon. A cross-cultural research of the plants used by the Asháninka people of Peru and the Malinké people of Mali to treat various diseases was carried out by Nathaniel Bletter (2007).

Kunwar et al., (2010) worked on the ethnomedicinal plant and their uses in Far-west Nepal and concluded a report of about 48 medicinal plants. Shin et al., (2018) identified 83 wild edible plants of medicinal value from Southern Shan State, Myanmar, from 44 angiosperm families. Salinitro et al., (2017) conducted a study on local knowledge about the use of wild and cultivated plants in traditional medicine and everyday life in the Kilombero Valley, recording 196 species. Boesi (2014) conducted a study on the traditional knowledge of wild food plants in several Tibetan communities. Abidin et al., (2022) studied traditional uses of medicinal plants of 3 indigenous communities of South-west Pakistan, identifying 68 plant species from 40 families used in herbal tea, drinks and food. Research by Casagrande et al., (2023) on the indigenous knowledge of medicinal plants in a popular community in the Porto Alegre metropolitan area of Brazil resulted in the identification of 237 plant species. Lira et al., (2009) carried out an ethnobotanical survey in the Tehuacán-Cuicatlán Valley in central Mexico to examine plants, ethnofloristic richness, and plant management. The research found 1,605 different species of plants. Punchay et al., (2020) discovered 124 species of wild food plants after examining traditional knowledge in the Karen and Lawa populations in Thailand regarding the diversity patterns and similarities of wild food plants. A total of 44 species of edible fruit plants were discovered by Suwardi et al., (2019) during their investigation into the variety and applications of wild edible fruit plants as well as the customs and knowledge of the locals in the West Aceh area of Indonesia. Mussarat et al., (2014) conducted an ethnopharmacological study on medicinal plants in an unexplored Pakistani region, identifying 43 plants of ethnoveterinary value. Phillips and Gentry

(1993) reported the quantitative evaluation of plants utilized by the non-indigenous people in southeast Peru. In their ethnobotanical research, Pawera et al., (2017) identified 78 species of wild edible plants and crop relatives in the White Carpathians of the Czech Republic. In central Sardinia, Signorini et al., (2009) studied ethnobotanically relevant plants and identified 72 that were used traditionally. Research on the ethnobotanical knowledge of plants used by the ethnic group in northeastern Thailand for textile dying was done by Junsongduang et al., in 2017. An ethnobotanical study by Staub et al., (2011) on the ceremonial plants and related beliefs in South China resulted in the documentation of 17 plant species.

Shopo et al., (2022) identified 89 traditionally helpful plants in Zimbabwe's Gokwe South area that are used for a variety of purposes. Dafni (2007) carried out an ethnobotanical investigation on the Middle Eastern rituals, rites, and traditions pertaining to sacred plants. Research on the medicinal and sacred plants used by the Brahmin/Chhetry dominant group in Nepal's Baglung area was carried out by Sapkota (2013). Zarli et al., (2021) carried out a quantitative ethnobotanical investigation on the therapeutic herbs utilized by the Wah-Theinkha ethnic group in Myanmar. In order to determine the relative use of the plants in Tambopata, Peru (I& II), Phillips & Gentry (1993) carried out a quantitative ethnobotanical investigation and hypothesis testing. Prance et al., (1987) provided quantitative information on the use of trees by four ethnic communities in the Amazon: the Tembe and Ka'apor, two Tupi-Guarani-speaking communities in Brazil. A research on the ethnobotany of four Amozanian Indian tribes was also reported by Prance (1973). Heinrich et al., (1998) investigated into the ethnobotanical research of therapeutic plants used by four different Mexican Indian ethnic groups. Kim & Song (2011) documented how traditional knowledge was preserved and used to treat a variety of digestive problems among the North Jeolla people in Korea.

2.2. Ethnobotany in India

A significant amount of ethnobotanical research has been conducted in India due to the country's great ethnic variety and traditional knowledge (TK). There are more than 537 distinct indigenous communities in India that possess a deep understanding of plants (Ramapathy & Newmaster, 2009). Ancient Indian societies, like the Indus Valley Civilization, probably possessed a thorough awareness of the regional flora and how to employ it. Unfortunately, a lot of this knowledge is conjectural because there aren't many

written documents. One of the world's earliest religious writings, the Rigveda, makes mention of plants and their therapeutic qualities. A total of 99 medicinal plant species are described in the Rigveda, 82 in the Yajurveda, and 28 in the Atharvaveda. These plants are employed to treat fatal illnesses. There are several references to therapeutic plants in the Samaveda as well (Bhattachajya & Borah, 2008).

India has a wide range of ethnobotanical studies covering a wide range of topics, such as conservation, sustainable agriculture, food and nutrition, traditional medicine, and cultural traditions. The ethnobotanical research in India was started by Bodding in the British India era (1925–1927). Chopra et al., (1940) mentioned few poisonous plants of India, which claims to be medicinal and aromatic properties. Elwins (1943) also reported the medicinal plants utilized by the ethnic tribe 'Maria gond residing in the Baster district of Madhya Pradesh. In 1952, Ahluwalia accounted a paper on medicinal plant used by the people of Kangra valley. A later advancement of the same study was made by E.K. Janaki Ammal (1956) and Chopra et al., (1956). The field of ethno botany was initially introduced to the tribes of central India by Jain (1963a, 1963b, 1963c, 1963d), encompassing the states of modern-day Jarkhand, Chattisgarh, Madhya Pradesh, and Orissa.

Jain et al., (1973) conducted studies on adivasis of central India and reported many medicinal and magico-religious plants used among the tribes. The first taxonomic works on medicinal and aromatic plants in Indian Subcontinent were initiated by Kirtikar & Basu (1935) in which medicinal uses of some potential Indian drugs yielding plants were reported. Numerous researchers, including Jain (1965), Mitra & Jain (1991), Kumar (2000), and Maheshwari and Singh (1984), have outlined the field's scope, significance, and approach (Gwalwanshi, 2014). Singh & Arora (1978) reported that a total of 800 species are utilized as food plants by the ethnic populations of which 300 plant species occur in the North-east Part of India.

Research on the Ayurvedic medications available in the South Indian market was done by Nair et al., (1984). Jain et al., (2005) investigated the medicinal plants in the Sitamata wildlife sanctuary in the Rajasthani districts of Udaipur and Chittorgarh and recorded the indigenous people in over fifty surrounding communities utilizing 243 genera and 76 families, as a major source of healthcare to treat a variety of illnesses. Panghal et al., (2010) reported on the traditional remedies used by snake charmers and carried out an ethnobotanical investigation in the hamlet of Khetawas, situated in the

Jhajjar region of Haryana. Muthu et al., (2004) in their study and documentation of the usage of medicinal plants in Tamil Nadu's Kancheepuram area showed that the traditional healers there employed 85 kinds of plants, spread among 76 genera and 41 families, to cure a variety of illnesses. Manikandan & Lakshmanan (2014) carried out an ethnobotanical investigation on the medicinal plant found in Tamil Nadu's Eastern Ghats. Parthiban et al., (2015) carried a research and produced a report on the quantitative traditional information of therapeutic plants from Kudavasal taluk in Thiruvarur district, Tamil Nadu, India, that are used to cure livestock illness. In their study, Kannan et al., (2015) detailed the applications of 84 plants of ethnobotanical significance that were found in the wild used by the Malayali tribes in the Kalrayan Hills of Tamil Nadu, India. The information gathered from traditional healers on the medicinal plants used in the Gulbarga area of Karnataka was recorded by Ghatapanadi et al., (2011). Rajasab & Isaq (2004) documented the wild edible plants of North Karnataka and reported 51 plant species. Roy & Janbandhu (2020) discovered 51 Traditional Medicinal Plants (TMPs) among the tribal inhabitants of Ratnagiri and Palghar district, Maharashtra, India. Roy & Janbandhu (2020) reported 51 traditional medicinal plants utilized among the ethnic residents of Ratnagiri and Palghar district of Maharashtra.

Bhagat et at., (2016) studied and documented the traditional religious uses of wild edible fruits in Mulshi, Northern Western Ghats, for both tribal and non-tribal people. An ethnobotanical study conducted by Venkatesan K et al., (2021) quantified the medicinal plants used by an indigenous community residing in Kerela's Munnar Forest. Panda & Panda (2016) recorded the traditional knowledge of the Koraput tribal people of Odhisa on the use of tuber species as food and medicinal. Mishra and Chaudhury (2012) studied the ethnobotany of four important tribes in Kerela's Koraput area. Venkatesan (2022) conducted a survey and documented the quantitative ethnobotanical use of 47 wild flowers by the tribes people residing in the Wayanad forest division in Kerela, India.

Dangwal et al., (2014) listed 58 wild edible food plants that the Gujjar and Bakerwal tribes of the Rajouri district (J& K) utilizes Haq et al., (2023) employed a cross-cultural approach to describe and assess the ethnomedical and cultural knowledge of the high-altitude indigenous flora. They found 46 species that are used by the four ethnic groups that inhabit the Kashmir Valley, belonging to 25 distinct families. The invaluable indigenous knowledge of Gulmarg, Jammu and Kashmir, India, was recorded

by Kumar et al., (2015). Sharma et al., (2015) reported 395 plant species of medicinal value from Subtropical forest of Jammu & Kashmir.

Jan et al., (2019) recorded 54 noteworthy plants through ethnobotanical study in the Karwa pani region of the Doon Valley, Uttarakhand. Lata et al., (2022) examined the customary plant used by the Tharu ethnic community in Udham Singh Nagar, Uttarakhand, in their rites and celebrations. The important ethnobotanical data about the usage of plants for food, fodder, medicine, firewood, lumber, tannin, dye, oil, fibre, alcohol, gum, resin, and other purposes by the tribal people of Rajasthan was evaluated by Sharma et al., (2010). In the Kedarnath Wildlife Sanctuary in the Garhwal Himalaya, Bhat et al., (2013) studied the ecological status and traditional knowledge of 152 medicinal plants in their ethnobotanical investigation, Shukla et al., (2010) noted 69 medicinal plants in the Madhya Pradesh area of Rewa.

Biswas & Das (2011) documemted 45 wild edible plants from the tribal areas of Malda District of Paschimbanga, India. The medicinal plants of Jharkhand's Chatra district were investigated by Kumari et al., (2019). The traditional knowledge of the local people on the usage of locally grown medicinal fabaceous plants in the Madhya Pradesh Runj forest Panna was documented by Gwalwanshi et al., (2014). Zhasa et al., (2015) investigated the indigenous knowledge of eight Naga tribes regarding plant biodiversity and its use in treating human ailments.

2.3. Status of ethnobotanical study in the North East India

India's northeast region includes the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim (Dutta & Dutta, 2005). North East India, home to over 220 ethnic communities, is a significant biodiversity region with the largest plant diversity pool, accounting for almost half of India's biodiversity (Mao et al., 2009). The great biodiversity and different ethnic populations of Northeast India are well-known, and each has its own traditional knowledge of plants and their use. Over millennia, Northeast Indian’s has experienced a significant evolution in ethno botany over centuries, as these indigenous communities have adapted to their natural surroundings. The Northeastern states also maintained cultural ties with China, Tibet, and other Southeast Asian countries. The variety of plant knowledge might have probably been influenced by these interactions. The use of medicinal plants in traditional medicine, among other traditional healing methods, was an essential part of their cultural identity. Mao et al., (2010) reviewed ethnobotanical studies in the Northeast India. In the

North East India, Assam is the state with the greatest documented ethnobotanical work, followed by Arunachal Pradesh and Manipur (Mao & Roy, 2016).

Ethnobotanical study in some tribes like Karbi Anglong tribes of Assam were reported by Borthakur (1976, 1980, 1981). Barua & Sharma (1984) reported 25 plants used for medicinal purpose by the Bodo community of Assam. In their ethnobotanical investigation of the medicinal plants used in the Darrang area of Assam, Borah et al., (2001) identified 25 plant species with potential medical uses. Majumder et al., (2001) conducted survey on the medicinal plant diversity of Assam reporting with a total of 120 plant species Sajem & Gosai (2006) worked on the Jaintia tribes on their traditional utilization of medicinally useful plants in the North Cachar hills of Assam. Albert et al., (2008) documented the traditional ethnobotanical work on rare and endemic medicinal plant of North Cachar hills of Assam. A study on the plant-based magico-religious beliefs of the Mishing people in Assam was carried out by Sharma & Pegu (2011). Sen & Ghosh (2011), explored and documented some fern species of ethnomedical uses utilized by indigenous community of Assam. Buragohain (2011) listed 175 plant species and detailed the traditional knowledge of the medicinal plants utilized by the ethnic population of Tinsukia for various ailments. Ripunjoy (2013) reported 33 medicinal plants used by the indigenous people of Sonowal Kachari tribe of Dibrugarh, Assam. Medhi et al., (2014) conducted research on edible wild plants in the Dima Hasao area of Assam, India and 168 plant and fungal species that have been identified, 55 species are used as leafy vegetables, 61 species' fruits and seeds are used either raw or cooked, 19 species' tubers are consumed boiled, 18 species are used as seasonings and sauces, 10 species are edible wild mushrooms, and 5 species are used as masticators and fumigators. Hazarika & Dutta (2016) carried out a study and survey on the traditional usage of plants used by the Deori tribal community in Lakhimpur, Assam, to treat various diseases. Das (2016) documented the medicinal plant utilized by the people of Barpeta district, Assam. Some 200 species of medicinal plants of the Karbi and Tiwa tribe of Karbi-Anglong, Assam were reported by Teron (2019). Borah et al., (2020) documented the Non-timber forest product of Behali reserve forest, Assam and mention its utility as food and drug. A study on the magico-religious plants utilised by the Mising tribe in Assam was carried out by Pangging et al., (2021). Gogoi & Sen (2023) performed research and recorded the use of 45 medicinal plants by the locals of Kailashpur, Assam. Bhattacharya et al., (2023) documented the plants for curing human illness utilized by the traditional healers of

Barpeta district, Assam. Boro et al., (2023) documented the medicinal plant utilized by the Bodo community in Baksa district of Assam and reported its statistical analysis.

Singh et al., (2007) recorded the diversity and cultural importance of traditional food system of some northeast tribes including Miji, Galo, Adi, Apatani, Sherdukpen, Bhutia, Kinema, Meitei, Aao-Naga, and Sema tribes. Bhusi et al., (2021) reviewed on the ehnomedinally important plant utilized by the ethnic community of Arunachal Pradesh and conclude with significant 358 plants.

During his ethnobotanical studies in Manipur, Sinha (1987) identified 667 significant plants. Singh & Singh (1996) reported a total of 18 plant species utilized by the Meithei community of Manipur. Khumbonmayum et al., (2005) reported 120 medicinal plants from Manipur. Dedrilkumar & Binu (2016) documented the use of wild edible plants by the Meitei indigenous community in Manipur. Hazarika & Singh (2018) highlighted the socioeconomic significance of 49 wild edible fruits among rural residents and their ethnomedical application of Manipur. Panmei et al., (2019) discovered 145 medicinal plants used to cure 59 diseases from their ethnobotanical study of the Zeliangrong community in Manipur. Huidrom et al., (2021) conducted survey in Manipur's three lakes, Loktak, Ikop, and Waithou, and discovered 54 ethnomedicinal plants that have been used to cure 15 various conditions. In their study, Vemai et al., (2022) recorded 35 plants with therapeutic potential in an effort to better comprehend the traditional knowledge of medicinal plants utilized by the Poumai tribe's healers in Manipur.

A total of 65 ethnobotanically significant plants were recorded by Rao & Neogi (1980) used by Khasi and Garo people of Meghalaya. Neogi et al., (1989) documented some weeds of ethnobotanical use of khasi and Garo hills of Meghalaya. According to Ahmed's (2001) research, thirty plant species have therapeutic use among the Khasi ethnic community in Meghalaya. Laloo et al., (2006) conducted research on onswer and Mairang sacred groves of Meghalaya and reported a totalof 80 medicinally important woody species. Kayang (2007) conducted an ethnobotanical survey on the traditional knowledge of *Khasi*, *Jaintia* and *Garo tribes* of Meghalaya. A study conducted by Jeeva (2009) evaluated the horticultural significance of 151 wild edible fruits of the Khasi people in Meghalaya.

Mao & Hyniewta (2000) reported status on floristic diversity of North East India. Lalramighinglova (2001) reported some 200 odd plants species used as ethnomedicine in

Mizoram. Rai & Lalramnghinglova (2010) identified 159 plants of therapeutic significance from the ethnomedical plants utilised by the people of Mizoram. Lalfakzuala et al., (2007) carried out the survey among the tribal group of western Mizoram in significant ethnobotanical plants utilized by them, India on wild edible plants. According to Hazarika et al., (2012), the indigenous people of Mizoram employ 60 wild, edible fruits as medicine, primarily to treat gastrointestinal disorders.

An ethnobotanical investigation by Singh et al., (1997) among the Tripuri people in Tripura revealed 30 plants with potential medical uses. Das et al., (2009) documented medicinal plants used by Rripuri and Reang tribes of Tripura. In their study, Majumdar & Datta (2007) investigated how folkloric herbalists and medical professionals of Tripura used plants for therapeutic purposes. They found that 50 different plants were used topically to treat various ailments. Dipankar et al., (2012) explored the ethno-medicinal knowledge of the Darlong community in Tripura, India, revealing their traditional use of 39 plant species as both deterrents and therapeutic agents for various ailments, including their local names and various parts used.

A survey on ethnomedicinal plants used by the Lepcha tribe in the Dzongu valley, which borders the Khangchendzonga Biosphere Reserve in North Sikkim, India, was carried out by Pradhan & Badola (2008). Pal & Palit (2011) investigated the Lepcha tribe's socioreligious practices, ethnomusic, and ethnoculture in North Sikkim and documented the 44 species for medical applications. Das et al., (2012) reported 79 medicinal plant of traditional value utilized by the ethnic tribesmen of Sikkim. Lahiri & Dash (2022) reviewed wild plant used by the ethnic communities of Sikkim and documented 78 plants of 62 different uses.

Mao (1993) identified 71 important plant species from his first ethno botanical research of the wild plant species in the Mao-Naga community. Jamir et al., (2010, 2016) reported ethnobotanical plant of Nagaland. Pfoze et al., (2014) studied the ethnobotanical uses of plants by the native Naga ethnic community and recorded a total of 628 species of ethnobotanical importance while In Zunheboto district, Nagaland, Sumi & Shohe (2018) stated that Sumi tribesmen employed 50 different types of medicinal herbs in the hamlet where Sumi lived. Ozukum et al., (2019) conducted study and found that the Khiamniungan tribe in Tuensang district, Nagaland, employs 76 different varieties of traditional medicinal plants.

The ethnomedical use of in the Indo-Burma Hotspot area was reviewed by Rai & Lalramnghinglova (2011). Lokho & Narasimhan (2019) conducted a study on the ethnobotanical use of bamboo, listing six species and their traditional usage and other relevant information.

2.4. Ethnobotanical exploration in Arunachal Pradesh

Hooker (1872-1897) authored the first authoritative taxonomic account 'Flora of British India'' which includes the flora of Burma and Ceylon. Lt. R. Wilcox and Captain Bedford visited Assam frontier tracts for geographical survey in 1825-28 visited Mishmi Hills for the first time. However, it was Griffith who botanized the flora of Mishmi Hills in his record "Flora of Mishmi Hills" in 1836 following more or less the route of Wilcox and Bedford. His botanical account deals with 900 species of angiosperms, 22 species of fern and fern allies. Further botanical exploration on Mishmi Hills of Lohit District was accomplished by Kingdon Ward (1929-1931, 1953) in his account "Botanical Expedition on Mishmi Hills" which mentioned only general taxonomic account of the dominant flora. Burkill (1924, 1925) first initiated the botanical work in Abors Hills. Earlier, Bor (1935, 1938) gave an account of the vegetation of Aka Hills and he has mentioned 1549 species of flowering plants, a species of gymnosperms, 58 species of fern and fern allies. Flora of Assam by Kanjilal et al., (1934-40) brought out in four volumes has the mentions of some higher plant species of erstwhile NEFA region, which included flora of Lohit Valley. BSI eastern regional centre has surveyed flora of north East India. Rao (1972) conducted botanical works in Arunachal Pradesh and documented the flora of Kameng, Subansiri, Siang and Tirap. Panigrahi & Naik (1961) reported flora of (NEFA) Kameng, Subansiri, Siang, Tirap and Lohit, which mentioned general flora of the districts but he did not follow the ethnobotanical approach to document the local knowledge and resource base. Pal (1979-85) also documented the flora of Subansiri district in two volume. Rawat & Chowdhury (1998) also documented the medico ethnobotany of Arunachal Pradish. Hegde (1984) reported Orchids flora of Arunachal Pradesh. Dam & Hajra (1980) documented 76 medicinal plants used by Monpa tribe. Nath & Bordoloi (1989) recorded 50 plants species of ethnomedicinal importance from Tirap District used by the Nocte, Khamti, Sighpoo and Tangsa local tribes. More ethnobotanical works on Nocte of Tirap has been done later by Rama Shankaret et al., (1998). Rama Shankar et al., (1993) reported medicinal plants from Dibang Valley district of Arunachal Pradesh. Rama Shankar & Rawat (1995) reported some Ayurvedic

importance medicinal plants of Arunachal Pradesh. Murtem (2000) recorded 25 wild edible vegetable of *Nyishi* tribe of Arunachal Pradesh. Das (1986) and Rawat et al., (1996) initiated the first ethnobotanical works on Adi tribe of East Siang district of Arunachal Pradesh. Chauhan et al., (1996) reported 119 species of both flowering and non flowering categories form Namdhapa, Changlang and Tirap district. Chowdhery et al., (1996) presented "*Materials for the Flora of Arunachal Pradesh*" which is basically a taxonomic account of the Arunachal Himalayan region ideal for identification of locally known plants. In recent decades, Haridasan et al., (1990), Bhuyan (2000), Sarma et al., (2000), Haridasan & Bhuyan (2002), Hegde & Haridasan (2002) have done some commendable work on rearing, conservation and commercial exploitation of some selected commercially viable medicinal plants of Arunachal Pradesh. In Assam, Borthakur (1976) mentioned 46 medicinal plants used by the Mikir tribe of Karbi-Anglong district. Mojumdar (1980) listed 142 families of Ayurvedic importance from Brahamaputra Valley. Balakrishna (1971) presented the Flora of Jowai (United Khasi and Jaintia Hills). Sharma (1989) presented detail flora of Sibsagar district (Present Jorhat and Dibrugarh). Gogoi (1997) and Tag (2008) presented ethnobotany of Thai Ahom and Tai Khamti tribe of Upper Assam and Lohit district of Arunachal Pradesh which have mentioned about 600 species of medicinal plants. Notable progress in the field of taxonomic and ethnobotanical research have been made during last two decades in other North East states such as Jamir (1991), Jamir et al., (2010) on Naga tribal communities. Haridasan & Rao (1987) documented forest flora of Meghalaya. Jain (1981) presented "*Glimpses of Indian Ethnobotany*" and he has mentioned the ethnobotany of North East tribes but no such ethnobotanical reports are available to date from the Tagin and Apatani dominated region of Arunachal Pradesh. Sarma et al., (2001) recorded 116 species of medicinal plants from West Kameng and Tawang districts mainly used by the Monpas and Sherdukpen tribes. Das and Tag (2006) and Tag et al., (2008), Tag & Das (2007) conducted ethnobotanical studies on Khamti tribe of Lohit district, Nyishi and Adi tribes of Subansiri and Siang district in Arunachal Pradesh. Kar & Borthakur (2008) recorded medicinal plants used for treating dysentery, diarrhea and cholera by the tribes of Kameng district. Srivastava (2010a, 2010b) documented ethnobotanical resources and traditional knowledge of Nyishi and Adi tribes of Arunachal Pradesh. Jambey (2016), Jambey et al., (2017) reported ethnobotanical resources of wild food and medicinal flora of Tawang and West Kameng District of Arunachal Pradesh. A study on ethnomedicinal plants used by different tribes of

Arunachal Pradesh were studied by Khongsai et al., (2011) and reported a total of 84 plant species used by the seven ethnic tribes. Perme et al., (2015) reported traditional medicinal uses of plants from different parts of Arunachal Pradesh. They reported about 101 species of significant medicinal plants for treating 156 differenet disease. Bharali et al., (2017) conducted ethnobotanical investigation on spices and condiments used by Adi, Apatani and Nyishi tribes of Arunachal Pradesh and reported 52 plant species. Saklani and Jain (1994) reported cross cultural ethnobotany of North East Region including Arunachal Pradesh. Gajurel et al., (2002) reported *Piper* species of Arunachal Pradesh and North East India.

About 33 ethnomedicinal plant species were documented by Das et al., (2013) as being employed by the Adi people in their traditional medicinal preparations. Tag et al., (2015) examined the ethnobotanical uses of 33 poisonous plant species by the Monpa, Nyishi, and Adi tribes of Arunachal Pradesh. They found that *Aesculus assamica, Derris scandens, Gymnocladusburmanicus, Persicaria hydropiper, and Zanthoxylum rhetsa* are used as fish poison by the Nyishi and Adi tribes, while the root of Aconitum ferox is used for traditional hunting and local warfare. Angami et al., (2006) studied on the status and prospective of wild edible plants of Arunachal Pradesh and the study revealed about 118 wild edible plants. Sanjay et al., (2021) highlighted the significant ethnobotanical resources utilized by the Mishmi community in Lohit district, Arunachal Pradesh, including 72 commonly used species for medicinal, food, civil engineering, and cultural materials. Nimasow et al. (2012) documented the use of traditional ethnomedicinal plants by the Adi tribe in Lower Dibang Valley District, Arunachal Pradesh, for disease treatment. Momang et al., (2020) investigation of the biocultural significance, local status, and variety of tropical wild fruits among the Adi tribe in Arunachal Pradesh, India, turned up 88 species grouped into 56 genera and 39 families. Sarkar and Sundriyal (2002) documented the utilization of the variety of bamboo plants in the traditional system, the annual need for building, mending, fencing, and craft needs, as well as the indigenous knowledge regarding the use, management, and conservation of this resource by the Tangsa tribe in the Changlang district of Arunachal Pradesh, India. They came to the conclusion that 12 species of bamboo was found in that Area, of which seven species were the most commonly used bamboo. Yanka et al., (2019) conducted brief cross-cultural ethnobotany of the Arunachal Pradesh Abotani tribes, comprising of five distinct indigenous tribal populations living in Arunachal Pradesh, India: Adi, Apatani, Nyishi, Galo, and Tagin that live in the Siang, Subansiri, Kurung Kumey, Pakke Kessang, and

Papum Pare belt of Arunachal Pradesh and revealed a number of 45 species of ethnobotanically significant plants that are regularly harvested and used as local food and medicine security as well as cultural materials. Pradeep et al., (2011) investigated and recorded the traditional systems of resource management and biodiversity protection used by a few tribes in Arunachal Pradesh, India. Singh et al., (2013) investigated the biocultural aspects of the *tasat* tree (*Arenga obtusifolia* Griff.) and its conservation by the Adi tribe in Arunachal Pradesh, India. Bisht et al., (2021) recorded 54 ethnobotanical species used by the Nyishi tribe of Arunachal Pradesh, India, from 41 families during their investigation.

Ete (2014) emphasized on significance of bamboo and cane in the socio-economic development of the indigenous handicrafts industry of Galo tribe in Arunachal Pradesh. Tripathi et al., (2017) conducted a survey on ethnomedicinal plants used by the Nyishi tribe in Arunachal Pradesh, India and reported a total of 21 medicinal plants of treating various ailments. Singh et al., (2012) highlighted the biocultural significance of the tree tara (*Calamus erectus* Roxb.) for the Adi tribe in Upper Siang district, highlighting its conservation efforts. An ethnobotanical survey of the Monpa ethnic group in Arunachal Pradesh was carried out by Namsa et al., (2011). Nimasow (2011) et al., reported 18 ethnomedicinal plants used by the Aka tribe of Arunachal Pradesh. 122 wild food plants that the Adi tribes of Arunachal Pradesh used were identified by Taram et al., (2018). Jha (2017) examined how the indigenous people of the Northeast use and manage non-timber forest products. Kashung et al., (2023) reported a total of 94 non timber forest product sold in the local market of Itanagar, Arunachal Pradesh. Murtem & Chaudhry (2014) conducted a study on the sacred groves in the Arunachal Pradesh. Bharali et al., (2016) on their ethnobotanical study on the Galo tribe of Arunachal Pradesh revealed that 45 plants are being used for treating various illnesses. Ronald et al., (2019) gathered eighty-three wild edible plants from the Arunachal Pradesh district of Shi Yomi. Balkrishna et al., (2021) reported 219 Medicinal plants from Pakke-Kessang district of Seijosa circle. Pangging et al., (2021) reviewed ethnomedicinal Plants used by the Monpa tribe of Arunachal Pradesh. In the context of biodiversity protection, Chaudhry & Murtem (2016) recorded a total of 72 plants from the Upper Subansiri district of Arunachal Pradesh for totem, taboo, avoidance, and magico-religious functions. Mahanta & Tiwari (2005) studied and recorded the utilization of plants for natural dye by the ethnic people of Arunachal Pradesh. An ethnobotanical assessment on

wild food and medicinal plants among the Monpa and Nyishi population in Arunchal Pradesh was carried out by Das et al., (2019).

Sarmah (2010) reported 63 non timber forest product utilized by the Litsu community of Changlang. Thomas et al., (1998) reported the ethnobotanical study on various uses of Rattan palms utilized among the Adi and Nyishi tribes of Arunachal Pradesh. Ramakrishnan (1990) explored the folklore on medicinal plants utilized by Nyishi, Sulung and Apatani tribe of Arunachal Pradesh and reported 171 plants of medicinal uses. Perme et al., (2015) conducted ethnobotanical study of Arunachal Pradesh and reported 101 medicinal plants. Devi et al., (2014) listed nine species of *Allium* used as herbal medicine from Arunachal Pradesh, India.

2.5. Some ethnobotanical record on the Tagin tribe

Murtem (2004) and Pradeep & Murtem (2017) reported some significant ethnobotanical plants used by Tagin tribe of Upper Subansiri. Goshwami et al., (2009) documented the practice of traditional health medicine among the tagin tribe. Murtem & Chaudhury (2016) documented some economically important plants used by *Tagin, Galo and Nyishi* tribes of the Upper Subansiri district of Arunachal Pradesh. Rinyo et al., (2018) highlighted the ethnobotanical resources and traditional skills of the Tagin community in Arunachal Pradesh. Wangpan et al., (2019) conducted preliminary exploration of the important medicinal and poisonous plants of the Upper Subansiri district and documented a total of 36 plants. However, detail ethnobotanical exploration focused on cross cultural approach, quantitative and rigorous field method is required to document and evaluate ethnobotanical resources and associated traditional knowledge system of the target community and their knowledge system need to be compared and cross checked with other Tani group of tribes of Arunachal Pradesh.

2.6. Ethnobotany of the Apatani tribe

Sundriya et al., (2002) reported bamboo and cane resources used in the Apatani Plateau which are mostly used for house construction, fencing, firewood and vegetable purposes. Kala (2005) documented some important medicinal plants used the Apatani community which is basically based on literature studies. Srivastava et al., (2010c) documented the indigenous biodiversity of Apatani plateau and reported 106 species of local plant used in food, ethnomedicine, handicrafts, and hunting. Dollo et al., (2009) investigated the traditional management of natural and man-made ecosystems in the

Apatani plateau of Arunachal Himalaya. Yakang et al., (2013, 2015, and 2017) and Tilling et al., (2015) recorded some ethnobotanical resources which includes medicinal, festivals and rituals plants used by the Apatani tribe whereas Taka & Tangjang (2015) reported some agroforestry methods prevalent among the village folks for biodiversity conservation. Dutta et al., (2007) reported conservation of plants in the sacred groves *'ranthiis'* in Ziro valley. Yamang (2022) studied indigenous knowledge demonstrating the traditional handicraft tools and techniques used by the Apatani person which is connected to their every-day utilitarian items made of cane and bamboo. The use and management of cane and bamboo plantations in the Apatani people in Arunachal Pradesh were investigated by Sundriyal et al., (2002). According to the study, nine bamboo species and three cane species are utilized in the building of homes, fences, firewood, and edible shoots. Jha (2016) investigated the market at Ziro, a UNESCO World Heritage Site, carried out a study, and noted Significant Non-Timber Forest Products.

With the above regional taxonomic and ethnobotanical literatures background, there is an scope for in depth cross cultural ethnobotanical research on the local tribes of Arunachal Pradesh to understand their local culture and flora they used for livelihood supports. Therefore, the proposed research work is expected to unfold some vital information on ethnobotanical plants of cultural, food and ethnomedicinal importance used by the Tagin and Apatani tribes of Arunachal Pradesh.

CHAPTER 3
STUDY AREA

3.1. Study Area

The ethnobotanical study was conducted on the Apatani and Tagin tribes of Arunachal Pradesh. Therefore, the Lower Subansiri and Upper Subansiri district was selected as the study area as the Apatani tribe primarily resides in the Lower Subansiri district and the Tagin tribe resides in the Upper Subansiri district. Presently, the Lower Subansiri district is situated approximately between 93º32′04″and 94°06′44″ East longitude and 27°17′26″ and 27°56′10″ North latitudes. The district shares a boundary with Kurung Kumey and Kra Daadi to the north, Papum Pare district to the west and south and Kamle to the east. Whereas, the Upper Subansiri district is situated approximately between 93º11′19″ and 94°36′10″ East longitude and 27°45′45″ and 28°42′32″ North latitudes and shares an international boundary with China to the north, Kurung Kumey, Kra Daadi and Kamle to the west, Lower Siang to the south and Leparada, West Siang and Shi Yomi to the east.

The elevation of Lower Subansiri ranges from 344 meters to 3023 meters with a mean elevation of 1566 meters. The mean temperature of the district ranges from 10.30 °C to 21.39 °C with a mean of 16.68°C for the district. Similarly, the annual precipitation of the district varies from 92.90 cm. to 287.00 cm. with a mean of 187.11 cm. for the district. As per the Census, 2011, the district was a home of 83,030 population including 41,843 males and 41,187 females with a growth rate of 49% and a sex-ratio of 984 persons per thousand males. The district shares 6% of population to the total population of the state with a density of 24 persons per square kilometer. The literacy rate of the district were 74.35% whereas male literacy rate were 80.53% and female literacy rate were 68.08 %. In the district, 15.42% of people were living in the urban areas and 84.58 % in the rural areas.

The elevation of Upper Subansiri varies from 262 meters to 5757 meters with a mean elevation of 2081 meters. The mean temperature of the district varies from -4.89 °C to 22.38°C with a mean of 12.26°C for the district. Similarly, the annual precipitation of the district ranges from 39.50 cm. to 296.50 cm. with a mean of 137.72 cm. for the district. As per the Census, 2011, the district was a home of 83,448 populations including

41,758 males and 41,690 females with a growth rate of 50.78% and a sex ratio of 998 persons per thousand males. The district covers 6.03% of the population of the State with a density of 12 persons per square kilometer. The average literacy rates of the district was 63.80% whereas the male literacy rate was 70.02% and the female literacy rate was 57.59 %. The 16.06% of people were living in the urban areas and 83.94 % in the rural areas.

3.2. *The Tagin tribe*

The Tagin community is predominantly located in the Upper Subansiri area of Arunachal Pradesh, a state renowned for its abundant ethnic tribe and rich cultural legacy. The river Subansiri and its tributaries split the whole region. The area is abundant in naturally occurring plants and animals as well as minerals like dolomite and limestone (Abraham & Sako, 2021). It comprises of the people from northeastern India, Bhutan, Nepal, and portions of Southeast Asia, whereas the Tagins are a component of the greater Tibeto-Burman ethnic group. They belong to the Abo Tani linguistic group, which includes the Apatani, Adi, Galo, and Nyishi tribes of Arunachal Pradesh, and the Mishing tribe of Assam.

These tribes are thought to have migrated to their current locations in the northeastern side of Tibet centuries ago, having shared an ancestral origin from the Tibetan plateau or its surrounding regions, based on their linguistic affinity. The linguistic evidence, oral traditions, and anthropological study all contribute to the origin myth of the Tagin tribe, which points to a Tibeto-Burman origin with migrations from the Tibetan area and moved southward into what is now called Arunachal Pradesh, their forefathers having left the Tibetan area. Gradually, they established themselves in the hilly regions of Upper Subansiri, adjusting to their surroundings and forming a unique cultural and social identity.

As per 1981 census, 27,122 Tagin were recorded and increased to 39,091 by 1991. The census data for Tagin at the time of this survey was 39,091 (Government of India 2001). According to more current data, the Tagin population stands at 62,931 (Government of India 2013:149).

3.2.1. Faith and Belief System of the Tagin Community

The Tagin tribe is known for their rich traditional cultural heritage, which includes vibrant festivals that are an integral part of their social and religious life. Like many other indigenous tribes in the area, the Tagin tribe of Arunachal Pradesh adheres to a traditional faith and belief system that is animistic and shamanistic. Their faith is based on the worship of natural elements such as the Sun, Moon, Stars and ancestral spirits, and natural landscape, with a great focus on the relationship between nature, the spiritual world, and mankind. Their everyday activities, festivals, and rituals are all influenced by this belief system, which is fundamental to the sustenance of life. One of the most important celebrations observed by the Tagin tribe is the *Si-Donyi* festival. It reflects the profound respect of the Tagin people towards the natural world and their spiritual beliefs, embodying their religious and cultural philosophy.

3.2.2. Vegetation and forest types

The Tagin inhabited Upper Subansiri district of Arunachal Pradesh comprises of diverse forest types and climatic zone which adds to the rich biodiversity, which the Tagin community utilize them for food, medication, and materials for traditional handcrafts. Based on altitude, there are four different types of climatic zone in the region: alpine, temperate, subtropical, and tropical.

1. **Alpine climate**: Some of the Tagin settlement region of Upper Subansiri district of Arunachal Pradesh, ranges between 3000- 4000 m from mean sea level. This zone experiences cold temperatures -20^{0}C to15^{0}Call year round, with frequent snowfall in the winter. These places have very little flora, mostly made up of alpine shrubs and high-altitude meadows.
2. **Temperate climate**: Some population of Tagin lives intemperate region, which have a moderate temperature ranging between 15^{0}C – 25^{0}C. With moderate to high rainfall, temperate regions experiences warm summers and frost during winter. Oak, Rhododendron, and coniferous forest are the characteristic features of the temperate zone with elevation ranging between 2000 to 3000 m from mean sea level which is home to several species of plants and wildlife.
3. **Subtropical climate**: This region is characterized by humid summers and gentle winters, with elevated degrees of precipitation, particularly during the storm season. The terrain is dominated by tropical and subtropical woods, with lush,

thick flora and elevation is usually ranging between 1000-2000 meters above mean sea level.

4. **Tropical climate**: The lowest elevation inhabited by the Tagin tribe experiences a warm Tropical climate**.** High humidity and year-round warmth are characteristics of these places. It is characterized by a high species diversity and elevation usually ranging between 200 and 1000 meters above mean sea level.

3.3. *The Apatani tribe*

The Apatani, an ethnic group mostly found in the Ziro Valley in the Lower Subansiri region of Arunachal Pradesh, India, are renowned for their distinctive agricultural methods and rich cultural customs. The elevation of the Apatani areas ranges between 1,500 and 2000 meters above sea level. Among the various tribal tribes in Arunachal Pradesh, this ethnic group is said to be among the most developed community. Researchers have speculated that the Apatani, like many other Tibeto-Burman communities in Northeastern India, may have migrated from Tibet or other regions of China thousands of years ago. However, evidence of the Apatani's early migration is limited and mostly of the information comes from oral tradition. Approximately 30,000 people live in these settlements overall, with 90% of them being members of the Apatani tribe (Farooky, 2017).

3.3.1. Indigenous faith and belief systems of the Apatani people

Apatani worships the Sun (Donyi) and Moon (Polo), as their primary deities. The indigenous Apatani tribe of Arunachal Pradesh follows an animistic and shamanic traditional belief system, much like the Tagin tribes. This ethnic people celebrate the ‘Dree festival’, which is popularly observed among the community members with community feasting, ceremonial offerings, and sacrifices made for bumper harvest of agricultural crops, protect community members and livestock population from epidemic diseases.

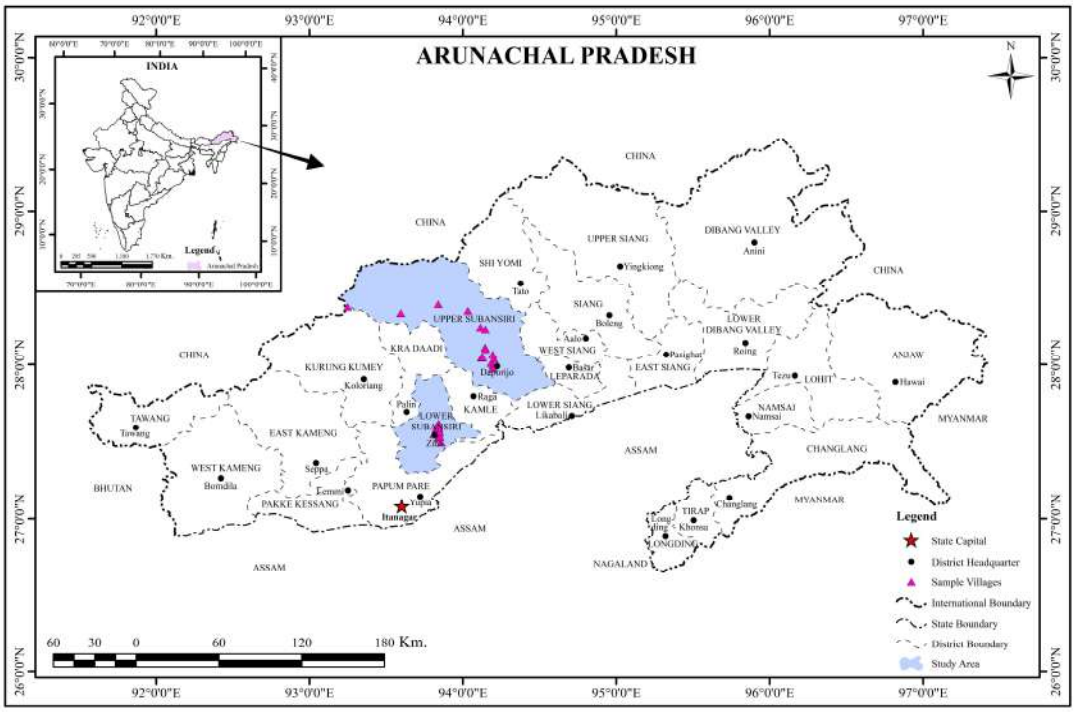


Fig.1. Location map of study area

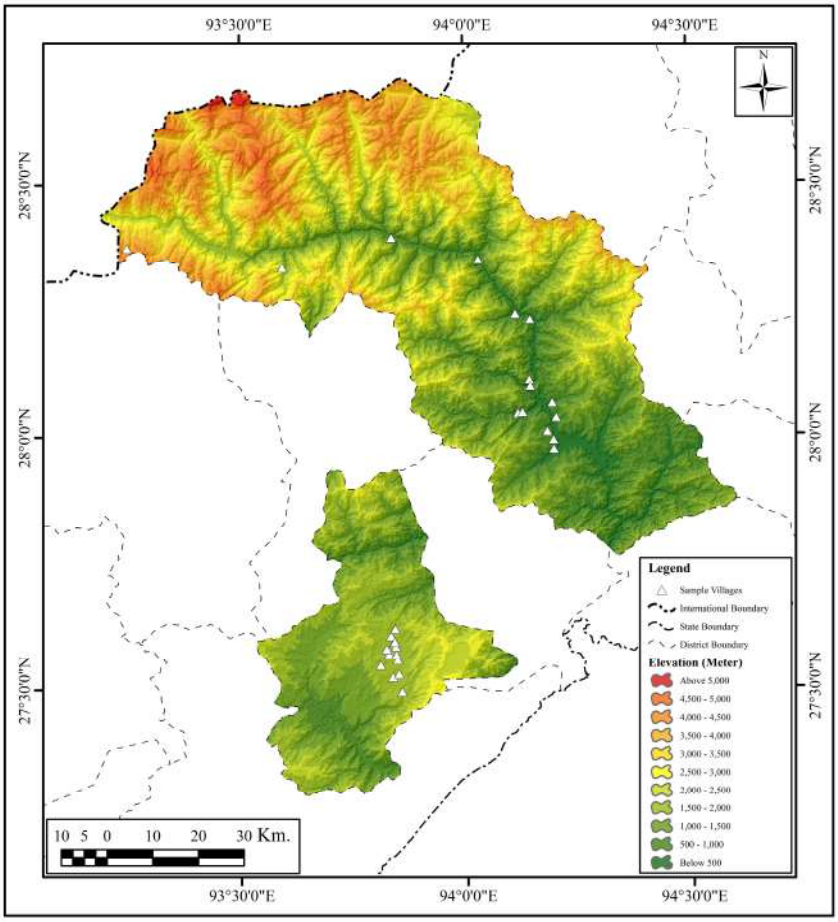


Fig.2. Altitude map of study area

CHAPTER 4
MATERIALS AND METHODS

4.1. Ethnobotanical field survey

4.1.1. Selection of Study site

Initially a rigorous literature review was made during the year 2019-2020 on both the selected area of study, and the related work done with the available publications works on the flora, topography, climate, vegetation, census, settlement etc. The extensive cross-cultural ethnobotanical field survey was conducted and documented from the selected villages of Tagin (Taksing, Limeking, Nacho, Siyum, Taliha, Kodak, Radding, Menga, Bui, Mosi, Soki, Riddi, Dulom, Nima, Yekar) and Apatani (Lempia, Myolyang, Mudang Tage, Biiri, Dutta, Hari, Hija, Manipolyang, Hong, Siiro, Bulla, Bamin-Michi, Hake-tare, Reru, Siibey) i.e., Upper and Lower Subansiri districts of Arunachal Pradesh during the different seasons of the year from 2021-2023 since the plants have different flowering season and ethnobotanical study is incomplete without flowers and fruits for its identification. The study site for cross-culture ethnobotanical study was selected according to different climatic zone viz., tropical, subtropical, temperate/ alpine targeting the oldest and the most populous villages in *Tagin Biocultural Landscape* (TBL) in Upper Subansiri. However, in Ziro Valley, the forest and vegetation type would be only subtropical and temperate type since *Apatani Biocultural Landscape* (ABL) of Lower Subansiri District devoid of tropical climatic regime. A total of 30 villages were selected from Tagin and Apatani inhabiting area (15 villages from Tagin and 15 from Apatani inhabiting area).

4.1.2. Sample Size and Total Informants

During the course of field visit, a total of 30 villages were selected from Tagin Biocultural Landscape (TBL) and Apatani Biocultural Landscape (ABL) in Upper and Lower Subansiri district of Arunachal Pradesh for cross cultural ethnobotanical survey, knowledge documentation and quantitative evaluation of ethnobotanical resources. A total of 300 informants were interviewed covering a total sampling site of 150 household in 30 villages from Tagin and Apatani. The informants selected for the study were from the age group of 15-85 years.

4.1.3. Ethnobotanical Data Collection

The traditional Tagin and Apatani Villages were selected for the survey and interviews for this cross-regional ethnobotanical study were documented by different techniques viz., direct observation, structured questionnaire, semi-structured questionnaire, open ended interview and a focused group discussion session (Martin, 1995; Alexiades, 1996), transect walk in the forest, with addition to market survey. Before the planned interview with the local informants, all of them were given the Prior Informed Consent (PIC) document to get their signed approval to participate along with a clear explanation of the study's goals (Tareau et al., 2020).

The different category of informants was selected for the ethnobotanical survey. The primary informants or knowledge holder were the elder people with knowledge of the cultural history of plants, Older farmers to learn about the historical use of agricultural implements and who possess a wealth of experience and knowledge of traditional agricultural techniques, as well as craftsmen for traditional crafts made from plants, priests to share their understanding of the plants for their various plant based food, crafts, decoration etc. utilized in rituals as well as their insights on the spiritual and ceremonial aspects of the plants, the housewife for insights into the home garden, wild veggies, hunters for the awareness about the forest and its taboos, herbalist for the knowledge of traditional medicine and its application, the leader of the village to advise on local laws and customs, a government worker, a student, and so forth.

Information gathered from the informants was documented in the field notebook, and the questionnaire format contains details of the demographic information on the name of local informant, gender, community, age, occupation, level of knowledge; name of species, collection number, place of collection, geographical coordinates, altitude; Habit, Habitat, life forms, cultivation status; ethnobotanical uses including wild edible, medicinal, fodder, magico-religious, decoration, crafts, veterinary drugs, etc. Once all the data were collected, they were entered into an MS Excel spreadsheet for additional quantitative data analysis.

4.1.4. Collection and preparation of voucher specimen

With the acquisition of digital photography (Model No. Nikon D3500) plant sample was photographed and the plant voucher specimens were identified and collected from the community forest with the help of a local guide. The fresh plants species were

collected and each plant species was collected with at least two or three sets of herbarium specimens. The collected plants species were carefully put in newspapers to dry, and the newspapers were replaced every day until the plants had dried entirely with that the formalin (1:10) was applied over the specimen for preservation to avoid it from infection after every change. Following the whole drying process, the plant specimens were mounted on a standard 50 x 35 cm herbarium sheet. The necessary information was then put on a pre-printed label that was adhere to the right corner at the bottom of the sheet. The information listed on the labels of the herbarium sheets includes the following: the botanical name of plants, family, collection number, local name, type/typus, location, date of collection, altitude, accession number, and collector's name in compliance with the Jain & Rao procedure (1977), Martin (1995).The plant were categorized into different life forms as trees, shrubs, herbs, climbers, and grasses in accordance to the classification suggested by Raunkiar (1943) and Brown (1977), (Roy & Janbandhu, 2020).

4.1.5. Identification of voucher specimen

The collected and documented ethnobotanically significant plants were identified in the field locally by the local expert with their local names. With the help of voucher specimen and photographs, the taxonomic expert identified the unknown plant species with their botanical names. The references from district flora were also used to identify the plant specimens, including Flora of Lower Subansiri District, Arunachal Pradesh (India) Vols. 1 & 2 by Pal (2013), Flora of Kurung Kumey District, Arunachal Pradesh by Dash & Paramjit (2017), and Flora of Assam by Kanjilal et al., (1934-1940), Flora of India Series (BSI), e-Flora of China (Vol. II – XXIV), Forest Flora of British Burma (Kurz, 1877), and Flowers of Himalaya by Polunin and Stainton (1997). The accepted names and distribution range were verified in POWO: Plant of the World Online (https://powo.science.kew.org/), World Flora Online (WFO) (WFO, 2021). For reference purposes in the future, the voucher specimens were deposited in the Herbarium of Arunachal University (HAU), Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh-791112, and Arunachal Pradesh.

4.1.6. Enumeration of ethnobotanical species

As per the Angiosperm Phylogeny Group (APG-IV) system (2016), the ethnobotanically significant plant species identified at the species level were enumerated and categorized under various plant families, while the gymnosperm species were

positioned at the beginning before the angiosperm families. The species belonging to each plant family were arranged alphabetically with their correct botanical name is given in bold italics. The author citations, local name, family, collection number with date & year, habit & habitat, altitude, part used, traditional use, and conservation status are also provided.

4.2. Statistical analysis

For the quantitative analysis, the ethnobotanical data were analyzed in the Microsoft excel spreadsheet, 2007.

4.2.1. Semi-quantitative sampling of ethnobotanical species

4.2.1.1. DAFOR scale (Sutherland, 1996)

The DAFOR scale is a semi-quantitative sampling methods suggested by Sutherland (1996) which is used to quickly determine the density or coverage of species (usually plants) in a particular region. For evaluating plant abundances over wide regions, this technique is employed. Simply classifying each species as dominant, abundant, common, rare, or occasional (or "DAFOR") is all that is required to do this. Numerical computation in the conventional sense is not required when allocating DAFOR scale values to plant species during a survey as suggested by Sutherland. There is no set definition for these classes, so it involves making own judgments about what counts and whether to base the score on species density or relative cover.

The following categories make up the DAFOR scale:

Value	Percentage cover	Notes
D - Dominant	> 75%	Rarely used in practice.
A - Abundant	51 - 75%	Very common over most of the site
F - Frequent	26 - 50%	
O - Occasional	11 - 25%	
R - Rare	1 - 10%	

The DAFOR scale (Guide notes for recording DAFOR scores recommended by Sutherland, 1996) was used to classify the ecological state of all reported species at the local level during field trips in the Tagin and Apatani within the five categories mentioned above.

A species was classified as Dominant (D) if it was determined to be extremely frequent and had the largest population in comparison to other species in many sites; A species was assigned the lesser rank of **Abundant (A)** if it was shown to be highly common in several locations but was sub dominate by another species; A species was classified as **Frequent (F)** if a Species that are observable and often occur but do not occupy extensive regions; Rarely observed, these species do not regularly occur throughout the region and do not cover a extensive amount of terrain are categorized as **Occasional (O)**; An uncommon species is one that is thought to exist in tiny populations or a few individuals are placed under **Rare** category **(R)**.

4.2.2. Quantitative evaluation of ethnobotanical species

4.2.2.1. Informant Consensus Factor (ICF)

The informant consensus factor was initially developed in 1986 by Trotter & Logan and revised in 1998 by Heirinch et al., It is used for the calculation of ethno-medicinal plant knowledge utilized among the informants and authenticates the homogeneity of the knowledge given by the informants on medicinal plants. It calculates the reported ailments with variation in manner of utilization. Following is the calculation of the ICF.

$$\mathbf{ICF} = \frac{\mathbf{Nur - Nt}}{\mathbf{Nur - 1}}$$

Where, 'Nur' represents the number of use reports of informants for a specific illness category. 'Nt' represents the total number of species utilized by all informants for a specific illness.

If the ICF value is near 1, it means that popular plant species are widely used in the community and are authentic in treating illnesses, as reported by many people. On the other hand, if the ICF index is close to 0, it means that informants are not well-informed about the benefits of various plant species and how little effective they are at treating illnesses (Roy & Janbandhu, 2020). In this case, the informant consensus maximum value is 1.

4.2.2.2. Use Value (UV)

The use value index (UV) was given by Phillips et al., in 1994, is an evaluation of the plant species that are regarded as most significant in the given population. It is calculated using the following formula:

$$\mathbf{UV} = \frac{\mathbf{\Sigma Ui}}{\boldsymbol{n}}$$

Where, 'Ui' is the number of uses cited by each informant for a particular plant species, '*n'* is the number of informants.

4.2.2.3. Fidelity level (FL)

As stated by Musa et al., (2011), it is an index that indicates if a certain plant species is appropriate for treating a given ailment. The Fidelity Level was utilized to identify the most crucial plant species used by local herbal practitioners and elderly individuals to cure certain ailments in the study area (Venkatesan et al., 2022)
FL was calculated using the following formula:

$$\mathbf{FL\ (\%)} = \frac{\mathbf{Np}}{\mathbf{N}} \times \mathbf{100}$$

Where 'Np' is the total informants who practically utilized a species a particular ailment, and 'N' is the total informants who reported the utility of that plant species for an ailment (Frieman et al., 1986). The high-fidelity level revealed the higher occurrence of plant utilization against certain illnesses or the worth of a particular plant species over other plants for healing specific diseases while low fidelity unveils the less occurrence of plant usage against particular illness and its utilization for various medicinal uses (Roy & Janbandhu, 2020).

It computes the percentage of informants who utilize a plant for the same purpose comparative to all uses of the plant for any other purpose.

4.2.2.4. Relative Frequency of Citation (RFC)

The Relative frequency of Citation (RFC) is a measure useful in determining the plants that were most frequently cited as useful (Tardio & Pardo-de-Santayana, 2008). RFC index vary from 0 to 1 theoretically. If it is 0, when no informants mentioned the

plants as useful while if every informant mentioned using the species, which is improbable, then it is 1. It was computed by using the following formula

$$\mathbf{RFC} = \frac{FC}{N} \ \mathbf{(0 < RFC < 1)}$$

Where,

FC: Number of informants who cited a use of plants species

N: Total number of informants in the survey

4.2.3. Similarity Coefficients (Overlap Analysis for Cited Plant Species)

To evaluate the degree of plant species overlap or resemblance between the two communities under investigation, both the Jaccard Similarity Index (JSI) and Rahman's Similarity Index (RSI)

4.2.3.1 Jaccard Similarity Index (JSI)

The Jaccard Similarity index (JSI) was created by Grove Karl Gilbert in 1884, a commonly utilized index in several scientific fields, which was employed to investigate ethnobotanical knowledge according to cultural backgrounds (Wang & Wang, 2017). In this case, it is commonly used to investigate the comparison of plant species based on similarity and diversity utilized between the two communities. The following is an expression for the Jaccard Index (Jaccard, 1902; González-Tejero et al., 2008):

$$\mathbf{JSI} = \frac{\mathbf{C}}{\mathbf{A+B-C}} \times \mathbf{100}$$

Where, A is the number of species of community A, B the number of species of community B, and C is the number of species common to community A and B.

4.2.3.2 Rahman's Similarity Index (RSI)

Inayat Ur Rahman and Farhana Ijaz developed Rahman's Similarity indicator (RSI), a novel ethnobotanical similarity index, in 2019. It is a measure for calculating the cultural similarity and differences of two community of different area on ethnobotanical knowledge in the utilization of plant species. Rahman's similarity Index can be calculated as:

$$\mathbf{RSI} = \frac{d}{a+b+c-d} \times \mathbf{100}$$

Where ‘a’ is the number of plant species unique in community A; ‘b’ is the number of plant species unique in community B; ‘c’ is the number of plants species common in A & B Community; and‘d’ is the number of common plant species used for similar ailments in both A and B community, where a and $b \neq 0$ and c and $d \geq 0$.

CHAPTER 5
ANALYSIS OF ETHNOBOTANICAL INFORMATION

5. Statistical analysis of ethnobotanical meta data

5.1. Total informants, total household and total villages surveyed

A total of 300 informants-76 male and 74 female from the Tagin area and 80 male and 70 female from Aptatani i.e., a total of 156 male and 144 female -were questioned for the current cross-cultural ethnobotanical studies. These informants represented 75 households from the Tagin villages and 75 from the Ziro villages of the Upper and Lower Subansiri district of Arunachal Pradesh. The names of the surveyed villages are shown in Figure 1, while Table presents the names of the studied villages together with their GPS coordinates and altitude, the total number of households surveyed, the total number of informants questioned, their genders, and their ages. A total of 30 villages were surveyed from both the study area i.e., 15 villages from Tagin and 15 from Apatani residing area.

5.2. Age group, gender, literacy and skill level of informants

In this cross-cultural investigation, a total of 300 informants were interviewed from 75 household each from Tagin and Apatani biocultural landscape of Upper and Lower Subansiri district of Arunachal Pradesh.

The informants interviewed for assessment of ethnobotanical knowledge and skills (both theoretical & practical dimension knowledge) falls within age group between 15 -85 years which is presented in Table 5.2.1.

In the present study, a total of 300 informants who were questioned of which 144 were women and 156 were men. In the Apatani community, over 70% of male informants were literate, compared to 30% of illiterate male informants. Similarly, 57 % of female informants were literate, whereas 43% of male informants were illiterate. Furthermore, the study showed that among the Tagin informants, 51% of the female informants fell into literate and 48 % in illiterate categories, with 71% of the male informants being literate and 28 % of the male informants being illiterate. The majority of male informants (n = 154) were found to be in the age range of 55-65, while the majority of female informants (n = 146) were found to be in the age range of 45-55 from both communities. These informants were found to be highly knowledgeable about the

plant species that are traditionally used. It was also determined by the study that the male informant had more knowledge of ethnobotanical topics such as magico-religious plants, customary laws, building, crafts, hunting and fishing, and therapeutic knowledge, while the female informant had more knowledge of the value of foraging for edible wild plants, agricultural tools and techniques, medicinal uses of plants, and so forth. The age group over 45 gave far more insight and stated to be more knowledgeable with their traditional laws and practices pertaining to plants than the age group under 45. Additionally, since the elderly, illiterate informant's also good amount of all the necessary information on the ethnobotanical knowledge, the research demonstrated that literacy had nothing to do on traditional ethnobotanical knowledge and abilities.

Table 5.2.1. An overview of all informants questioned to gather information on the use of ethnobotanical resources across a range of age groups in the Apatani community (15-85 years old) in both theoretical and practical dimensions

Informant's Age Group (Years) Apatani							
Gender of informants	**15-25**	**25-35**	**35-45**	**45-55**	**55-65**	**65-75**	**75-85**
Total	0	17	35	55	32	10	01
Male	0	09	12	24	25	09	01
Female	0	08	23	31	07	01	0
Percentage	0%	11.3%	23.3	36.3%	21.3%	6.7%	0.67%

Table 5.2.2. An overview of all informants questioned to gather information on the use of ethnobotanical resources across a range of age groups in the Tagin community (15-85 years old) in both theoretical and practical dimensions

Informant's Age Group (Years) Tagin							
Gender of informants	**15-25**	**25-35**	**35-45**	**45-55**	**55-65**	**65-75**	**75-85**
Total	02	26	42	44	31	05	0
Male	02	13	14	22	22	03	0
Female	0	13	28	22	09	02	0
Percentage	1.4 %	17.3%	28%	29.3%	20.7	3.3%	0%

Table 5.2.3. A list of villages visited during the ethnobotanical field survey in the two districts of Arunachal Pradesh, Lower and Upper Subansiri, together with the number of households sampled, the total number of informants questioned, the gender of the informants, the elevation range, and the geographic coordinates.

Name of district	Name of villages	No. of household sampled	Total informants interviewed	Informant (Gender)		Elevation (meter)	Geographical Coordinates
				Male	Female		
Lower Subansiri	Mudang Tage	5	10	5	5	1634	27°37'13.41"N 93°50'30.68"E
	Dutta	5	10	4	6	1600	27°34'35.63"N 93°49'41.14"E
	Bamin-Michi	5	10	4	6	1603	27°34'10.15"N 93°49'41.67"E
	Hong	5	10	5	5	1627	27°33'30.06"N 93°50'49.15"E
	Bulla	5	10	5	5	1612	27°35'43.94"N 93°50'24.64"E
	Hari	5	10	6	4	1622	27°35'3.68"N 93°50'34.95"E
	Hija	5	10	6	4	1607	27°34'47.55"N 93°49'21.56"E
	Lempia	5	10	5	5	1618	27°36'22.37"N 93°49'57.62"E
	Siiro	5	10	5	5	1604	27°31'26.89"N 93°50'11.38"E
	Manipolyang	5	10	5	5	1627	27°31'47.91"N 93°50'59.15"E
	Myolyang	5	10	7	3	1632	27°37'12.91"N 93°50'31.13"E
	Siibey	5	10	6	4	1606	27°32'57.32"N 93°48'34.06"E
	Hakey Tare	5	10	3	7	1670	27°29'42.72"N 93°51'24.76"E
	Biiri	5	10	6	4	1612	27°34'6.43"N 93°50'39.37"E
	Reru	5	10	6	4	1611	27°35'39.69"N 93°50'26.34"E
Upper Subansiri	Taksing	5	10	5	5	2449	28°22'32.87"N 93°14'52.31"E
	Limekeng	5	10	6	4	1411	28°20'11.42"N 93°35'39.30"E
	Nacho	5	10	7	3	707	28°23'43.52"N 93°50'17.77"E
	Siyum	5	10	3	7	600	28°21'5.94"N 94° 1'54.72"E

	Taliha	5	10	4	6	470	28°14'2.04"N
							94° 8'47.98"E
	Kodak	5	10	5	5	630	28°14'34.14"N
							94° 6'50.00"E
	Redding	5	10	3	7	877	28° 6'46.87"N
							94° 8'39.29"E
	Mosi	5	10	8	2	510	28° 2'43.93"N
							94° 7'6.62"E
	Soki	5	10	6	4	506	28° 2'49.57"N
							94° 7'42.63"E
	Menga	5	10	6	4	315	28° 6'1.85"N
							94° 8'46.85"E
	Riddi	5	10	4	6	530	28° 2'13.40"N
							94°12'11.38"E
	Bui	5	10	3	7	410	28° 3'57.60"N
							94°11'40.79"E
	Yekar	5	10	6	4	816	28° 0'34.87"N
							94°11'0.81"E
	Dulom	5	10	5	5	612	27°59'34.99"N
							94°11'49.59"E
	Nima	5	10	6	4	465	27°58'29.41"N
							94°11'52.73"E

Table 5.2.4. An overview of the male and female informants (n=150) from the Apatani people that were questioned for an ethnobotanical study in the Lower Subansiri district of Arunachal Pradesh, including 75 households and 15 villages, together with information on their age, the number of informants, and their literacy level

Gender of informants	**Age (Years)**	**No. of Informants (Apatani)**	**Literacy Level**	
			Literate	**Illiterate**
Male	15-25	0	0	0
	25-35	9	9	0
	35-45	12	9	3
	45-55	24	15	9
	55-65	25	19	6
	65-75	9	4	5
	75-85	1	0	1
Total		**80**	**56**	**24**
Percentage			**70%**	**30%**
Female	15-25	0	0	0
	25-35	8	3	5
	35-45	23	17	6
	45-55	31	18	13
	55-65	7	2	5
	65-75	1	0	1
	75-85	0	0	0
Total		**70**	**40**	**30**
Percentage			**57 %**	**43%**

Table 5.2.5. An overview of the male and female informants (n=150) from the Tagin people that were questioned for an ethnobotanical study in the Upper Subansiri district of Arunachal Pradesh, including 75 households and 15 villages, together with information on their age, the number of informants, and their literacy level.

Gender of informants	Age (Years)	No. of Informants (Tagin)	Literacy Level	
			Literate	Illiterate
Male	15-25	2	2	0
	25-35	13	9	4
	35-45	14	10	4
	45-55	22	16	6
	55-65	22	16	6
	65-75	3	1	2
	75-85	0	0	0
Total		**76**	**54**	**22**
Percentage			**71%**	**28%**
Female	15-25	0	0	0
	25-35	13	7	6
	35-45	28	20	8
	45-55	22	8	14
	55-65	9	3	6
	65-75	2	0	2
	75-85	0	0	0
Total		**74**	**38**	**36**
Percentage			**51%**	**48%**

CHAPTER 6
TAXONOMIC DIVERSITY OF ETHNOBOTANICAL SPECIES

6.1. Taxonomic diversity and dominant plant families

The current cross-cultural ethnobotanical study of Tagin and Apatani community of Upper and Lower Subansiri district revealed a total of 333 significant belonging to 245 genera and 107 plant families plant species from the diverse climatic zone of two study area. The statistical analysis revealed the top 10 dominant families such as Asteraceae (20 sp.), Rosaceae (17 sp.), Poaceae (14 sp.), Cucurbitaceae (13 sp.), Urticaceae (12 sp.) Arecaceae (12 sp.), Solanaceae (11 sp.), Fabaceae (10 sp.), Polygoniaceae (9 sp.), and Rutaceae (9 sp.) which represented by highest number of species which are presented in Figure 6.1. A and B. While the remaining plant families were found to be represented by fewer than four species, other plant families, including Zingiberaceae, Euphorbiaceae, Moraceae, Araceae, Lauraceae, Rubiaceae, Lamicaeae, Musaceae, Ranunculaceae, Dioscoriaceae, Brassicaceae, Amaryllidaceae and Melastomataceae, and Amaranthaceae, were found to have moderate species diversity.

6.2. Diversity of dominant genera and species

According to current research, there are 245 distinct plant genera recorded from the study area, including fungi, gymnosperms, angiosperms, and pteridophytes. Every plant genus is represented by one to many species, which are shown in Figures 6.2.A to E. The most species of plants in the ethnobotanically significant plant genera were found in *Rubus* (7 species), *Solanum* (6 species), *Allium* (5 species), *Calamus* (5 species), *Ficus* (5 species), and *Persicaria* (5 species). These were followed by *Begonia* (4 species), *Citrus* (4 species), *Cucurbita* (4 species), *Piper* (4 species), and *Saurauia* (4 species), with less than 3 species (>three sp.) represented in the remaining genera.

As shown in Table 6.2. most plant families, genera, and species belong to the angiosperm dicot (245 sp.), followed by angiosperm monocot (70 sp.), Pteridphyte (10 sp.) gymnosperm (4 sp.), and fungi (4 sp.).

Table 6.2. Plant group summary: each of the three plant categories i.e., Gymnosperm, Angiosperm, and Fungi reports data from the Tagin and Apatani communities

Plant group	Family	Genera	Species
Pteridophyte	7	9	10
Gymnosperm	2	2	4
Angiosperm			
Monocot	15	41	70
Dicot	79	189	245
Fungi	4	4	4

6.3. Habit/life form of ethnobotanical species

According to a statistical assessment of ethnobotanical plant habit categories from two communities in the Upper and Lower Subansiri districts (Tagin and Aptani), herbaceous plant species indicate the highest number of species (131 sp.) which account for 39% out of 333 total plant documented. It is then followed by Tree with 27 % (90 sp.), Shrub 14.4% (48 sp.), Climber 3 % (11 sp.), Subshrub 4% (14 sp.), Liana 2% (7 sp.), Fungi 1% (4 sp.) and Runner 1% (3 sp.). The habit categories are represented in the table given below.

Table 6.3. Plant habit category of ethnobotanical species (n=333) used by the Tagin and Apatani community of Arunachal Pradesh.

Habit	Number of Species	Percentage
Herb	131	39.3%
Tree	90	27%
Shrub	48	14.4%
Sub-shrub	14	4%
Climber	11	3%
Liana	7	2%
Runner	3	1%
Fungus	4	1%

6.4. Habitat diversity of ethnobotanical species

Of the 333 ethnobotanical species reported by 300 informants from Tagin and Apatani community of Arunachal Pradesh, the highest number of species were recorded for forest habitat with 61.8% (206 sp.) which is followed by meadows/field with 28.2 % (94 sp.), wetland/bog with 12% (40 sp.), and barren/tundra with lowest species habitat covering 4.8 % (16 sp.), which are presented in table given below.

Table 6.4. Plant Habitat diversity of ethnobotanical species (n=333) used by the Tagin and Apatani tribe of Arunachal Pradesh.

Habitat Type	No. of species	Percentage
Forest/ thickets	206	61.8%
Meadow/field (open areas)	94	28.2%
Wetland/bog	40	12%
Barren/ tundra (alpine areas)	16	4.8%

6.5. Species distribution along diverse agro-climatic zone

The species distribution study of plant species along the different climatic region revealed that the highest numbers of plant were distributed in Tropical forest with 46 % (154 sp.) which is followed by temperate forest with 22 % (73 sp.), Subtropical 17 % (57 sp.) tropical to subtropical forest 9.6% (32 sp.), subtropical to temperate 4.5% (15 sp.), Alpine 0.6% (2 sp.) which is presented in the table given below.

Table 6.5. Distribution of ethnobotanically significant plants in different agroclimatic zone or forest type of two district-Upper and Lower Subansiri district of Arunachal Pradesh.

Agro-climatic zone/Forest Type	Altitude Range	Number of Species	Percentage
Tropical Forest	100 - 1000 m	154	46%
Temperate Forest	2000-3000 m	73	22%
Sub-tropical forest	1000 -2000 m	57	17%
Tropical to Sub-tropical forest	100 – 2000 m	32	9.6%
Sub-tropical to Temperate Forest	1000 – 3000 m	15	4.5%
Alpine	Above 4000 m	2	0.6%

6.6. Observance of Abundance (DAFOR Scale by Sutherland, 1996)

Out of total 333 plant species reported from the Tagin and Apatani tribe of Arunachal Pradesh, 46.2 % (154 sp.) was recorded under the Frequent (F) category, 37.2 % (124 sp.) under the Occasional (O) category, 11 % (37 sp.) under the Abundant (A) category, 3.9 % (13 sp.) under the Rare (R) category, and 1.5 % (5 sp.) under the Dominant (D) category which are shown in the table given below:

Table 6.6. Observation of distribution status and abundance of ethnobotanical plant species (n=333) using DAFOR Scale (Sutherland, 1996) observed in the biocultural landscapes of Tagin and Apatani, Arunachal Pradesh**.**

DAFOR Scale (Sutherland, 1996)	No. of Species	Percentage (%)
Dominant	5	1.5%
Abundant	37	11 %
Frequent	154	46.2%
Occasional	124	37.2
Rare	13	3.9%

6.7. Statistical analysis on ethnobotanical species

6.7.1. Category of plant parts harvested

The investigation of ethnobotanical plant parts harvested and their utilization reports from the Tagin and Apatani community of Arunachal Pradesh have shown that leaves were the frequently harvested plant parts used among the two tribes with highest percentage of 42.3% (141 sp.), which is followed by fruit with 31.83% (106 sp.), stem 17.1 % (57 sp.), whole part 10.5% (35 sp.), seeds 6.6% (22 sp.), flower 3.3% (11 sp.) and tender shoot 3% (10 sp.).On the other hand, less than (>) 10 species were documented in each of the other categories. The table 6.7 shows the species reported under the different usage categories.

Table 6.7.1. Ethnobotanically significant species (n=333) used by the Tagin and Apatani tribes of Arunachal Pradesh with respect to the plant parts harvest and usage category

Plant parts	Number of species	Percentage
Leaves	141	42.3%
Fruit	106	31.83%
Stem	57	17.1%
Whole part	35	10.5%
Seeds	22	6.6%
Flower	11	3.3%
Tender shoot	10	3%
Tuber	7	2.1%
Branch	6	1.8%
Rhizome	6	1.8%
Root	4	1.2%
Bulbils	4	1.2%
Bark	4	1.2%
Bulb	3	0.9%
Inflorescence	2	0.6%
Pods	2	0.6%
Resin	2	0.6%

Thorns	1	0.3%
Spines	1	0.3%
Cotyledon	1	0.3%
Pericarp	1	0.3%
Fiber	1	0.3%
Bracts	1	0.3%
Leaf sheath	1	0.3%

6.7.2. Ethnobotanical species under different usage categories

The study revealed that commercially relevant plant species accounted for the highest percentage, with 31 % (103 sp.) of the total species (333 species) which is followed by the medicinal plants 30.03 % (101 sp.), wild edible vegetable with 23.72 % (79 sp.), wild edible fruit 17.7% (59 sp.), magico-religious belief category with 11.4 % (38 sp.), 9 % (29 sp.) for traditional handcrafts, 11.7% (39 sp.) were fodder, 9% (30) were cultivated vegetables, , 7.21% (27 sp.) were cultivated fruit, 7.2% (24 sp.) were Fuel, 6.6% (22 sp.) were recorded for construction, 6.6% (22 sp.) were recorded for the miscellaneous under category, 4.2 % (14 sp.) under biofencing and 3.9% (13 sp.) as stupefacient/poison, 3.6% (12 sp.) as spice and condiments, 3.3% (11 sp.) as beverages/Wine (Table 6.8).

Table 6.7.2. Ethnobotanical species (n=333) recorded under various Usage categories reported by the Tagin and Apatani tribes of Arunachal Pradesh.

Use categories	**Number of species**	**Percentage**
Economically significant plant	103	31%
Medicinal plant	101	30.03%
Wild edible vegetables	79	23.72%
Wild edible fruits	59	17.7%
Fodder plants	39	11.7%
Magico-religious belief	38	11.4%
Cultivated vegetables	30	9%
Traditional handcrafts	28	9%
Cultivated fruit plant	27	7.21%
Fuel	24	7.2%
Construction	22	6.6%
Miscellaneous usage	22	6.6%
Biofencing	14	4.2%
Stupefacient and poison	12	3.6%
Spice and condiments	12	3.6%
Beverages/Wine	11	3.3%

Taboos	9	2.7%
Binding/packaging	8	2.4%
Decoration	8	2.4%
Staple food	7	2.1%
Veterinary	7	2.1%
Dye	4	1.2%
Agriculture tools	3	0.9%
Insect and pest repellent	3	0.9%

6.7.3. Ethnomedicinal species recorded under various ailments category

Present studies have reported 101 species of ethnomedicinal plant species that were statistically analyzed and reported under 12 categories of ailments which includes 45 sp. under gastrointestinal disorders with highest percentage among all the ailment categories, 22 sp. recorded for injuries, wounds, and swelling, 14 sp. for cough, cold, fever, and headaches,12 sp. for blood pressure, amnesia and hypercholesterolemia, 10 sp. for dermatological disorders, 7 sp. for veterinary disorders, and 6 sp. for skeletal-muscular disorders. The remaining ailment categories were represented by less than 6 species in each category, as shown in Table No.6.9.

Table 6.7.3. The Checklist of 101 medicinal plant species used by Apatani and Tagin tribes of Arunachal Pradesh for curing 12 category of ailments.

Ailment category	**Number of Species**	**percentage**
Gastrointestinal	45	45%
Injury, wound & swelling	22	22%
Cough,cold, fever, headaches	14	14%
Bloodpressure, Amnesia, Hypercholesterolemia	12	12%
Dermatological disorder	10	10%
Veterinary	7	7%
Skeleton-muscular disorder	6	6%
Oral & Dental disorder	5	5%
Optical disorder	5	5%
Anemia	5	5%
Appetizer	4	4%
Mammary & gynecological	1	1%

6.8. Quantitative analysis of ethnobotanical data

The quantitative evaluation of ethnobotanical species is reported separately for Apatani and Tagin tribes.

6.8.1. Use value (UV) of ethnobotanical species

Apatani

The ethnobotanical species' Use value (UV) indices (n =152) ranged from 0.006 to 0.05, as shown in Table 6.8.1.A. The top ten highest UV indices were recorded for the species *Phyllostachys mannii* (0.05) and *Pinus wallichiana* (0.05), which is followed by *Elusine coracana* (0.04) *Magnolia champaca* (Linnaeus) (0.03) *Zingiber officinale* (0.03), *Allium tuberosum* (0.02), *Amaranthus caudata* (0.02), *Castanopsis faberi* (0.02), *Clerodendrum colebrookeanum* (0.02), and *Cucurbita pepo* (0.02)

The above mentioned plants with higher UV indices were identified as culturally significant species commonly used by the Apatani tribe for food, medicine, and other essential purposes in their day to day life. This study found that ethnobotanical species with low UV indices (0.01-0.006) were more abundant (89 species) than those with higher UV indices (0.02-0.05).

Tagin

The ethnobotanical species' Use value (UV) indices (n =283) ranged from 0.006 to 0.05, as shown in Table 6.8.1.B. The top ten highest UV indices were recorded for the species *Dendrocalamus hamiltonii* (0.05) which is followed by *Zanthoxylum rhetsa* (0.04) *Curculigo capitulata* (0.03), *Calamus erectus* (0.03), *Bauhinia purpuria*.(0.03), *Bauhinia variegata* (0.03), *Cucurbita pepo* (0.03), *Zingiber officinale* (0.03), *Artimisia nilagirica* (0.03), and *Albizia chinensis* (0.02).

The remaining plant species comprised of less than 0.01 to 0.006 species and the above mentioned plants with higher UV indices were identified as culturally significant species commonly used by the Tagin tribe for food, medicine, and other essential purposes in their day to day life. This study found that ethnobotanical species with low UV indices (0.01-0.006) were more abundant (196 species) than those with higher UV indices (0.02-0.05).

6.8.2. Relative frequency of citation (RFC)

Apatani

The current research demonstrates that the Relative Frequency of Citation (RFC) varies between a minimum of 0.04 and a maximum of 0.88 which are presented in Table 6.8.2.A. The top ten plant species highest RFC was reported for *Acmella oleracea* with 0.88 RFC, which is followed by *Houttuynia cordata* (0.86), *Thladiantha ziroensis* (0.84),

Zingiber officinale (0.81) *Centella asiatica* (0.80), *Clerodendrum colebrookeanum,* (0.74), *Allium hookeri, Oenanthe javanica* (0.73), *Elusine coracana* (0.69) and *Rhus chinensis* (0.62). The least RFC was reported for *Taxus wallichiana* (0.04), *Solanum myriacanthum* (0.08) and *Ranunculus sceleratus* (0.11)

Tagin

The current research demonstrates that the Relative Frequency of Citation (RFC) varies between a minimum of 0.05 and a maximum of 0.87 which are presented in Table 6.8.2.B.

The top ten plant species with highest RFC was reported for *Ageratum conyzoides* with 0.87 RFC, which is followed by *Paederia foetida* (0.85), *Acmella oleracea* (0.79), *Zingiber officinale* (0.71), *Solanum nigrum* (0.64), *Mikania micrantha* (0.59), *Dryopteris felix- mas* (0.57), *Psidium guajava* (0.52), *Begonia aborensis* (0.51) and *Dendrocalamus hamiltonii* (0.49). The least RFC was found for *Rohdea nepalensis* (0.05), *Rheum nobile* (0.07) and *Juglans regia* (0.07).

6.8.3. Informant consensus factor (ICF)

Apatani

The informant consensus factor (ICF) index of the disease categories reported by informants against ethnomedicinal plants reported ranges from lowest (0.87) to highest (0.99) for Apatani tribes, which are depicted in Table 6.8.3.A.

The ailments categories with highest ICF values recorded were for Oral & Dental disorder (ICF: 0.99), Skeleton-muscular (ICF: 0.97), Optical disorder (ICF: 0.97), Dermatological (ICF: 0.96), Anemia (ICF: 0.95), The disease group with IFC scores ranging from mild to high (0.87 – 0.92) with high use reports were Cuts and wounds (ICF:0.87;Nur:113,Ns:15), followed by High Blood pressure/Amnesia/Hypercholesterolemia (ICF: 0.89; Nur: 75, Ns: 9), Cough/cold/fever/headaches (ICF: 0.91; Nur: 95, Ns: 9), Gastrointestinal ICF: 0.92; Nur: 339; Ns: 27).

Tagin

The informant consensus factor (ICF) index of the disease categories reported by informants against ethnomedicinal plants reported ranges from lowest (0.82) to highest (0.98) for Tagin tribes, which are depicted in Table 6.8.3.B.

The ailments categories with highest ICF values recorded were for Mammary & gynaecological (0.98), followed by Oral & Dental disorder (ICF: 0.98), Skeleton-muscular (ICF: 0.95), Dermatological (ICF: 0.95), Anemia (ICF: 0.94), Veterinary (ICF: 0.94). The disease group with IFC scores ranging from mild to high with high use reports were Gastrointestinal ICF: 0.91; Nur: 297; Ns: 26).

An ICF score that is closer to 1 or 1 indicates that informants were more likely to communicate knowledge on the healing properties of a certain plant species, and it also indicates that informant consent was greatest when using a given plant against a particular disease category.

6.8.4. Fidelity level (FL)

Apatani

The current study revealed the fidelity level in this study range between 0 and 93.7 % for Apatani tribe which are depicted in Table 6.8.4.A. and the top ten plants with highest fidelity level was reported for *Houttuynia cordata* (93.7%), followed by *Zingiber officinale* (92.8), *Thladiantha ziroensis* (92.5%), *Centella asiatica* (88.9%), *Clerodendrum colebrookeanum* (83.6%), *Crassocephalum crepidioides* (80%) *Diplazium esculentum* (80%), *Phoebe bootanica* (74%), *Hydrocotyle javanica* (73%), *Oenanthe javanica* (72%). The plant with lowest fidelity level was found for *Taxus wallichiana* (0%).

Tagin

The current study revealed the fidelity level in this study range between 14 and 100 % for Tagin tribe which are depicted in Table 6.8.4.B. and the top ten plants with highest fidelity level was reported for *Rheum nobile* with 100% followed by *Zingiber officinale* (86.7%), *Ageratum conizoides* (85.8%), *Terminalia chebula* (83%), *Mikania micrantha* (82%), *Solanum spirale* (80%), *Diplazium esculentum* (76%), *Dendrocalamus hamiltonii* (73%), *Chromolaena odorata* (72.7%), *Artemisia nilagirica* (70%). The plant with lowest fidelity level was found for *Curcuma caesia* (14%).

The higher degree of species fidelity level among the informants suggests a greater degree of agreement on the potential, usefulness, and efficacy of medicinal plants in treating the proposed diseases

6.9. Cultural Similarity Index

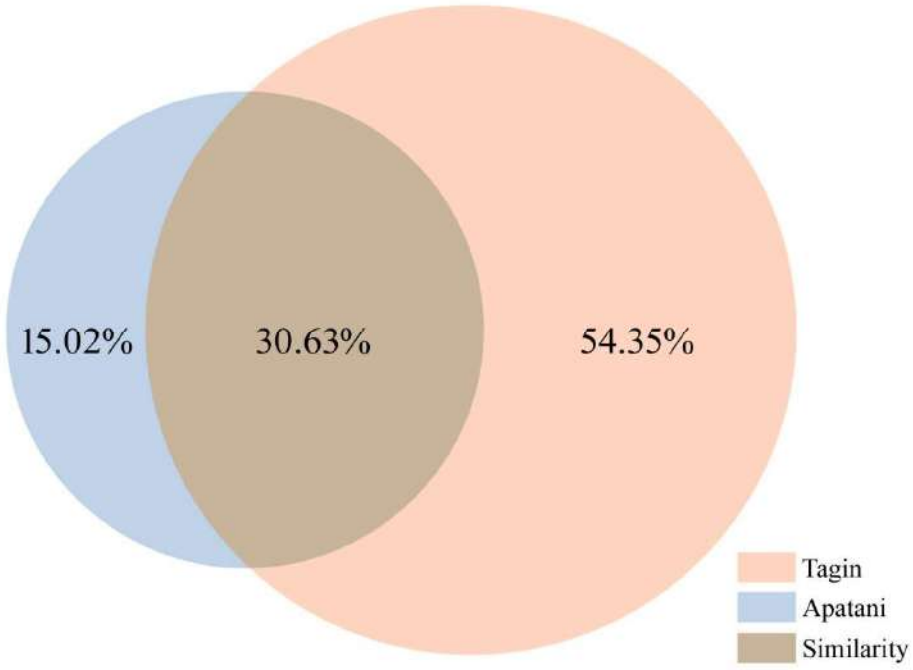
6.9.1. Jaccard index

The Jaccard Index is a tool used to assess the similarity between various cultural groups with respect to plants utilization. The comparative analysis of the present study on the ethnobotanical plant species used by Tagin and Apatani community reveals a similarity index of 31.32 % suggesting a moderate degree of resemblance between their ethnobotanical knowledge and application methods. Out of 333 plant species cited by the informants, 102 species were found to be shared among the tribesmen of both the community, meanwhile 152 species were used by the Apatani people and 283 plants species were found to be used by Tagin community which is presented in table 6.9.1.A., while the checklist of commonly shared ethnobotanical species by both the tribes and their use categories are presented in table 6.9.1.B and Ven diagram in figure 6.C.

Table 6.9.1.A. Summary of Jaccard Similarity Index of the ethnobotanical species used by Tagin and Apatani tribes of Arunachal Pradesh

Jaccard Index			Index	%
Plant found in Apatani belt	a	152	0.3063	30.63
Plant found in Tagin belt	b	283		
Common Plants found in both belt	c	102		

Figure 6.C. Ven diagram showing the Jaccard Similarity percentage of ethnobotanical species utilized among the Tagin and Apatani tribes of Arunachal Pradesh



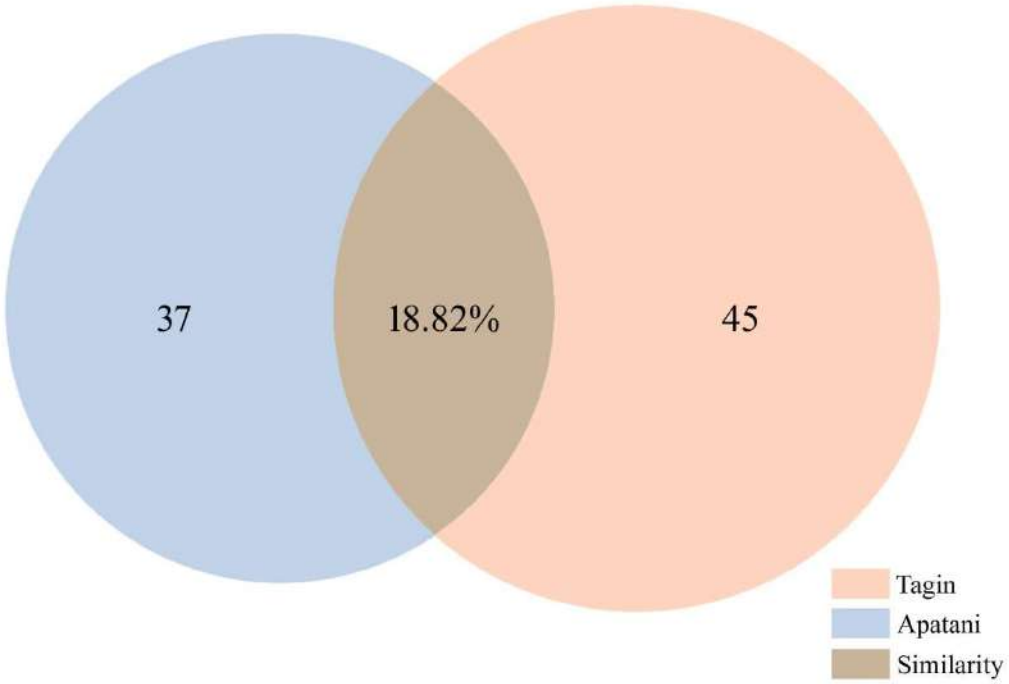
6.9.2. Rehman's Similarity Index

According to Rahman et al., (2019), the Rahman's similarity index (RSI) calculates specific plant species and their common medicinal usage to illustrate the cultural similarities across ethnic populations in different regions. The Rahman's index is mainly utilised to clarify and distinguish between the cultural links or species similarity and difference in terms of illness treatment between the two ethnic groups. The checklist of common medicinal plants used by both the tribes for treating similar ailments in presented in table 6.9.2.B.

Table 6.9.2.A. Summary of Rahman Similarity Index of common ethnomedicinal plants utilized for similar ailments in Tagin and Apatani tribes of Arunachal Pradesh

Rehmans similarity Index			**Index**	**%**
Unique species for Apatani	a	37	**0.1882**	**18.82**
Unique species for Tagin	b	45		
Common species found in both tribe	c	19		
Shared species treating similar ailments in both sites (a & b)	d	16		

Figure 6.D. Ven diagram showing the Rahman Similarity Percentage of common ethnomedicinal plants utilized for similar ailments in Tagin and Apatani tribes of Arunachal Pradesh



The comparative analysis of the present study on the medicinal plant species used by Tagin and Apatani tribes reveals a similarity index of 18.82 % suggesting a low degree of resemblance between their ailments treated. Out of 101 medicinal plant species cited by the informants, 19 species are found common in both the community, meanwhile 35 species are only unique to Apatani and 45 plants species are unique to Tagin community and 16 plant species have shown similarity in medicinal usage. The details are shown in the table 6.9.2.A. and also visualized in Ven diagram (Figure 6.D.)

6.10. Ethnobotanical novelties

For the first time, a total of 27 plant species have been reported as ethnobotanical novelties or new usages which are used for various ethnobotanical uses reported, 9 from Apatani and 19 from Tagin tribes of Arunachal Pradesh. These species are found to be unique and their usage types are exclusive among the two communities, Apatani and Tagin community and have never been reported in earlier work of the two community. The ethnobotanical pecies reported from Apatani tribes as novelties include *Amaranthus caudatus, Colocasia esculenta, Dichrocephla integrifolia, Hibiscus syriacus, Ligustrum ovalifolium, Nasturtium microphyllum, Solanum myriacanthum, Zea mays, Arenga obtusifolia,* while from the Tagin tribe the ethnobotanical species as novelties include *Artemisia nilagirica, Curculigo capitulata, Berberis napaulensis, Clerodendrum colebrookeanum, Furcraea selloana, Fagophyrum cymosum, Juglans regia, Livistona jenkinsiana, Pandanus furcatusm, Persicaria nepalensis, Portulaca oleraceae, Rheum nobile, Uncaria scandens, Zanthoxulum armatum, Helenia speciosa, Smilax laurifolia, Ophiocordyceps sinensis, Morchella esculenta, Arenga obtusifolia.*

The moderate to high RFC, ICF, and Fidelity level (FL%) demonstrated by some of these ethnobotanical species suggests that these species have the ethnomedicinal and cultural significance among the two communities.

Fig. 6.1.A. Statistics of total number of plant families (n= 107) (Serial Number 1 – 51) and total number of species (n=333) recorded under different plant families used by the Apatani and Tagin tribes of Arunachal Pradesh for various ethnobotanical applications

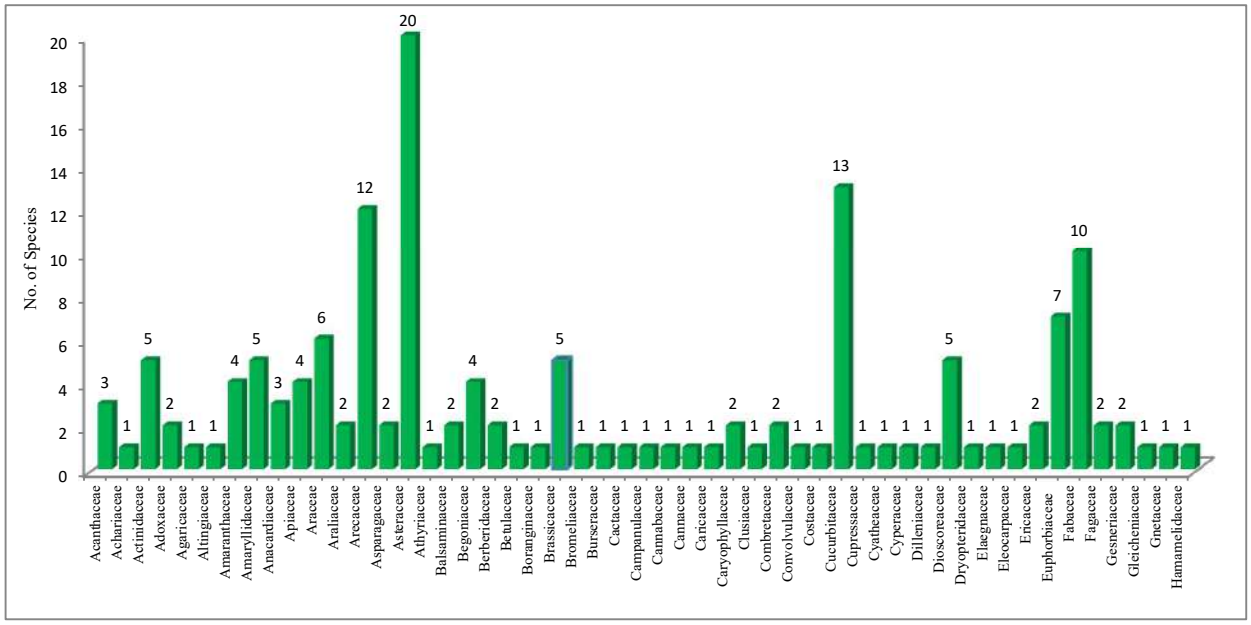


Fig. **6.1.B.** Statistics of total number of plant families (n= 107) (Serial Number 52– 107) and total number of species (n=333) recorded under different plant families used by the Apatani and Tagin tribes of Arunachal Pradesh for various ethnobotanical applications

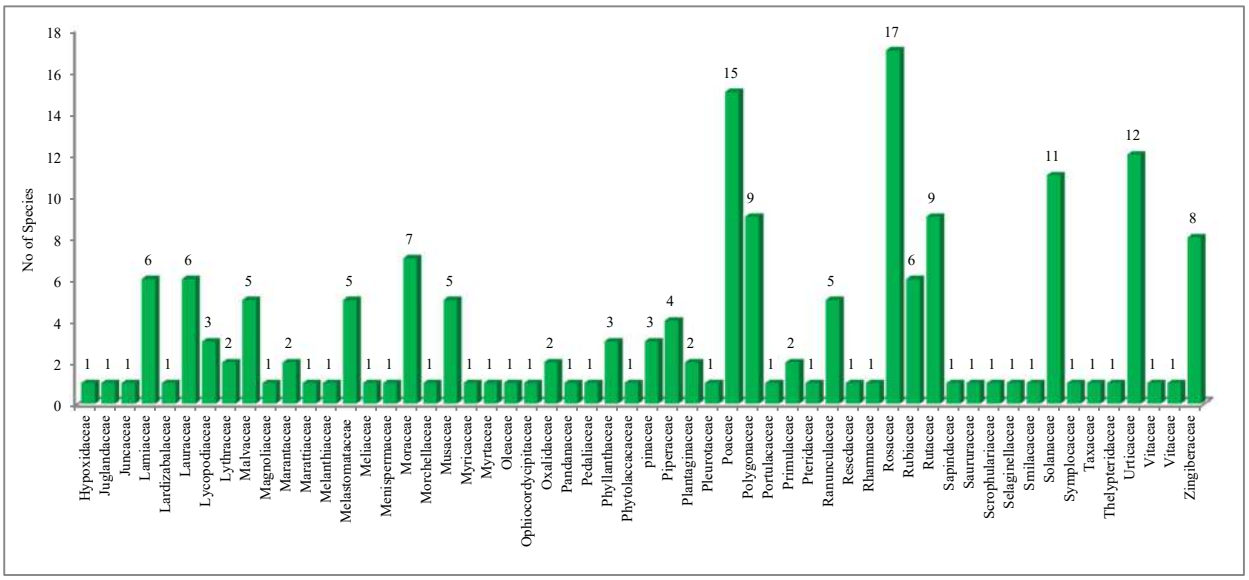


Fig. 6.2.A. Statistics of plant Genus (Serial Number 1-48) with composition of ethnobotanical species recorded under each genus used by the Apatani and Tagin tribes of Arunachal Pradesh

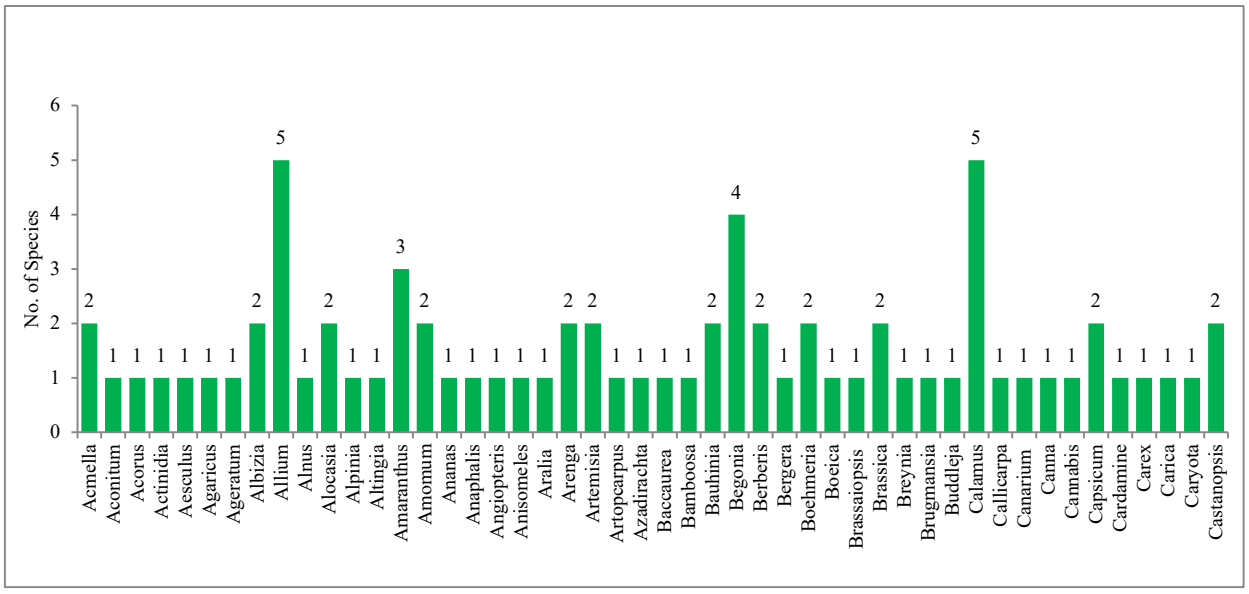
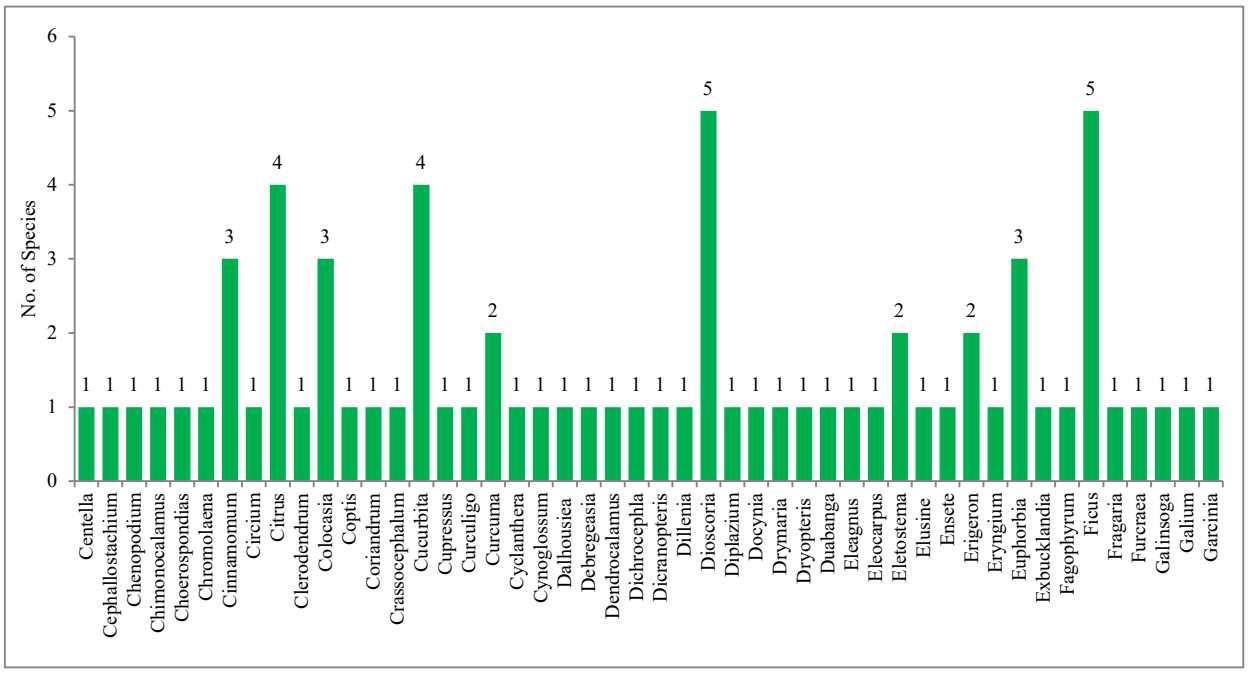


Fig. 6.2.B. Statistics of plant Genus (Serial Number 49-96) with composition of ethnobotanical species recorded under each genus used by the Apatani and Tagin tribes of Arunachal Pradesh



Figures 6.2.C. Statistics of plant Genus (Serial Number 97-145 with composition of ethnobotanical species recorded under each genus used by the Apatani and Tagin tribes of Arunachal Pradesh

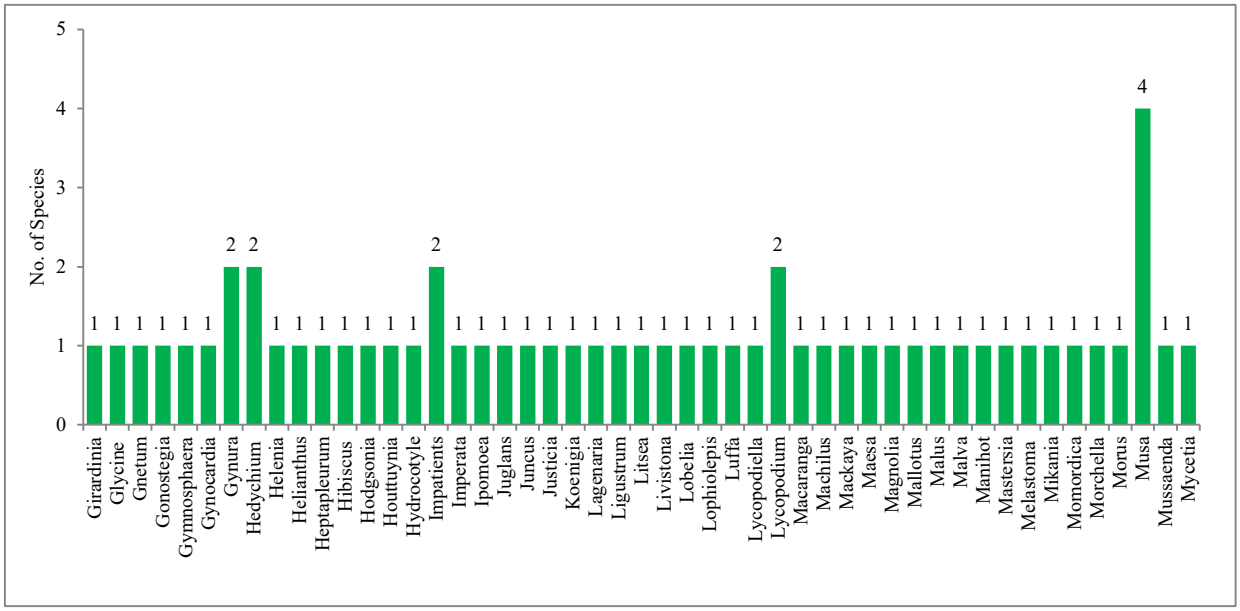
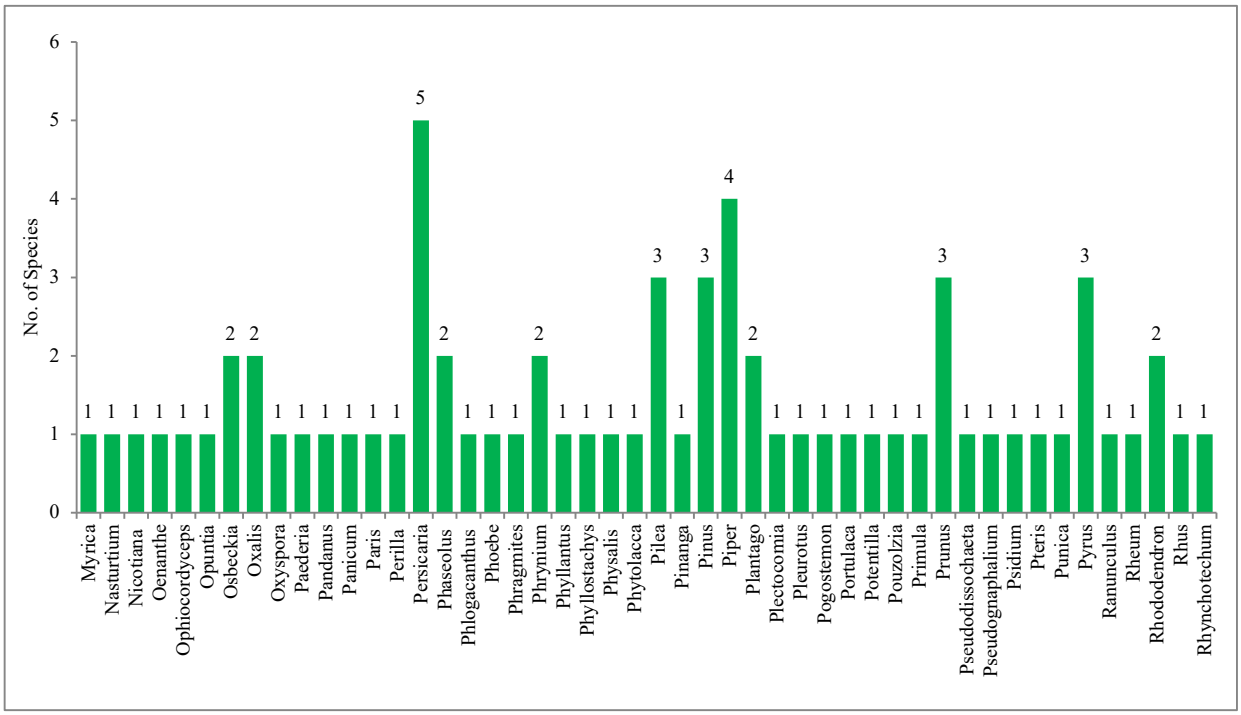


Fig. 6.2.D. Statistics of plant Genus (Serial Number 146-193) with composition of ethnobotanical species recorded under each genus used by the Apatani and Tagin tribes of Arunachal Pradesh



Figures 6.2.E. Statistics of plant Genus (Serial Number 194-245) with composition of ethnobotanical species recorded under each genus used by the Apatani and Tagin tribes of Arunachal Pradesh

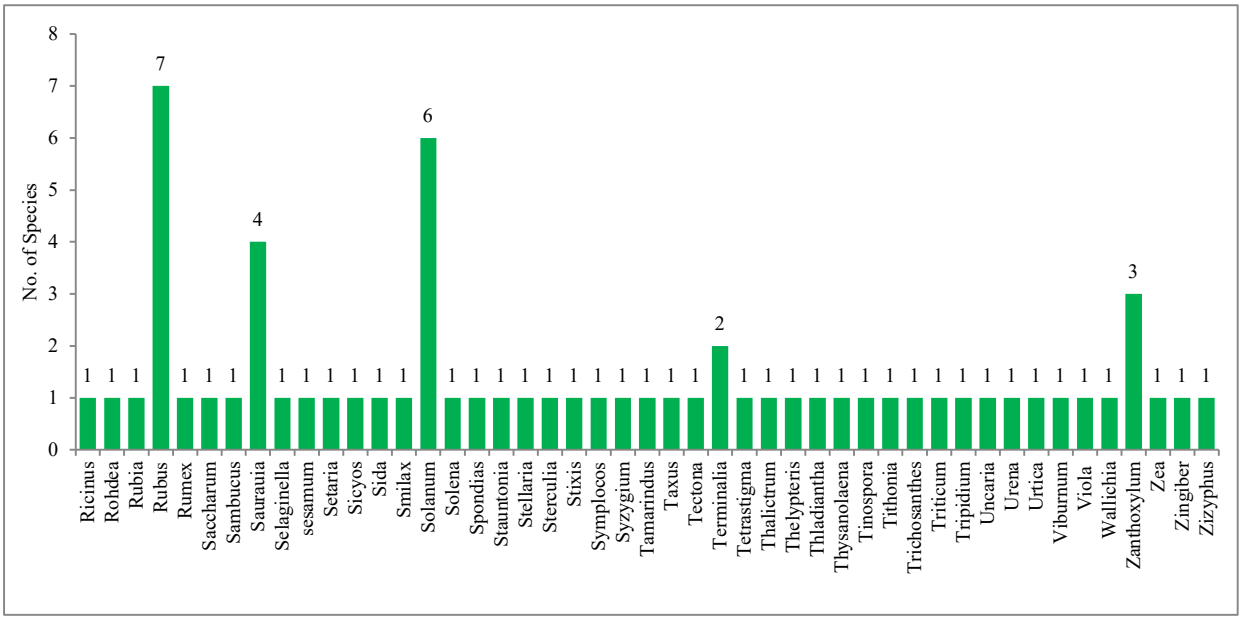


Table 6.8.1.A. Checklist of ethnobotanical species (n=152) with calculated Use Value (UV) Indices under various categories reported Apatani biocultural landscape of Lower Subansiri district of Arunachal Pradesh

Sl. No.	Botanical Name	Use category (Apatani)	Use Value Index
1	*Acmella oleracea*	Edible, vegetable, medicinal	0.02000
2	*Acmella paniculata*	Edible, vegetable, medicinal	0.02000
3	*Aconitum ferox*	Poison	0.00667
4	*Acorus calamus*	Medicinal	0.00667
5	*Actinidia chinensis var. deliciosa*	Edible, beverage	0.01333
6	*Agaricus bisporus*	Edible	0.00667
7	*Ageratum conizoides*	Medicinal	0.02000
8	*Allium cepa*	Edible, vegetable, spice	0.02000
9	*Allium chinense*	Edible, vegetable, spice	0.02000
10	*Allium hookeri*	Edible, vegetable, medicinal	0.02000
11	*Allium sativum*	Edible, vegetable, spice	0.02000
12	*Allium tuberosum*	Edible, medicinal, vegetable, spice	0.02667
13	*Alnus nepalensis*	Biofencing, fuel	0.01333
14	*Amaranthus caudate*	Edible, vegetable, medicinal, fodder	0.02667
15	*Amaranthus viridis*	Edible, vegetable	0.01333
16	*Anaphalis margaritacea*	Medicinal	0.00667
17	*Anisomeles indica*	Medicinal	0.00667

18	*Artemisia indica*	Edible, medicinal	0.01333
19	*Begonia burkillii*	Edible	0.00667
20	*Begonia palmata*	Edible	0.00667
21	*Begonia roxburgii*	Edible, medicinal	0.01333
22	*Berberis napaulensis*	Edible, medicinal, dye	0.02000
23	*Berberis wallichiana*	Edible, medicinal, tatooing	0.02000
24	*Brassica juncea*	Edible, vegetable	0.01333
25	*Brassica oleracea*	Edible, vegetable	0.01333
26	*Calamus acantospathus*	Crafts, magico-religious, binding	0.02000
27	*Callicarpa rubella*	Edible	0.00667
28	*Capsicum annum*	Edible	0.00667
29	*Capsicum frutescens*	Edible	0.00667
30	*Cardamine hirsuta.*	Edible, vegetable, medicinal	0.02000
31	*Castanopsis faberi*	Edible, construction, fuel, magico-religious	0.02667
32	*Castanopsis indica*	Edible, magico-religious	0.01333
33	*Centella asiatica*	Edible, vegetable, medicinal	0.02000
34	*Cephallostachium capitatum*	Medicinal, craft	0.01333
35	*Chenopodium album*	Edible, vegetable	0.01333
36	*Chimonocalamus griffithianus*	Edible, fuel, construction,	0.02000
37	*Cinnamomum bejolghota*	Crafts, beverage, anti-mites/ insect	0.02000
38	*Citrus × aurantiifolia*	Edible, stain Remover	0.01333
39	*Clerodendrum colebrookeanum*	Edible, vegetable, medicinal	0.02000
40	*Colocasia affinis*	Edible, vegetable, fodder	0.02000
41	*Colocasia esculenta*	Edible, medicinal,fFodder	0.02000
42	*Coriandrum sativum* L	Spice, edible	0.01333
43	*Crassocephalum crepidioides*	Edible, vegetable, medicine,	0.02000
44	*Cucumis sativus*	Edible, medicinal	0.01333
45	*Cucurbita ficifolia*	Edible, fodder, vegetable	0.02000
46	*Cucurbita pepo*	Edible, vegetable, medicinal, fodder	0.02667
47	*Dendrocalamus hamiltonii*	Edible, crafts, construction,	0.02000
48	*Dichrocephla integrifolia*	Medicinal	0.00667
49	*Dicranopteris linearis*	Binding, magico-religious, biofence	0.02667
50	*Dioscorea pentaphylla*	Edible, medicinal	0.01333
51	*Dioscoria bulbifera*	Edible	0.00667
52	*Diplazium esculentum*	Edible, vegetable, medicine,	0.02000
53	*Docynia indica*	Edible, vegetable	0.01333
54	*Elatostema sessile*	Edible	0.00667
55	*Eleagnus latifolia*	Edible	0.00667
56	*Eletostema platyphyllum*	Edible, vegetable	0.01333
57	*Elusine coracana*	Edible, medicinal, beverage, magico-religious, miscellaneous	0.04000

58	*Exbucklandia populnea*	Construction, fuel, miscellaneous	0.02000
59	*Fagophyrum cymosum*	Edible, vegetable, fodder	0.02000
60	*Ficus auriculata*	Edible	0.00667
61	*Glycine Max*	Edible	0.00667
62	*Gonostegia hirta*	Edible, vegetable, medicinal	0.02000
63	*Gynura nepalensis*	Medicinal	0.00667
64	*Helianthus annuus*	Edible, decoration	0.01333
65	*Hibiscus syriacus*	Edible	0.00667
66	*Houttuynia cordata*	Edible, vegetable, medicinal	0.02000
67	*Hydrocotyle javanica*	Edible, vegetable, medicinal	0.02000
68	*Impatiens racemosa*	Edible, vegetable, medicinal	0.02000
69	*Impatients latifolia*	Edible, vegetable, medicinal	0.02000
70	*Ipomoea batatas*	Edible, vegetables	0.01333
71	*Juglans regia*	Edible	0.00667
72	*Juncus effusus*	Binding	0.00667
73	*Lagenaria siceraria*	Edible, crafts, magico-Religious	0.02000
74	*Ligustrum ovalifolium*	Crafts, biofence, magico-religious	0.02000
75	*Litsea cubeba*	Edible, medicinal,	0.01333
76	*Lobelia nummularia*	Medicine, miscellaneous	0.01333
77	*Lophiolepis veruta*	Tattooing	0.00667
78	*Lycopodium clavatum*	Decoration	0.00667
79	*Lycopodium complanatum*	Decoration	0.00667
80	*Machilus glaucescens*	Edible	0.00667
81	*Magnolia champaca*	Edible, medicinal, fuel, crafts, construction	0.03333
82	*Malus domestica*	Edible	0.00667
83	*Malva verticillata*	Edible, vegetable	0.01333
84	*Morus alba*	Edible	0.00667
85	*Myrica esculenta*	Edible, fuel	0.01333
86	*Nasturtium microphyllum*	Edible, vegetable, fodder	0.02000
87	*Oenanthe javanica*	Edible, vegetable, medicinal	0.02000
88	*Oxalis corniculata*	Edible, medicinal	0.01333
89	*Perilla frutescens*	Edible, spice	0.01333
90	*Persicaria barbata*	Edible, fodder	0.01333
91	*Persicaria runcinata*	Edible	0.00667
92	*Persicaria hydropiper*	Poison	0.00667
93	*Phaseolus vulgaris*	Edible, vegetable	0.01333
94	*Phaseolus coccineus*	Edible, vegetable	0.01333
95	*Phoebe bootanica*	Edible, medicinal	0.01333
96	*Phragmites karka*	Crafts, miscellaneous	0.02000
97	*Phyllostachys manii*	Edible, construction, crafts, fuel, agriculture tool, decoration, magico-religious	0.04667
98	*Physalis angulata*	Edible	0.00667
99	*Phytolacca acinosa*	Edible, vegetable, fodder	0.02000

100	*Pinus wallichiana*	Craft, construction, medicinal, fuel, agriculture tool, miscellaneous	0.04667
101	*Piper hamiltonii*	Medicinal	0.00667
102	*Piper pedicellatum*	Edible, vegatable, medicinal	0.02000
103	*Plantago asiatica*	Edible, vegetable, medicinal, fodder	0.02667
104	*Plantago asiatica* subsp. *erosa*	Edible, vegetable, fodder	0.02000
105	*Plectocomia himalayana*	Crafts, binding	0.01333
106	*Pleurotus ostreatus*	Edible	0.00667
107	*Pogostemon yatabeanus*	Edible, miscellaneous	0.02000
108	*Portulaca oleraceae*	Edible	0.00667
109	*Potentilla indica*	Edible	0.00667
110	*Primula denticulate*	Decoration	0.00667
111	*Prunus cerasoides*	Edible, fuel, beverage	0.02000
112	*Prunus domestica* L.	Edible, fuel, beverage	0.02000
113	*Prunus persica*	Edible, magico-religious	0.02000
114	*Pseudognaphalium affine*	Edible, vegetable	0.01333
115	*Punica granatum*	Edible	0.00667
116	*Pyrus communis*	Edible, fuel, beverage	0.02000
117	*Pyrus pashia*	Edible, fuel, beverage	0.02000
118	*Pyrus pyrifolia*	Edible, fuel, beverage	0.02000
119	*Ranunculus sceleratus*	Medicinal	0.00667
120	*Rhododendron arboreum*	Decoration	0.00667
121	*Rhododendron arunachalense*	Decoration	0.00667
122	*Rhus chinensis*	Edible, medicinal, construction	0.02000
123	*Rubia manjith*	Dye	0.00667
124	*Rubus calycinus*	Edible, medicinal	0.01333
125	*Rubus ellipticus*	Edible, medicinal	0.01333
126	*Rubus niveus*	Edible	0.00667
127	*Rubus rosaefolius*	Edible	0.00667
128	*Rubus sumatranus*	Edible	0.00667
129	*Rumex nepalensis*	Edible, fodder	0.01333
130	*Saurauia roxburgii*	Edible	0.00667
131	*Saurauia punduana*	Edible, magico-religious	0.01333
132	*Sicyos edulis*	Edible	0.00667
133	*Solanum aethiopicum*	Edible, vegetable, medicinal	0.02000
134	*Solanum myriacanthum*	Medicinal	0.00667
135	*Solanum nigrum*	Edible, vegetable, medicinal	0.02000
136	*solanum violaceum*	Edible, medicinal	0.01333
137	*Solena heterophylla*	Edible	0.00667
138	*Stauntonia coriacea*	Edible	0.00667
139	*Symplocos paniculata*	Dye	0.00667
140	*Syzygium cumini*	Edible	0.00667

141	*Taxus wallichiana*	Medicinal	0.00667
142	*Tetrastigma serrulatum*	Edible	0.00667
143	*Thelypteris parasitica*	Medicinal, veterinary	0.01333
144	*Thladiantha ziroensis*	Medicinal	0.00667
145	*Trichosanthes tricuspidata*	Medicine, poison	0.01333
146	*Tripidium arundinaceum*	Magico-religious	0.00667
147	*Viburnum foetidum*	Edible	0.00667
148	*Viola hamiltoniana*	Edible	0.00667
149	*Zanthoxulum armatum* DC.	Edible, Spice	0.01333
150	*Zanthoxylum acanthopodium*	Edible, vegetable, medicine	0.02000
151	*Zea mays*	Edible, crafts, fodder, beverage	0.02667
152	*Zingiber officinale*	Edible, vegetable, spice, medicine, magico-religious	0.03333

Table 6.8.1.B. Checklist of ethnobotanical species (n=283) with calculated Use Value (UV) Indices under various categories reported Tagin biocultural landscape of Upper Subansiri district of Arunachal Pradesh

Sl. No.	Botanical Name	Use category (Tagin)	Use Value Index
1	*Acmella oleracea*	Edible, vegetable, medicinal	0.02000
2	*Acmella paniculata*	Edible, vegetable, medicinal	0.02000
3	*Aconitum ferox*	Poisoning	0.00667
4	*Acorus calamus*	Medicinal	0.00667
5	*Actinidia chinensis var. deliciosa*	Edible, beverage	0.01333
6	*Aesculus assamica*	Poisoning	0.00667
7	*Agaricus bisporu*s	Edible	0.00667
8	*Ageratum conizoides*	Medicinal	0.00667
9	*Albizia chinensis*	Construction, fuel, magico-religious, poisoning	0.02667
10	*Albizia lebeck*	Fodder, fuel, poisoning, Construction,	0.02667
11	*Allium cepa*	Edible, vegetable, spice	0.02000
12	*Allium chinense*	Edible, vegetable, spice	0.02000
13	*Allium hookeri*	Edible, vegetable, medicinal	0.02000
14	*Allium sativum*	Edible, vegetable, spice	0.02000
15	*Allium tuberosum*	Edible, medicinal, vegetable, spice	0.02667
16	*Alnus nepalensis*	Biofencing, fuel	0.01333
17	*Alocasia acuminata*	Fodder. edible, medicinal, Veterinary	0.02667
18	*Alocasia macrorrhizos*	Fodder	0.00667
19	*Alpinia nigra*	Edible	0.00667
20	*Amaranthus spinosus*	Edible, vegetable, fodder	0.02000
21	*Amaranthus viridis*	Edible, vegetable	0.01333
22	*Amomum dealbatum*	Edible, spice	0.01333

23	*Amomum maximum*	Edible, packaging	0.01333
24	*Ananas comosus*	Edible	0.00667
25	*Angiopteris evecta*	Edible	0.00667
26	*Anisomeles indica*	Medicinal	0.00667
27	*Aralia armata*	Edible, vegetable	0.01333
28	*Arenga micrantha*	Edible, vegetable, construction	0.02000
29	*Arenga obtusifolia*	Edible, vegetable, fodder, crafts,	0.02667
30	*Artemisia indica*	Edible, medicinal,vetarinary,	0.02000
31	*Artimisia nilagirica*	Medicinal, magico-religious, insence, miscellaneous	0.03333
32	*Artopcarpus heterophyllus*	Edible, fuel, taboo	0.02000
33	*Azadirachta indica*	Medicinal, fodder	0.01333
34	*Baccaurea ramiflora*	Edible	0.00667
35	*Bamboosa tulda*	Medicinal, construction, craft, edible	0.02667
36	*Bauhinia purpuria*	Edible, vegetable, biofence, fuel, fodder	0.03333
37	*Bauhinia variegata*	Edible, vegetable, biofence, fuel, fodder	0.03333
38	*Begonia aborensis*	Edible, medicinal	0.01333
39	*Begonia burkillii*	Edible	0.00667
40	*Begonia palmata*	Edible, medicinal	0.01333
41	*Begonia roxburgii*	Edible, medicinal	0.01333
42	*Berberis napaulensis*	Edible, medicinal, magico-religious, dye	0.02667
43	*Berberis wallichiana*	Edible, tatooing	0.01333
44	*Bergera koenigii*	Edible, spice	0.01333
45	*Boehmeria hamiltoniana*	Binding	0.00667
46	*Boehmeria macrophylla*	Fodder	0.00667
47	*Boeica fulva*	Edible	0.00667
48	*Brassaiopsis hispida*	Rituals	0.00667
49	*Brassica juncea*	Edible, vegetable	0.01333
50	*Brassica oleracea*	Edible, vegetable	0.01333
51	*Breynia androgyna*	Edible, vegetable, biofence	0.02000
52	*Brugmansia suaveolens*	Biofence	0.00667
53	*Buddleja asiatica*	Medicinal	0.00667
54	*Calamus acantospathus*	Crafts, magico-religious, binding	0.02000
55	*Calamus erectus*	Edible, crafts, construction, biofence, magico-religious	0.03333
56	*Calamus flagellum*	Edible, biofence, magico-religious	0.02000
57	*Calamus inermis*	Edible, craft, binding, magico-religious	0.02667
58	*Calamus leptospadix*	Crafts	0.00667
59	*Callicarpa rubella*	Edible	0.00667
60	*Canarium strictum*	Edible, medicinal, poison, repellent	0.02667

61	*Canna indica*	Edible, fodder	0.01333
62	*Cannavis sativa*	Edible	0.00667
63	*Capsicum annum*	Edible	0.00667
64	*Capsicum frutescens*	Edible	0.00667
65	*Carex cruciata*	Edible, magico-religious	0.01333
66	*Carica papaya*	Edible, medicinal	0.01333
67	*Caryota urens*	Crafts, construction	0.01333
68	*Castanopsis indica*	Edible, magico-religious	0.01333
69	*Chenopodium album*	Edible, vegetable	0.01333
70	*Choerospondias axillaris*	Edible, fuel	0.01333
71	*Chromolaena odorata*	Medicinal	0.00667
72	*Cinnamomum bejolghota*	Beverage	0.00667
73	*Cinnamomum tamala*	Spice	0.00667
74	*Cinnamomum zeylanicum*	Medicinal, spice	0.01333
75	*Circium spinosissimum*	Fodder	0.00667
76	*Citrus maxima*	Edible	0.00667
77	*Citrus medica*	Edible	0.00667
78	*Citrus reticulata*	Edible	0.00667
79	*Clerodendrum colebrookeanum*	Edible, vegetable, medicinal, Taboo	0.02667
80	*Colocasia affinis*	Edible, vegetable, fodder	0.02000
81	*Colocasia esculenta*	Edible, fodder	0.01333
82	*Colocasia falax*	Edible, fodder	0.01333
83	*Coptis teeta*	Medicinal	0.00667
84	*Coriandrum sativum*	Spice, edible	0.01333
85	*Crassocephalum crepidioides*	Edible, vegetable, medicinal	0.02000
86	*Cucumis sativus*	Edible, medicinal, taboo	0.02000
87	*Cucurbita ficifolia*	Edible, fodder, vegetable	0.02000
88	*Cucurbita melo*	Edible, vegetable, fodder	0.02000
89	*Cucurbita pepo*	Edible, vegetable, medicinal, fodder, taboo	0.03333
90	*Cupressus torulosa*	Repellent	0.00667
91	*Curculigo capitulata*	Edible, binding, magico-religious packaging, miscellaneous	0.03333
92	*Curcuma caesia*	Edible, medicinal	0.01333
93	*Curcuma longa*	Edible, medicinal, pice	0.02000
94	*Cyclanthera pedata*	Edible, vegetable	0.01333
95	*Cynoglossum lanceolatum*	Fodder	0.00667
96	*Dalhousiea bracteata*	Magio-religious	0.00667
97	*Debregeasia longifolia*	Fodder	0.00667
98	*Dendrocalamus hamiltonii*	Edible, medicinal, crafts, Construction, magico-religious, fuel,taboo	0.04667
99	*Dichrocephla integrifolia*	Edible,	0.00667
100	*Dicranopteris linearis*	Binding, magico-religious	0.01333
101	*Dillenia indica*	Edible, medicinal,	0.01333
102	*Dioscorea pentaphylla*	Edible, medicinal	0.01333

103	*Dioscorea deltoidea*	Edible	0.00667
104	*Dioscorea glabra*	Edible	0.00667
105	*Dioscoria alata*	Edible, medicinal, taboo	0.02000
106	*Dioscoria bulbifera*	Edible	0.00667
107	*Diplazium esculentum*	Edible, vegetable, medicinal	0.02000
108	*Drymaria cordata*	Medicinal, veterinary	0.01333
109	*Dryopteris felix- mas*	Medicinal, veterinary	0.01333
110	*Duabanga grandiflora*	Construction, fuel	0.01333
111	*Elatostema sessile*	Edible, vegetable, medicinal	0.02000
112	*Eleagnus latifolia*	Edible	0.00667
113	*Eleocarpus floribundus*	Edible	0.00667
114	*Eletostema platyphyllum*	Edible, vegetable	0.01333
115	*Elusine coracana*	Edible, beverage, magico-religious	0.02000
116	*Ensete glaucum*	Edible,vegetable, magico-religious	0.02000
117	*Erigeron canadensis*	Edible, vegetable	0.01333
118	*Erigeron floribundus*	Edible, vegetable	0.01333
119	*Eryngium foetidum*	Edible, spice	0.01333
120	*Euphorbia hirta*	Edible, vegetable	0.01333
121	*Euphorbia neriifolia*	Biofence	0.00667
122	*Euphorbia pulcherrima*	Edible, vegetable,fencing	0.02000
123	*Exbucklandia populnea*	Construction, fuel, miscellaneous	0.02000
124	*Fagophyrum cymosum*	Edible, vegetable, fodder	0.02000
125	*Ficus auriculata*	Edible, fodder, miscellaneous	0.02000
126	*Ficus fistulosa*	Edible, fuel	0.01333
127	*Ficus hirta*	Edible, fodder, beverage	0.02000
128	*Ficus hispida*	Edible, vegetable	0.01333
129	*Ficus semicordata*	Edible	0.00667
130	*Fragaria nubicola*	Edible	0.00667
131	*Furcraea selloana*	Biofence	0.00667
132	*Galinsoga parviflora*	Edible, vegetable	0.01333
133	*Galium aparine*	Edible, vegetable	0.01333
134	*Garcinia lanceifolia*	Edible	0.00667
135	*Girardinia diversifolia*	Edible, vegetable,	0.01333
136	*Glycine Max*	Edible, taboo	0.01333
137	*Gnetum montanum*	Binding	0.00667
138	*Gonostegia hirta*	Edible, vegetable, medicinal	0.02000
139	*Gymnosphaera gigantea*	Magio-religious	0.00667
140	*Gynocardia odorata*	Poison, veterinary	0.01333
141	*Gynura cosimbua*	Edible, vegetable	0.01333
142	*Hedychium speciatum*	Edible	0.00667
143	*Hedychium stenopetalum*	Medicinal	0.00667
144	*Helenia speciosa*	Medicinal	0.00667
145	*Helianthus annuus*	Edible, decoration	0.01333
146	*Heptapleurum ellipticum*	Edible, fodder	0.01333

147	*Hodgsonia macrocarpa*	Edible	0.00667
148	*Houttuynia cordata*	Edible, vegetable, medicinal	0.02000
149	*Hydrocotyle javanica*	Edible, vegetable	0.01333
150	*Impatiens racemosa*	Edible, vegetable	0.01333
151	*Impatients latifolia*	Edible, vegetable,	0.01333
152	*Imperata cylindrica*	Edible	0.00667
153	*Ipomoea batatas*	Edible, vegetables, taboo	0.02000
154	*Juglans regia*	Edible, medicinal, poison	0.02000
155	*Justicia gendarussa*	Medicinal	0.00667
156	*Koenigia mollis*	Edible, vegetable	0.01333
157	*Lagenaria siceraria*	Edible, crafts, magico-religious	0.02000
158	*Liquidambar excela*	Construction, craft	0.01333
159	*Litsea cubeba*	Edible	0.00667
160	*Livistona jenkinsiana*	Edible, crafts, construction, biofence,	0.02667
161	*Luffa acutangula*	Edible, vegetable, body Brush	0.02000
162	*Lycopodiella cernua*	Magico-religious	0.00667
163	*Macaranga denticulata*	Fodder, fuel, packaging	0.02000
164	*Mackaya neesiana*	Edible, vegetable	0.01333
165	*Maesa indica*	Edible, biofence	0.01333
166	*Magnolia champaca*	Edible, fuel, crafts, construction	0.02667
167	*Mallotus Paniculatus*	Magico-religious	0.00667
168	*Malus domestica*	Edible	0.00667
169	*Malva verticillata*	Edible, vegetable	0.01333
170	*Manihot esculenta*	Edible, vegetable, fodder	0.02000
171	*Mastersia assamica*	Medicinal	0.00667
172	*Melastoma malabathricum*	Edible, medicinal, dye	0.02000
173	*Mikania micrantha*	Edible, medicinal	0.01333
174	*Momordica charantia*	Edible, vegetable, medicinal	0.02000
175	*Morchella esculenta*	Edible	0.00667
176	*Morus alba*	Edible, biofence	0.01333
177	*Musa acuminate*	Edible, construction, binding	0.02000
178	*Musa aurantiaca*	Edible, construction, binding	0.02000
179	*Musa balbisiana*	Edible, packing, magico-religious	0.02000
180	*Musa paradisiaca*	Edible, vegetable	0.01333
181	*Mussaenda roxburgii*	Edible, vegetable	0.01333
182	*Mycetia longifolia*	Edible, vegetable	0.01333
183	*Nicotiana tabacum*	Miscelleneous	0.01333
184	*Oenanthe javanica*	Edible, vegetable	0.01333
185	*Ophiocordyceps sinensis*	Medicinal	0.00667
186	*Opuntia tuna*	Biofence	0.00667
187	*Osbeckia stellata*	Edible	0.00667
188	*Osbekia nepalensis*	Edible	0.00667
189	*Oxalis debilis*	Edible, medicinal	0.01333
190	*Oxalis corniculata*	Edible	0.00667
191	*Oxyspora cenua*	Edible	0.00667

192	*Paederia foetida*	Edible, vegetable, medicinal	0.02000
193	*Pandanus furcatus*	Crafts	0.00667
194	*Panicum miliaceum*	Edible, beverage	0.01333
195	*Paris polyphylla*	Edible, medicinal	0.01333
196	*Perilla frutescens*	Edible, spice	0.01333
197	*Persicaria capitata*	Fodder	0.00667
198	*Persicaria nepalensis*	Medicine, fodder	0.01333
199	*Persicaria runcinata*	Edible	0.00667
200	*Persicaria hydropiper*	Poisoning	0.00667
201	*Phaseolus vulgaris*	Edible, vegetable	0.01333
202	*Phaseolus coccineus*	Edible, vegetable	0.01333
203	*Phlogacanthus thyrsiformis*	Edible, vegetable	0.01333
204	*Phoebe bootanica*	Edible, taboo	0.02000
205	*Phrynium imbricatum*	Packaging, magico-religious	0.01333
206	*Phrynium pubinerve*	Pacaking, magico-religious	0.01333
207	*Phyllantus emblica*	Edible	0.00667
208	*Pilea insolens*	Edible, vegetable, fodder	0.02000
209	*Pilea pumila*	Edible, vegetable, fodder	0.02000
210	*Pilea umbrosa*	Edible, vegetable	0.01333
211	*Pinanga gracilis*	Magico-religious	0.00667
212	*Pinus kesiya*	Construction, crafts	0.01333
213	*Pinus roxburgii*	Fuel, decoration, repellent	0.02000
214	*Pinus wallichiana*	Construction, medicinal, fuel, miscellaneous	0.02667
215	*Piper nigrum*	Edible, medicinal	0.01333
216	*Piper pedicellatum*	Edible, vegatable, medicinal	0.02000
217	*Piper peepuloides*	Edible, vegetable, medicinal	0.02000
218	*Plantago asiatica*	Edible, vegetable, medicinal	0.02000
219	*Plantago asiatica* subsp. *erosa*	Edible, vegetable, fodder,	0.02000
220	*Pleurotus ostreatus*	Edible	0.00667
221	*Portulaca oleraceae*	Edible, vegetable, medicinal	0.02000
222	*Potentilla indica*	Edible	0.00667
223	*Pouzolzia sanguinea*	Edible, vegetable, fodder	0.02000
224	*Prunus domestica*	Edible	0.00667
225	*Prunus persica*	Edible	0.00667
226	*Pseudodissochaeta assamica*	Edible	0.00667
227	*Psidium guajava*	Edible, medicinal	0.01333
228	*Pteris tripartite*	Edible, vegetable	0.01333
229	*Pyrus pashia*	Edible	0.00667
230	*Rheum nobile*	Edible, medicinal	0.01333
231	*Rhus chinensis*	Edible	0.00667
232	*Rhynchotechum elliptichum*	Edible, vegetable	0.01333
233	*Ricinus communis*	Fodder, veterinary	0.01333
234	*Rohdea nepalensis*	Medicinal	0.00667
235	*Rubia manjith.*	Dye	0.00667
236	*Rubus acuminatus*	Edible	0.00667

237	*Rubus ellipticus*	Edible	0.00667
238	*Rubus niveus*	Edible	0.00667
239	*Rubus sumatranus*	Edible	0.00667
240	*Rubus buergeri*	Edible	0.00667
241	*Rumex nepalensis*	Edible, fodder	0.01333
242	*Saccharum officinarum*	Edible, fodder	0.01333
243	*Sambucus canadensis*	Miscellaneous	0.01333
244	*Saurauia roxburgii*	Edible, magico-religious	0.01333
245	*Saurauia armata*	Edible, miscellaneous	0.01333
246	*Saurauia nepaulensis*	Edible	0.00667
247	*Selaginella biformis*	Edible	0.00667
248	*Sesamum indicum*	Edible, s	0.01333
249	*Setaria italica*	Edible, beverage	0.01333
250	*Sicyos edulis*	Edible	0.00667
251	*Sida acuta*	Crafts	0.00667
252	*Smilax laurifolia*	Magico-religious	0.00667
253	*Solanum torvum*	Edible, vegetable, medicinal	0.02000
254	*Solanum aethiopicum*	Edible,vegetable, medicinal	0.02000
255	*Solanum nigrum*	Edible, vegetable, medicinal, Taboo	0.02667
256	*Solanum spirale*	Edible, medicinal	0.01333
257	*Solanum violaceum*	Edible, medicinal	0.01333
258	*Spondias pinnata*	Edible, construction	0.01333
259	*Stauntonia coriacea*	Edible	0.00667
260	*Stellaria wallichiana*	Edible, vegetable	0.01333
261	*Sterculia hamiltonii*	Edible	0.00667
262	*Stixis suaveolens*	Edible	0.00667
263	*Tamarindus indica*	Edible	0.00667
264	*Tectona grandis*	Construction	0.00667
265	*Terminalia chebula*	Edible, medicinal	0.01333
266	*Terminalia myriocarpa*	Construction	0.00667
267	*Tetrastigma serrulatum*	Edible	0.00667
268	*Thalictrum foliolosum*	Medicinal	0.00667
269	*Thladiantha ziroensis*	Medicinal	0.00667
270	*Thysanolaena latifolia*	Craft	0.00667
271	*Tinospora cordifolia*	Medicinal	0.00667
272	*Tithonia diversifolia*	Biofence	0.00667
273	*Triticum aestivum*	Edible	0.00667
274	*Uncaria scandens*	Medicinal	0.00667
275	*Urena lobata*	Miscellaneous	0.00667
276	*Urtica ardens*	Medicinal	0.00667
277	*Wallichia triandra*	Craft	0.00667
278	*Zanthoxulum armatum*	Edible, insence, spice, magico-religious	0.02667
279	*Zanthoxylum acanthopodium*	Edible, vegetable, medicinal, poison	0.02667

280	*Zanthoxylum rhetsa*	Edible, vegetable, medicinal, poison, spice, taboo	0.04000
281	*Zea mays*	Edible	0.00667
282	*Zingiber officinale*	Edible, vegetable, spice, medicinal, magico-religious	0.03333
283	*Zizyphus mauritiana*	Edible	0.00667

Table 6.8.2.A. Use Value (UV) and Relative Frequency of Citation (RFC) of ethnomedicinal plants reportedly used by the Apatani tribes

Botanical name	Ailment treated (Apatani)	Use report (FC)	Use value	Relative Frequency of citation
Acmella oleracea (L.) R.K.Jansen	Stomach pain, toothache, intestinal worms	133	0.02000	0.88667
Acorus calamus L.	Cuts and wounds, Skin allergy, headache, bone pain, intestinal pain	94	0.03333	0.62667
Ageratum conizoides (L.) L.	Cuts and wounds	76	0.00667	0.50667
Allium hookeri Thwaites	Nose blockade, cough/cold, headache, indigestion, gastritis	110	0.04000	0.73333
Allium tuberosum Rottler ex Spreng	Gastritis,indigestion, allergies, cold, headache	92	0.03333	0.61333
Amaranthus caudatus L.	Anemia	70	0.00667	0.46667
Anaphalis margaritacea (L.) Benth. & Hook.f	Cuts and wounds	43	0.00667	0.28667
Anisomeles indica (L.) Kuntze	Cuts and wounds, muscle pain	51	0.01333	0.34000
Artemisia indica Willd.	Headaches, noseblockade	23	0.01333	0.15333
Begonia roxburgii A.DC.	Stomach pain, diarrhea, dysentry	52	0.02000	0.34667
Berberis napaulensis (DC.) Spreng.	Toothache, skin allergy	81	0.01333	0.54000
Berberis wallichiana DC.	Cuts and wounds	36	0.00667	0.24000
Cardamine hirsuta L.	Stomach Pain	65	0.00667	0.43333
Centella asiatica (L.) Urb.	Blood purifier, gastritis, diarrhea	119	0.02000	0.79333
Cephallostachium capitatum Munro	Dysentry , stomach pain	38	0.01333	0.25333
Clerodendrum colebrookeanum Walp	High blood pressure, stomach pain	112	0.01333	0.74667
Colocasia esculenta (L.) Schott	Anemia	41	0.00667	0.27333
Crassocephalum crepidioides (Benth.) S.Moore	Cuts and wounds, stomach pain, constipation, optical correction	92	0.02667	0.61333
Cucurbita pepo L.	Acute Amnesia	35	0.00667	0.23333
Curculigo capitulata (Lour.) Kuntze	Cuts and wounds	37	0.00667	0.24667
Dichrocephla integrifolia (L.f.) Kuntze	Cuts and wounds	30	0.00667	0.20000

Dioscorea pentaphylla L.	Stomach pain	56	0.00667	0.37333
Diplazium esculentum (Retz.) Sw.	Constipation, stomach pain	77	0.01333	0.51333
Elusine coracana (L.) Gaertn	Anemia, hypercholesterolemia	103	0.01333	0.68667
Gonostegia hirta (Blume) Miq.	Anemia	20	0.00667	0.13333
Gynura nepalensis DC.	Cuts and wounds	41	0.00667	0.27333
Houttuynia cordata Thunb.	Stomach pain, diarrhea, dysentry, gastritis	129	0.02667	0.86000
Hydrocotyle javanica Thunb.	Stomach pain, high prsessure	72	0.01333	0.48000
Impatiens racemosa DC.	Stomach pain	42	0.00667	0.28000
Impatients latifolia L.	Stomach pain	48	0.00667	0.32000
Litsea cubeba (Lour.) Pers.	Cough/cold, insomnia, diarrhea	89	0.02667	0.59333
Lobelia nummularia Lam.	Cuts and wounds	20	0.00667	0.13333
Magnolia champaca (L.) Baill. ex Pierre	Stomach pain	78	0.00667	0.52000
Oenanthe javanica (Blume) DC.	Indestion, gastritis, stomach pain	110	0.02000	0.73333
Oxalis corniculata L.	Cuts and wounds, oral infection	77	0.01333	0.51333
Paederia foetida L.	Diarrhea, dysentry, gastritis, stomach pain	56	0.02667	0.37333
Phoebe bootanica (Meisn.)M. Gangop.	High pressure	55	0.00667	0.36667
Pinus wallichiana A.B.Jacks.	Crackeed heels, cuts and wounds	82	0.01333	0.54667
Piper hamiltonii C. DC.	Stomach pain, dysentry, cough	54	0.02000	0.36000
Piper pedicellatum C. DC.	Stomach pain, gastritis, diarrhea	29	0.02000	0.19333
Plantago asiatica L.	Stomachpain, constipation, high blood pressure,optical correction, cuts and wounds	82	0.03333	0.54667
Ranunculus sceleratus L.	Cuts and wounds	17	0.00667	0.11333
Rhus chinensis Mill.	Stomach pain, gastritis, dysentry	93	0.02000	0.62000
Rubus calycinus Wall. ex D. Don	Dysentry, stomach pain	36	0.01333	0.24
Rubus ellipticus Sm.	Indigestion	28	0.00667	0.18667
Solanum aethiopicum L.	High-blood pressure	62	0.00667	0.41333
Solanum myriacanthum Dunal	Anti-leech	13	0.00667	0.08667
Solanum nigrum L.	High-blood pressure	96	0.00667	0.64
Solanum violaceum L.	Constipation, stomach pain	52	0.01333	0.64000
Taxus wallichiana Zucc.	anti cancer	6	0.00667	0.04000
Thelypteris parasitica (L.) Tardieu	Cuts and wounds, veterinary	56	0.01333	0.37333
Thladiantha ziroensis Yanka H & Arup K. Das	Dysentry, gastritis, high-blood pressure, stomach pain, fever/cold/cough	126	0.04667	0.84000

Trichosanthes tricuspidata Loureiro	Boils (furuncle)	22	0.00667	0.14667
Zanthoxylum acanthopodium DC.	Diarrhea, dysentry, cough/ cold	56	0.02000	0.37333
Zingiber officinale Rosc.	Headaches, cough/cold, fever, Indigstion,	122	0.03000	0.81333

Table 6.8.2.B. Use Value (UV) and Relative Frequency of Citation (RFC) of ethnomedicinal plants reportedly used by the Tagin tribes

Botanical name	Ailment treated (Tagin)	Use report (FC)	Use value	Relative Frequency of citation
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Toothache	118	0.00667	0.78667
Ageratum conizoides (L.) L.	Cuts and wounds	131	0.00667	0.87000
Allium hookeri Thwaites	Indigestion, gastritis	66	0.01333	0.44000
Alocasia acuminata Schott	Veterinary, medicinal	67	0.01333	0.44667
Anisomeles indica (L.) Kuntze	Cuts and wounds, Muscle pain	18	0.01333	0.12000
Artemisia indica Willd.	Backpain, Veterinary	31	0.01333	0.20667
Artimisia nilagirica (C.B.Clarke) Pamp.	Cuts and wounds, fever/ cold/headaches, nosebleeding	26	0.03333	0.17333
Azadirachta indica A.Juss.	Dysentry	32	0.00667	0.21333
Begonia aborensis Dunn	Stomach pain	77	0.00667	0.51333
Begonia palmata D.Don	Diarrhoea, dysentry	49	0.01333	0.32667
Buddleja asiatica Lour.	Sinus	19	0.00667	0.12667
Canarium strictum Roxb.	Diarrhea	58	0.00667	0.38667
Centella asiatica (L.) Urb.	Blood purifier, gastritis, diarrhea	70	0.02000	0.46667
Carica papaya L.	Stomach pain	61	0.00667	0.40667
Chromolaena odorata (L.) R.M.King &H.Rob.	Cuts and wounds, ring worm, skin disease	54	0.02000	0.36000
Cinnamomum zeylanicum Breya.	Oral infection	48	0.00667	0.32000
Clerodendrum glandulosum Lindl.	Breast pain	55	0.00667	0.36667
Coptis teta Wall.	Bone & Joint pain, anemia, stomach pain, diarhhea, dysentry	19	0.03333	0.12667
Crassocephalum crepidioides (Benth.) S.Moore	Cuts and wounds	37	0.00667	0.24667
Curcuma caesia Roxb.	Headaches	21	0.00667	0.14000
Curcuma longa L.	Stomach pain	48	0.00667	0.32000
Dendrocalamus Hamiltonii Nees & Arn. ex Munro	Cuts and wounds	73	0.00667	0.48667
Dillenia indica Linn.	Gatritis, diarrhea, stomach pain, anti-dandruff	42	0.02667	0.28000
Dioscoria alata L.	Stomach pain	61	0.00667	0.40667

Diplazium esculentum (Retz.) Sw.	Constipation, stomach pain	36	0.01333	0.24000
Drymaria cordata (L.) Willd. Ex Schult.	Cuts and wounds, Veterinary	59	0.01333	0.39333
Dryopteris felix- mas (L.) Schott	Itching, swelling, veterinary	85	0.02000	0.56667
Elatostema sessile Frost.	Stomach pain	69	0.00667	0.46000
Gonostegia hirta (Blume) Miq.	Anemia	48	0.00667	0.32000
Gynocardia odorata R.Br.	Veterinary	31	0.00667	0.20667
Hedychium stenopetalum Lodd.	Sprain, cuts and wounds	59	0.01333	0.39333
Helenia speciosa (J.Koenig) S.R.Dutta	Eyepain (ophthalmalgia)	24	0.00667	0.16000
Houttuynia cordata Thunb.	Stomach pain, diarrhea, dysentry, gastritis	61	0.02667	0.40667
Juglans regia L.	Ringworm	11	0.00667	0.07333
Justicia gendarussa Burm.f.	Bone fracture, muscular pain	38	0.01333	0.25333
Mastersia assamica Benth.	Cuts and wounds	51	0.00667	0.34000
Melastoma malabathricum L.	Cuts and wounds	46	0.00667	0.30667
Mikania micrantha Kunth	Cuts and wounds, stomach pain	88	0.01333	0.58667
Momordica charantia L.	Highblood pressure	43	0.00667	0.28667
Oxalis debilis Kunth	Burns	35	0.00667	0.23333
Paederia foetida L.	Diarrhea,dysentry, gastritis, stomach pain	128	0.02667	0.85333
Paris polyphylla Sm.	Stomach pain, headache, body pain	26	0.02000	0.17333
Persicarianepalensis (Meisn.) H.Gross	Boil (furuncle)	20	0.00667	0.13333
Pinus wallichiana A.B.Jacks.	Crackeed heels, cuts and wounds	20	0.01333	0.13333
Piper nigrum L.	Backpain, muscle pain	39	0.01333	0.26000
Piper pedicellatum C. DC.	Stomach pain, gastritis, diarrhea	40	0.02000	0.26667
Piper peepuloides Roxb	Cough and cold	40	0.00667	0.26667
Portulaca oleraceae L.	High-blood pressure	25	0.00667	0.16667
Psidium guajava L.	Dysentry, stomach pain	78	0.01333	0.52000
Rheum nobile Hook. F. & Thomson	Headache	11	0.00667	0.07333
Rhus chinensis Mill.	Stomach pain, gastritis, dysentry	28	0.02000	0.18667
Ricinus communis L.	Veterinary	75	0.00667	0.50000
Rohdea nepalensis (Raf.) N. Tanaka	Stomach pain	8	0.00667	0.05333
Solanum aethiopicum L	Highblood pressure	62	0.00667	0.41333
Solanum americanum Mill.	Highblood pressure	96	0.00667	0.64000
Solanum torvum Sw.	Toothache	31	0.00667	0.20667
Solanum violaceum	Blood pressure	19	0.00667	0.12667
Terminalia chebula Retz.	Stomach pain, diarrhea	50	0.01333	0.33333
Thalictrum foliolosum DC.	Fever, eye pain (ophthalmalgia)	18	0.01333	0.12000
Thladiantha ziroensis Yanka	Dysentry, gastritis,	39	0.02000	0.26000

H & Arup K. Das	stomach pain			
Tinospora cordifolia (Willd.) Hook.f. & Thomson	Stomach pain and muscular pain	47	0.00667	0.31333
Uncaria scandens (Sm.) Wall./ sessilifructus Roxb.	Eyepain (ophthalmalgia)	48	0.00667	0.32000
Urtica ardens Link	Muscle pain, boils (furuncle)	39	0.01333	0.26000
Zingiber officinale Rosc.	Headaches, cold/cough/ fever, indestion, oral	106	0.02000	0.70667

Table 6.8.3.A. Informant consensus factor (ICF) of the ailments category treated with ethnomedicinal plant species among Apatani tribal informants

Sl.No.	Ailments Category (Apatani)	No. of uses report (Nur)	No. of Species report (Ns)	Informant Consensus report
1	Gastrointestinal	332	27	0.92
2	Cuts and wounds	113	15	0.89
3	Cough, cold, fever, headaches	95	9	0.92
4	Oral & dental	106	2	0.97
5	Optical disorder	41	2	0.94
6	Dermatological disorder	55	3	0.95
7	Bloodpressure, amnesia, hypercholesterolemia	75	9	0.91
8	Skeleton-muscular disorder	43	2	0.96
9	Veterinary	12	1	0.94
10	Anemia	61	4	0.95

Table 6.8.3.B. Informant consensus factor (ICF) of the ailments category treated with ethnomedicinal plant species among Tagin tribal informants

Sl. No.	Ailments Category (Tagin)	No. of uses report	No. of Species report	Informant Consensus report
1	Gastrointestinal	297	26	0.92
2	Injury, wound, swelling	95	13	0.89
3	Cough,cold, fever, headaches	91	8	0.92
4	Oral & dental	73	2	0.97
5	Mammary & gynecological	59	1	1
6	Optical	35	3	0.94
7	Dermatological disorder	129	7	0.95
8	Bloodpressure, amnesia, Hypercholesterolemia	58	7	0.91
9	Skeleton-muscular	110	5	0.96

10	Veterinary	91	5	0.94
11	Anemia	37	2	0.95

Table 6.8.4.A. Fidelity level (FL%) of commonly mentioned medicinal plant species utilized against several disease categories by the Apatani tribes

[Legend: Np = total informants who practically utilized a species a particular ailments; N = total informants who reported the utility of that plant species for an ailments.]

Botanical name	Ailment treated (Apatani)	N	NP	Fidelity level (Np/N ×100)
Acmella oleracea (L.)R.K.Jansen	Stomach pain, toothache, intestinal worms	69,84,22	30,41,12	43%, 48%, 54 %
Acorus calamus L.	Wounds, skin allergy, headache, bone pain, intestinal pain	15,21,12,30,15	7,11,4,20,4	46.6%, 52.8%, 33%, 66%, 26%
Ageratum conizoides (L.) L.	Cuts and wounds	76	55	72.30%
Allum hookeri Thwaites	Nose blockade, ough/cold/ headache, indigestion, gastritis	15, 28, 58, 75	11, 14, 29, 51	73%, 50%, 50%, 68%
Allium tuberosum Rottler ex Spreng	Gastritis, indigestion, allergies, cough/cold/ headache	44,28, 7, 13	32,17,3,3	72.7%, 60.7%, 42%, 23%
Amaranthus caudatus L.	Anemia	70	42	60%
Anaphalis margaritacea (L.) Benth. & Hook.f	Cuts and wounds	43	21	48%
Anisomeles indica (L.) Kuntze	Cuts and wounds, muscle pain	49,20	18, 5	36%,25%
Artemisia indica Willd.	Headaches, nose blockade	24, 14	14,9	58.3%, 64%
Begonia roxburgii A.DC.	Stomach pain, diarrhea, dysentry	26,15,11	18,6,8	69%, 40%, 72%
Berberis napaulensis (DC.) Spreng.	Toothache, skin allergy	42,39	20, 24	47.6%, 61.5%
Berberis wallichiana DC.	Cuts and wounds	36	23	63%
Cardamine hirsuta L.	Stomach pain	65	46	70.70%
Centella asiatica (L.) Urb.	Blood purifier, gastritis, diarrhea	46,118,25	40, 105, 15	86%, 88.9%, 60%
Cephallostachium capitatum Munro	Dysentry , stomach pain	15,23	6,15	40%, 65%
Clerodendrum colebrookeanum Walp.	High-blood pressure, stomach pain	98,43	82,32	83.6%,74%
Colocasia esculenta (L.)	Anemia	41	20	48.70%

Schott				
Crassocephalum crepidioides (Benth.) S.Moore	Cuts and wounds, stomach pain, constipation, optical correction	41,56,14,12	32,45,10,7	78%, 80%, 71%, 58%
Curculigo capitulata (Lour.) Kuntze	Cuts and wounds	37	16	43%
Cucurbita pepo L.	Acute amnesia	35	6	17%
Diplazium esculentum (Retz.) Sw.	Constipation, stomach pain	42,35	34,22	80%, 62.5%
Dioscorea pentaphylla L.	Stomach pain	56	29	51.70%
Dichrocephla integrifolia l.f. Kuntze	Cuts and wounds	30	14	46.60%
Elusine coracana (L.) Gaertn	Anemia, hypercholesterolemia	43, 60	31,54	72%, 90%
Gonostegia hirta (Blume) Miq.	Anemia	20	9	45%
Gynura nepalensis DC.	Cuts and wounds	31	18	58%
Litsea cubeba (Lour.) Pers.	Cough/cold, insomnia, diarrhea	32,63,9	20,57,5	62.5%, 90%, 55.5%
Lobelia nummularia Lam.	Cuts and wounds	20	6	30%
Houttuynia cordata Thunb.	Stomach pain, diarrhea, dysentry, gastritis	112,53,58,89	105,39,46,62	93.7%, 73.5%, 79.3%, 69.6%
Hydrocotyle javanica Thunb.	Stomach pain, high prsessure	56,16	41,7	73%, 43.7%
Impatients latifolia L.	Stomach pain	48	21	43.70%
Impatients racemosa DC	Stomach pain	42	16	38%
Magnolia champaca (L.) Baill. ex Pierre	Stomach pain	78	47	60%
Oenanthe javanica (Blume) DC.	Indestion, gastritis, stomach pain	31,33,46	18,22,35	58%, 66%, 76%
Oxalis corniculata L.	Cuts and wounds, oral infection	29,48	12,23	41%, 47.9%
Paederia foetida L	Gastritis, stomach pain	22,34	16, 25	72%, 74.8%
Pinus wallichiana A.B.Jacks.	Cracked heels, cuts and wounds	54,28	38, 21	70%, 75%
Piper pedicellatum C. DC.	Stomach pain	29	18	62%
Piper hamiltonii C. DC.	Stomach pain, dysentry, cough	23,11,20	17,5,12	73.9%, 45%, 60%
Rubus calycinus	Dysentry, stomach	21,15	9, 5	42%, 33%

Wall. ex D. Don	pain			
Rubus ellipticus Sm.	Indigestion	28	16	57%
Rhus chinensis Mill.	Stomach pain, gastritis, dysentry	78,22,41	52,13,23	66.6%, 59%, 56%
Ranunculus sceleratus L.	Cuts and wounds	17	8	47%
Phoebe bootanica (Meisn.)M. Gangop.	High-pressure	55	41	74%
Plantago asiatica L.	Stomach pain, Constipation, high blood pressure, optical correction, cuts and wounds	82,19,20,6,32	56,15,11,3,27	68%78%, 55%, 50%, 84%
Solanum aethiopicum L	High-blood pressure	62	53	85%
Solanum myriacanthum Dunal	Anti-leech	13	8	61.50%
Solanum nigrum L.	High-blood pressure	96	61	64.00%
Solanum violaceum	Constipation, stomach pain	22,12	11,3,	50%, 25%,
Taxus wallichiana Zucc.	Anticancer	6	0	0
Zanthoxylum acanthopodium DC	Diarrhea, dysentry, cough/ cold	21,15,20	14,6,11	66.6%%, 40%, 55%
Thelypteris parasitica (L.) Tardieu	Cuts and wounds	56	24	42.80%
Trichosanthes tricuspidata Loureiro	Boils (furnacle)	22	9	40.90%
Thladiantha ziroensis Yanka H & Arup K. Das	Dysentry, gastritis, highblood pressure, stomach pain, fever/cold/cough	21,32,39,54,19	15,28,33,50,11	71%, 87.5%, 58%, 92.5%, 57%
Zingiber officinale Roscoe	Headaches, cold/coughs/fever, indestion,	29,112,38,	21,104,25	72.4%, 92.8%, 65.7%

Table 6.8.4.B. Fidelity level (FL%) of commonly mentioned medicinal plant species utilized against several disease categories by the Tagin tribes

[Legend: Np = total informants who practically utilized a species a particular ailments; N = total informants who reported the utility of that plant species for an ailments.]

Botanical name	Ailment treated (Tagin)	N	NP	Fidelity level (Np/N ×100)
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Toothache	118	71	60%
Ageratum conizoides (L.)	Cuts and wounds	162	139	85.80%

L.				
Alocasia acuminata Schott	Anti-lice (veterinary), multiple disease	41, 26	27,11	65.8%, 42%
Alium hookeri Thwaites	Nose blockade, Cough/cold, headache, indigestion, gastritis	39, 27	22, 16	56.4%, 59.2%
Anisomeles indica (L.) Kuntze	Cuts and wounds, muscle pain	12, 6	8, 3	66.6%, 50%
Artemisia indica Willd.	Backpain	16	9	56.25%
Artimisia nilagirica (C.B.Clarke) Pamp.	Cuts and wounds, fever/cold, headaches, nosebleeding	6,5,8,7	2,7,5,3	33%, 70%, 62.5%,42.8%
Azadirachta indica A.Juss	Dysentry	32	22	68.75%
Begonia aborensis Dunn	Stomach pain	77	52	67%
Begonia palmata D.Don	Diarrhoea, dysentry	21,28	9, 14	42.8%, 50%
Buddleja asiatica Lour.	Sinus	19	7	36%
Carica papaya L.	Stomach pain	61	38	62.20%
Canarium strictum Roxb.	Diarrhea	58	40	68.90%
Centella asiatica (L.) Urb.	Blood purifier, gastritis, diarrhea	70	41	58.50%
Chromolaena odorata (L.) R.M.King &H.Rob.	Cuts and wounds, ring worm, skin disease	33,15,6	24,4,3	72.7%, 26.6%, 50%
Clerodendrum colebrookeanum Walp.	Breast pain	26	16	61%
Cinnamomum zeylanicum Breya.	Oral infection	48	29	60.40%
Crassocephalum crepidioides (Benth.) S.Moore	Cuts and wounds	37	20	54%
Curcuma caesia Roxb.	Headaches	21	3	14%
Curcuma longa L.	Stomach pain	48	31	64.50%
Coptis teta Wall.	Bone & joint pain, anemia, stomach pain,	11, 4, 19	4,0,12	36.3%, 0, 63%
Dendrocalamus Hamiltonii Nees & Arn. ex Munro	Cuts and wounds	73	54	73.90%
Dioscoria alata L	Stomach pain	61	43	70%
Diplazium esculentum (Retz.) Sw.	Constipation, stomach pain	21,15	16,4	76%, 33.3%
Drymaria cordata (L.) Willd. Ex Schult.	Cuts and wounds	59	27	45%
Dryopteris felix- mas (L.) Schott	Itching, swelling	39,46	17,27	43.5%, 58.6%
Elatostema sessile Frost.	Stomach pain	68	31	64.50%
Gonostegia hirta (Blume) Miq.	Anemia	48	29	60.40%
Gynocardia odorata R.Br.	Veterinary	41	22	53.60%
Hedychium stenopetalum	Sprain, cuts and	41,18	28,12	68%, 66.6%

Lodd	wounds			
Houttuynia cordata Thunb.	Stomach pain	61	38	62.20%
Helenia speciosa (J.Koenig) S.R.Dutta	Eye pain (ophthalmalgia)	24	4	16.60%
Juglans regia L.	Ringworm	11	6	54.50%
Justicia gendarussa Burm.f.	Bone fracture, muscular pain	31,8	18,3	58%, 37.5%
Mastersia assamica Benth.	Cuts and wounds	51	23	45%
Melastoma malabathricum L.	Cuts and wounds	46	21	45.60%
Mikania micrantha Kunth	Cuts and wounds, stomach pain	88, 34	56,28	63.7%, 82%
Momordica charantia L.	High-blood pressure	43	25	58%
Oxalis debilis Kunth	Burns	35	8	22.80%
Persicaria nepalensis (Meisn.) H.Gross	Boil (furuncle)	20	13	65%
Pinus wallichiana A.B.Jacks.	Crackeed heels, cuts and wounds	20	5	25%
Piper nigrum L.	Back pain, muscle pain	21,18	12,6	57%, 33%
Piper pedicellatum C. DC.	Stomach pain,	40	22	55%
Piper peepuloides Roxb	Cough and cold	40	27	67.50%
Portulaca oleraceae L	High-blood pressure	25	14	56%
Paris polyphylla Sm.	Stomach pain, headache, body pain	11,7,8	6,4,5	54.5%, 57%, 62.5%
Paederia foetida L.	Diarrhea, gastritis, stomach pain	41,39,48	25,21,34	60.9%,53.8%,70.8%
Psidium guajava L.	Dysentry, stomach pain	57,21	39,14	68%, 66.6%
Rheum nobile Hook. F. & Thomson	Headaches	11	11	100.00%
Solanum nigrum L.	Highblood pressure	96	61	64%
Rhus chinensis Mill.	Stomach pain,	28	11	39.20%
Rohdea nepalensis (Raf.) N. Tanaka	Stomach pain	8	3	37%
Ricinus communis L.	bone	75	49	65%
Terminalia chebula Retz	Stomach pain, diarrhea	42,8	35,6	83%, 75%
Thalictrum foliolosum DC	Fever, eye pain (ophthalmalgia)	13,5	4,2	26.6%,40%
Tinospora cordifolia (Willd.) Hook.f. & Thomson	Stomach Pain, muscular pain	31,16	18,7	58%,43.7%
Thladiantha ziroensis Yanka H & Arup K. Das	Dysentry, gastritis, stomach pain,	5,12,22	2, 7,14	40%, 50 %, 63%
Uncaria scandens (Sm.) Hutch.	Eye pain (ophthalmalgia)	48	21	43.70%
Urtica ardens Link	Muscle pain, boils (furuncle)	17,22	6,11	35%, 50%

Solanum aethiopicum L.	High-blood pressure	45	33	73.30%
Solanum torvum Sw.	Toothache	31	23	70.90%
Zingiber officinale Roscoe	Headaches, cold/coughs/fever, Indestion,	29,68,25	8,59, 12	27.5%, 86.7%, 48%
Solanum violaceum	High-blood pressure	19	13	68.40%
Solanum spirale Roxb.	High-blood pressure, diarrhea	88,21	71,14	80%, 66.6%

Table 6.9.1.B. Checklist of commonly shared ethnobotanical species by both the tribes and their use categories

Botanical name	Use category (Apatani)	Use category (Tagin)
Acmella oleracea (L.) R.K.Jansen	Edible, medicinal	Edible
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Edible	Edible, medicinal
Aconitum feroxWall. ex Ser.	Poisoning	Poisoning
Acorus calamus L.	Medicinal	Medicinal
Actinidia chinensis var. *deliciosa* (A.Chev.)A.Chev**.**	Edible	Edible
Agaricus bisporus (J.E.Lange) Imbach (1946)	Edible	Edible
Ageratum conizoides (L.) L.	Medicinal	Medicinal
Allium cepa L.	Edible	Edible
Allium chinense G.Don	Edible	Edible
Allium hookeri Thwaites	Edible, medicinal	Edible, medicinal
Allium sativum L.	Edible, spice	Edible, spice
Allium tuberosum Rottler ex Spreng	Edible, spice, medicinal	Edible
Alnus nepalensis D. Don	Biofence, fuel	Biofencing, fuel
Amaranthus viridis L.	Edible	Edible
Anisomeles indica (L.) Kuntze	Medicinal	Medicinal
Artemisia indica Willd.	Edible, medicinal,vetarinary,	Edible, medicinal
Begonia burkillii Dunn	Edible	Edible
Begonia palmata D.Don	Edible	Edible, medicinal
Begonia roxburgii A.DC.	Edible, medicinal	Edible, medicinal
Berberis napaulensis (DC.) Spreng.	Edible, medicinal, dye	Edible, medicinal, Magico-religious, dye
Berberis wallichiana DC.	Edible, medicinal, tattoing	Edible, tatooing
Brassica juncea (L.) Czern.	Edible	Edible
Brassica oleracea L.	Edible	Edible
Callicarpa rubella Lindl.	Edible	Edible
Capsicum annum L.	Edible	Edible
Capsicum frutescens L.	Edible	Edible
Castanopsis indica (Roxb. ex. Lindl.) A. DC.	Edible, magico-religious,	Edible, magico-religious
Chenopodium album L.	Edible	Edible
Cinnamomum bejolghota (Buch.Ham.) Sweet	Crafts, beverage,insect repellent	Beverage
Clerodendrum colebrookeanum Walp.	Edible, medicinal,	Edible, medicinal, taboo
Colocasia affinis Schott	Edible, fodder	Edible, fodder
Colocasia esculenta (L.) Schott	Edible, fodder, medicinal	Edible, fodder
Coriandrum sativum L.	Edible	Edible
Crassocephalum crepidioides (Benth.) S.Moore	Edible, medicinal	Edible, medicinal
Cucumis sativus L.	Edible, medicinal, taboo	Edible, medicinal

Cucurbita ficifolia Bouché	Edible, fodder	Edible, fodder
Cucurbita pepo L.	Edible, medicinal	Edible, fodder, taboo
Dendrocalamus hamiltonii Nees & Arn. ex Munro	Edible, crafts, construction	Edible, medicinal, crafts, construction, magico-religious, fuel,taboo
Dichrocephla integrifolia (L.f.) Kuntze	Medicinal	Edible
Dicranopteris linearis (Burm. F.) Underw.	Binding, magico-religious, miscellaneous	Binding, magico-religious
Dioscorea pentaphylla L.	Edible, medicinal	Edible, medicinal
Dioscoria bulbifera L.	Edible	Edible
Diplazium esculentum (Retz.) Sw.	Edible, medicinal	Edible, medicinal
Elatostema sessile Frost.	Edible	Edible
Eleagnus latifolia L.	Edible	Edible
Eletostema platyphyllum Wedd.	Edible	Edible
Elusine coracana Gaertn	Edible, medicinal, beverage, magico-religious, miscellaneous	Edible, beverage, magico-religious
Exbucklandia populnea (R. Br. ex Griff.)	Construction, fuel, miscellaneous	Construction, fuel, miscellaneous
Fagophyrum cymosum (Trevir.) Meisn	Edible, fodder	Edible, fodder
Ficus auriculata Lour.	Edible, fodder, miscellaneous	Edible
Glycine Max Linn. Merr.	Edible, taboo	Edible
Gonostegia hirta (Blume) Miq.	Edible, medicinal	Edible, medicinal
Helianthus annuus L.	Edible, decoration	Edible, decoration
Houttuynia cordata Thunb.	Edible, medicinal	Edible, medicinal
Hydrocotyle javanica Thunb.	Edible, medicinal	Edible
Impatiens racemosa DC.	Edible, medicinal	Edible
Impatients latifolia L	Edible, medicinal	Edible
Ipomoea batatas (L.) Lam.	Edible	Edible, taboos
Juglans regia L.	Edible, medicinal, poisoning	Edible
Lagenaria siceraria (Molina) Standl.	Edible, crafts, magico-religious	Edible, crafts, magico-religious
Litsea cubeba (Lour.) Pers.	Edible, medicinal	Edible
Magnolia champaca (Linnaeus) Bailon ex Pierre	Edible, medicinal, Fuel, Crafts, construction	Edible, fuel, crafts, construction
Malus domestica (Suckow) Borkh.	Edible	Edible
Malva verticillata L.	Edible	Edible
Morus alba L.	Fuel, crafts, construction	Edible, biofence
Oenanthe javanica (Blume) DC.	Edible	Edible, medicinal
Oxalis corniculata L.	Edible, medicinal	Edible
Perilla frutescens (L.) Britton	Edible	Edible
Persicaria runcinata (Buch.-Ham. ex D.Don)	Edible	Edible
Persicaria hydropiper (L.) Delarbre	Poisoning	Poisoning
Phaseolus vulgaris L.	Edible	Edible
Phaseolus coccineus L	Edible	Edible
Phoebe bootanica (Meisn.)M. Gangop.	Edible, medicinal, taboo	Edible, taboo
Pinus wallichiana A.B.Jacks.	Craft, construction, edicinal, fuel, agriculture tool, miscellaneous	Construction, medicinal, fuel, miscellaneous
Piper pedicellatum C. DC.	Edible, medicinal	Edible, medicinal
Plantago asiatica L.	Edible, medicinal, fodder	Edible, medicinal
Plantago asiatica subsp. *erosa* (Wall.) Z.Yu Li	Edible, fodder	Edible
Pleurotus ostreatus (Jacq.) P. Kumm.	Edible	Edible
Portulaca oleraceae L.	Edible	Edible, medicinal
Potentilla indica (Andrews) Th.Wolf	Edible	Edible
Prunus domestica L.	Edible, fuel, b	Edible
Prunus persica Linn.	Edible, magico-religious	Edible
Pyrus pashia Buch.-Ham. ex D.Don	Edible	Edible

Rhus chinensis Mill.	Edible	Edible, medicinal, construction
Rubia manjith Roxb.	Dye	Dye
Rubus ellipticus Sm.	Edible, medicinal	Edible
Rubus niveus Thunb.	Edible	Edible
Rubus sumatranus Miq.	Edible	Edible
Rumex nepalensis Spreng	Edible, fodder	Edible, fodder
Saurauia roxburgii Wall.	Edible, magico-religious	Edible
Sicyos edulis Jacq.	Edible	Edible
Solanum aethiopicum L.	Edible, medicinal	Edible, medicinal
Solanum myriacanthum Dunal	Medicinal	Medicinal
Slanum nigrum L.	Edible, medicinal	Edible, vegetable, medicinal, taboo
Solanum violaceum L.	Edible, medicinal	Edible, medicinal
Stauntonia coriacea (Diels) Christenh.	Edible	Edible
Tetrastigma serrulatum (Roxb.) Planch.	Edible	Edible
Thladiantha ziroensis Yanka H & Arup K. Das	Medicinal	Medicinal
Zanthoxulum armatum DC.	Edible, spice, magico-religious	Edible, insence, spice, magico-religious
Zanthoxylum acanthopodium DC.	Edible, medicinal	Edible, medicinal, poisoning
Zea mays L.	Edible, crafts, fodder, beverage	Edible
Zingiber officinale Rosc.	Edible, spice, medicine, magico-religious	Edible, spice, medicine, magico-religious

Table 6.9.2.B. Checklist of common medicinal plants used by both the tribes for treating similar ailments

Medicinal Plants	Ailments
Ageratum conizoides (L.) L.	Cuts and wounds
Allium hookeri Thwaites	Gastrointestinal
Anisomeles indica (L.) Kuntze	Cuts and wounds
Artemisia indica Willd.	Cough/cold/ fever/ headaches
Begonia roxburgii A.DC.	Gastrointestinal
Centella asiatica (L.) Urb.	Gastrointestinal
Crassocephalum crepidioides (Benth.) S.Moore	Cuts and wounds
Clerodendrum colebrookeanum Walp.	Gastrointestinal, blood pressure
Diplazium esculentum (Retz.) Sw.	Gastrointestinal
Houttuynia cordata Thunb.	Gastrointestinal
Paederia foetida L	Gastrointestinal
Piper pedicellatum C. DC.	Gastrointestinal
Solanum aethiopicum L.	Blood pressure
Solanum nigrum L.	Blood pressure
Thladiantha ziroensis Yanka H & Arup K. Das	Gastrointestinal, cough/cold, blood pressure
Zingiber officinale Roscoe	Gastrointestinal, cough/cold/ fever/ headaches

Table 6.10.1. Checklist of plant as Ethnobotanical novelties for Apatani tribe

Plant Species	Ethnobotanical Novelties
Amaranthus caudatus	Delicate leaves are considered good for Anemia
Colocasia esculenta	Delicate leaves are considered good for Anemia
Dichrocephla integrifolia	Leaf paste is applied to wounds and cuts
Hibiscus syriacus	Tender leaves are edible
Ligustrum ovalifolium	Small agricultural tool is crafted from its robust stems
Nasturtium microphyllum	Fragile leaves are edible
Solanum myriacanthum	The Raw fruit is crushed and utilised as a leech-resistance measure
Zea mays	A broom is also prepared from the husk of corn
Arenga obtusifolia	Trunk fibre is used for making shield worn like bagpack, locally called ***'Lecha'***

Table 6.10.2. Checklist of plant as Ethnobotanical novelties for Tagin tribe

Plant Species	Ethnobotanical Novelties
Artimisia nilagirica	During certain rites, dried leaves are burned as incense, and the fully dried leaves are also utilised as cushions
Berberis napaulensis	The leaf and stems are employed for ritual and rites
Clerodendrum colebrookeanum	The leaves are used to treat back and breast pain during the breastfeeding period
Curculigo capitulate	Leaves are used for polishing swords and blades to get rid of rust
Furcraea selloana	Planted as fencing to guard the area against animal intrusion and other dangers because of its long leaf and hook-like spine
Fagophyrum cymosum	Grounded seed flour is used to make chappati, and seeds are utilised to produce wine
Juglans regia	Pastes of leaves are also used in curing ringworm while powdered leaf, bark, and dried pericarp are used by the Tagin people to treat fish poisoning and to feed the fish
Livistona jenkinsiana	The dried leaf sheath is used to make ***shampuk,*** a type of native broom
Pandanus Furcatus	Leaves are utilised to make ta native sword bag's outer covering
Persicaria nepalensis	Leaves are Used for treating boils/ furuncle
Portulaca oleraceae	When eaten fresh, it is beneficial for high blood pressure and healthy blood circulation
Rheum nobile	The bracts are edible and used for headache remedy
Uncaria scandens	The sap from the stem is topically used to treat eye conditions
Zanthoxulum armatum	In several rituals, dried leaves are utilised as fragrant insence
Helenia speciosa	Applying the liquid sap that has been removed from the stem is used to ease irritation in the eyes
Arenga obtusifolia	Trunk fibre is used for making shield worn like bagpack, locally called ***'tash naara'***
Smilax laurifolia	The young creeping stems of taktragrii for customary religious uses
Ophiocordyceps sinensis	Treats variety of illnesses
Morchella esculenta	Eaten as a vegetable

CHAPTER 7
ECONOMIC AND CULTURAL IMPORTANCE OF ETHNOBOTANICAL SPECIES

7.1. Ethnobotanical species in the folk market

The social, cultural, and economic life of indigenous and tribal groups worldwide depends heavily on ethnobotanical species sold in the folk markets, which are more than just places to purchase and sell goods. The customs, ways of life, and interaction between the community and the environment are frequently reflected in them. Other than the farming and hunting, marketing of wild plant species available in their forests are one of the crucial sources of subsistence among the Apatani and Tagin community of Arunachal Pradesh. Plant species of high economic values and ethnobotanical significance that are extensively marketed in the local market and have the potential to improve the rural livelihood of villagers have been prioritized in the current study. From the folk market survey it was found that a total of 103 plant species were found to be frequently sold in the folk market of both the tribes. The majority of the plants sold in the market are wild species collected from the nearby forest, as well as those that have been nurtured in their own home garden and sold as a food crops, spices, vegetables, herbal remedies, or building materials. The checklist of the economically important plant prioritized from both wild as well as cultivated sources are presented in the table 7.1.1.

Table 7.1.1. Checklist of economically significant plant utilized among Tagin and Apatani Tribe of Arunachal Pradesh

Economically Significant species	Cultivation status	Condition of species	Rate (bunch; bottle; packet; gram; roll)	Part used
Acmella oleracea (L.) R.K. Jansen	Wild/cultivated	Fresh	20 per bunch	Leaves, flower
Actinidia chinensis var. *deliciosa* (A.Chev.) A. Chev.	Cultivated	Fresh	100 per pct	Fruit
Agaricus bisporus (J.E.Lange) Imbach (1946)	Wild	Fresh	100 per pct	Fruiting body
Allium tuberosum Rottler ex Spreng	Cultivated	Fresh	20 per bunch	Leaves, bulb
Allium chinense G.Don	Cultivated	Fresh	20 per bunch	Leaves
Allium hookeri Thwaites	Cultivated	Fresh	20 per bunch	Leaves
Amaranthus viridis L.	Wild	Fresh	20 per bunch	Leaves
Amaranthus spinosus Linn.	Wild/cultivated	Fresh	20 per bunch	Leaves
Amomum dealbatum Roxb.	Wild	Dried	50 per heap	Fruit
Ananas comosus (L.) Merr.	Cultivated	Fresh	50 per kg	Fruit

Arenga obtusifolia Mart	Wild	Preserved	100 per pct	Stem
Artopcarpus heterophyllus Lam.	Cultivated	Fresh	50 per kg	Fruit
Baccaurea ramiflora Lour.	Wild	Fresh	30 per heap	Fruit
Bamboosa tulda Roxb.	Wild/cultivated	Preserved	100 per bottle, 300	Young shoot
Brassica juncea (L.) Czern.	Wild	Fresh	20 per bunch	Leaves
Brassica oleracea L.	Cultivated	Fresh	40 Per Kg	Whole plant
Breynia androgyna (L.) Chakrab. &N.P.Balakr.	Cultivated	Fresh	20 per bunch	Leaves
Calamus flagellum Griff. Ex Mart.	Wild	Dried	200 per roll	Stem
Canarium strictum Roxb	Cultivated	Fresh, dried		Fruit, Resin
Capsicum annum L.	Cultivated	Fresh, dried	100 per bunch	Fruit
Capsicum frutescens L.	Cultivated	Fresh	100 per bunch	Fruit
Castanopsis indica (Roxb. ex. Lindl.) A. DC.v	Wild	Dried	50 per bunch	Fruit
Cardamine hirsuta L.	Wild	Fresh	20 per bunch	Leaves
Carica papaya L.	Cultivated	Fresh	50 per kg	Fruit
Centella asiatica (L.) Urb	Wild	Fresh	50/100 Per bunch	Leaves
Chenopodium album L.	Cultivated	Fresh	20/50 per bunch	Leaves
Choerospondias axillaris (Roxb.) B.L.Burtt and A.W.Hill.	Wild	Fresh	50 per bunch	Fruit
Cinnamomum tamala (Buch.-Ham.) T.Nees&C.H.Eberm.	Cultivated	Dried	50 per bunch	Leaves
Citrus maxima (Burm.) Merr.	Cultivated	Fresh	100 per kg	Fruit
Citrus medica L.	Cultivated	Fresh	100 per kg	Fruit
Citrus reticulata Blanco	Cultivated	Fresh	100 per kg	Fruit
Clerodendrum colebrookeanum Walp.	Wild/cultivated	Fresh	20/50 per bunch	Leaves
Colocasia esculenta (L.) Schott	Cultivated	Fresh	50 per bunch, 50 per kg	Leaves, corm
Coriandrum sativum L.	Cultivated	Fresh	20 per bunch	Leaves
Crassocephalum crepidioides (Benth.) S.Moore	Wild/cultivated	Fresh	20 per bunch	Leaves
Cucumis sativus L.	Cultivated	Fresh	70 per kg	Fruit
Cucurbita pepo L.	Cultivated	Fresh	50 per kg, 20 per kg	Fruit. Leaves
Dendrocalamus hamiltonii Nees & Arn. ex Munro	Wild	Preserved	100 per pct, 1500 per bottle	Young shoot, stem
Dillenia indica Linn.	Wild /cultivated	Fresh	50 per bunch	Fruit
Dioscoria alata L.	Culivated	Fresh	50 per kg	Bulbills, tuber
Dioscoria bulbifera L.	Cultivated	Fresh	50 per kg	Bulbills, tuber
Dioscorea pentaphylla L.	Cultivated	Fresh	50 per kg	Bulbills, tuber
Diplazium esculentum (Retz.) Sw.	Wild	Fresh	30 per bunch	Leaves
Eletostema platyphyllum Wedd.	Cultivated	Fresh	20 per kg	Leaves
Elusine coracana Gaertn	Cultivated	Dried	1000 per kg	Seeds
Ensete glaucum (Roxb.) Cheesman	Wild	Fresh	100 per bunch	Fruit
Erigeron floribundus (Kunth) Sch.Bip.	Wild	Fresh	20 per bunch	Leaves
Eryngium foetidum L.	Wild/cultivated	Fresh	20 per bunch	Leaves
Fagophyrum cymosum (Trevir.) Meisn	Cultivated	Fresh	20 per bunch	Leaves
Garcinia lanceifolia Roxb.	Wild/ cultivated	Fresh	50 per kg	Fruit
Glycine max Linn. Merr.	Cultivated	Dried	50 per kg	Seeds

Gonostegia hirta (Blume) Miq.	Wild	Fresh	50 per bunch	Leaves
Houttuynia cordata Thunb.	Wild/cultivated	Fresh	50 per bunch	Leaves, roots
Ipomoea batatas (L.) Lam.	Cultivated	Fresh	20 per bunch, 50 per kg	Leaves, tuber
Lagenaria siceraria (Molina) Standl.	Cultivated	Dried	50 kg	Fruit
Litsea cubeba (Lour.) Pers.	Wild/cultivated	Fresh	30 per bunch	Fruit
Livistona jenkinsiana Griff.	Wild/cultivated	Fresh	50 per kg	Fruit
Luffa acutangula (L.) Roxb.	Cultivated	Fresh	50 per kg	Fruit
Mackaya neesiana (Wall.) Das	Wild	Fresh	20 per kg	Leaves
Magnolia champaca (Linnaeus) Bailon	Cultivated	dried	100/50 per bunch, 800 per peice	Fruit, timber
Malva verticillata L.	Cultivated	Fresh	50 per bunch	Leaves
Manihot esculenta Crantz	Cultivated	Fresh	100 per kg	Tuber
Momordica charantia L.	Wild	Fresh	50 per kg	Fruit
Musa balbisiana Colla	Wild	Fresh	100 per bunch,	Fruit, inflorescence
Musa paradisiacal L.	Wild	Fresh	100 per bunch,	Fruit, inflorescence
Myrica esculenta Buch.-Ham. ex D.Don	Cultivated	Fresh	100 per kg	Fruit
Oenanthe javanica (Blume) DC.	Wild	Fresh	50/100 per bunch	Leaves
Perilla frutescens (L.) Britton	Cultivated	Dried	60 per kg	Seeds
Phaseolus coccineus L	Cultivated	Fresh	30 per kg	Seed pod
Phaseolus vulgaris L.	Cultivated	Fresh	30 per kg	Seed pod
Phoebe bootanica (Meisn.)M. Gangop.	Wild	Fresh	100 per bunch	Fruit
Phrynium pubinerve Blume	Wild	Fresh	200 per bunch	Leaves
Phrynium imbricatum Roxb.	Wild	Fresh	200 per bunch	Leaves
Phyllostachys manii Gamble	Wild/cultivated	Preserved	100 per kg, stem 45 per bamboo	Young shoot, stem (timber)
Phyllantus emblica L.	Cultivated	Fresh	50 per kg	Fruit
Pilea pumila A.Gray	Wild	Fresh	20 per bunch	Leaves
Pinus wallichiana A.B.Jacks.	Wild/cultivated	-	550 per piece	Stem (Timber)
Piper pedicellatum C. DC.	Wild	Fresh	50 per bunch	Leaves
Pleurotus ostreatus (Jacq.) P. Kumm.	Wild	Fresh	100 per pct	Fruting body
Pouzolzia sanguinea (Blume) Merr.	Wild	Fresh	20 per bunch	Leaves
Prunus domestica L.	Cultivated	Fresh	50 per kg	Fruit
Prunus persica Linn.	Cultivated	Fresh	40/50 per kg	Fruit
Psidium guajava L.	Wild	Fresh	50 per kg	Fruit
Pyrus pyrifolia (Burm.f.) Nakai	Cultivated	Fresh	50 per kg	Fruit
Pyrus communis L.	Cultivated	Fresh	50 per kg	Fruit
Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC.	Wild	Fresh	20 per bunch	Leaves
Saccharum officinarum L.	Cultivated	Fresh	200 per bunch	Stem
Setaria italica (L). P. Beauv.	Cultivated	Dried		Seeds
Sechium edule (Jacq.) Sw.	Cultivated	Fresh	50 per kg	Fruit
Selaginella biformis A.Braun ex Kuhn	Wild	Fresh	20 per bunch	Leaves
Sesamum indicum L.	Cultivated	Dried	200 per kg	Seeds
Solanum aethiopicum L.	Wild	Fresh	50 Per kg	Fruit
Solanum nigrum Mill.	Wild/cultivated	Fresh	50 Per bunch	Leaves
Solanum spirale Roxb.	Wild/cultivated	Fresh	20 perbunch	Fruit
Solanum torvum Sw.	Wild	Fresh	20 per bunch	Fruit
Solanum violaceum L.	Wild/cultivated	Fresh	20 per bunch	Fruit

Thladiantha ziroensis Yanka H & Arup K. Das	Wild	Dried	100 per roll	Stem
Thysanolaena latifolia (Roxb. ex Hornem.) Honda	Cultivated	Dried	50 per bunch	Flower
Zanthoxulum armatum DC.	Wild	Fresh	20 per bunch	Leaves, seeds
Zanthoxylum rhetsa DC.	Wild	Fresh	20 per bunch	Leaves
Zea mays L.	Cultivated	Fresh, Dried	100 per kg	Seeds (kernel), fruit
Zingiber officinale Rosc.	Cultivated	Fresh	50 per kg, 50 per bunch	Rhizome, leaves
Zizyphus mauritiana Lam.	Cultivated	Fresh	50 per kg	Fruit

Table 7.1.2. Checklist of some economically significant plant species with high use value index commonly sold in the folk market by both the tribes

Economically significant plant with high UVI	Use category
Dendrocalamus hamiltonii	Edible, Medicinal, Crafts, Construction, Magico-religious, Fuel,Taboo
Zanthoxylum rhetsa	Edible, Vegetable, Medicine, Poison, Spice,Taboo
Cucurbita pepo	Edible, Vegetable, Medicinal, Fodder, Taboo
Zingiber officinale	Edible, vegetable, Spice, Medicine, Magico-religious
Bamboosa tulda	Medicinal, Construction, Craft, Edible
Canarium strictum	Edible, Medicinal, Poison, Repellent
Clerodendrum colebrookeanum	Edible, Vegetable, Medicinal, Taboo
Livistona jenkinsiana	Edible, Crafts, Construction, Biofence,
Magnolia champaca	Edible, Medicinal, Fuel, Crafts, Construction
Pinus wallichiana	Edible, Construction, Crafts, Fuel, Agriculture tool, Decoration, Magicoreligious
Solanum nigrum	Edible, Vegetable, Medicinal, Taboo
Zanthoxulum armatum	Edible, Insence, Spice, Magico-religious
Acmella oleracea	Edible, Vegetable, Medicinal
Allium chinense	Edible, vegetable, Spice
Allium hookeri	Edible, Vegetable, Medicinal
Amaranthus spinosus	Edible, Vegetable, Fodder
Dioscoria alata	Edible, Medicine, Taboo
Cucumis sativus	Edible, Medicinal, Taboo
Phyllostachys manii	Edible, Construction, Crafts, Fuel, Agriculture tool, Decoration, Magicoreligious
Pinus wallichiana	Craft, Construction, Medicinal, Fuel, Agriculture tool, Miscellaneous
Elusine coracana	Edible, Medicinal, Beverage, Magico-religious, Miscellaneous
Houttuynia cordata	Edible, Vegetable, Medicinal
Lagenaria siceraria.	Edible, Crafts, Magico-religious
Zea mays	Edible, Crafts, Fodder, Beverage
Cardamine hirsuta	Edible, Vegetable, Medicinal
Centella asiatica	Edible, Vegetable, Medicinal
Colocasia esculenta	Edible, Medicinal, Fodder

Diplazium esculentum	Edible, Vegetable, Medicine
Gonostegia hirta	Edible, Vegetable, Medicinal
Phoebe bootanica	Edible, Medicinal, Taboo
Solanum aethiopicum	Edible,Vegetable, Medicinal
Zanthoxulum armatum	Edible, Insence, Spice, Magico-religious
Pyrus pyrifolia	Edible, Fuel, Beverage
Pyrus communis	Edible, Fuel, Beverage
Piper pedicellatum	Edible, Vegatable, Medicinal
Prunus persica	Edible, Magico-religious
Prunus domestica	Edible, Fuel, Beverage

7.2. Culturally Significant Plant

In addition to the food and medicinal plants, there are many more plant species that have great cultural values attached with Apatani and Tagin tribes. These plants are utilized in various cultural celebrations, rites or magico-religious purpose, agricultural tools and implements employed for farming, traditional handcrafts for various household chores, hunting, farming, ceremonies, festivals, plants for hunting or fishing, house or bridge construction and plants that are forbidden for any means. This study documented a total of 38 magico-religious plant, 28 species for traditional crafts and agricultural tools, 22 were found to be used for the construction, 11 for hunting and poisoning and 12 species were found to be avoided by the communities during taboos after rituals.

Table. 7.2.1. Checklist of plants utilized for Magico-religious purpose by Tagin and Apatani tribe

1	*Dalhousiea bracteata*	20	*Lycopodium clavatum*
2	*Carex cruciata*	21	*Castanopsis indica*
3	*Castanopsis faberi*	22	*Cephallostachium capitatum*
4	*Curculigo capitulata*	23	*Ligustrum ovalifolium*
5	*Gymnosphaera gigantea*	24	*Zanthoxulum armatum*
6	*Dendrocalamus hamiltonii*	25	*Saurauia roxburgii*
7	*Lycopodiella cernua*	26	*Lagenaria siceraria*
8	*Mallotus paniculatus*	27	*Calamus acantospathus*
9	*Pinanga gracilis*	28	*Phrynium pubinerve*
10	*Albizia chinensis*.	29	*Phrynium imbricatum*
11	*Brassaiopsis hispida*	30	*Tripidium arundinaceum*
12	*Berberis napaulensis*	31	*Artimisia nilagirica*
13	*Prunus persica*	32	*Dicranopteris linearis*
14	*Phyllostachys manii*	33	*Elusine coracana*
15	*Musa balbisiana*	34	*Ensete glaucum*
16	*Saurauia punduana*	35	*Lagenaria siceraria*
17	*Smilax laurifolia*	36	*Musa balbisiana*

18	*Zingiber officinale*	37	*Phyllostachys mannii*
19	*Plectocomia himalayana*	38	*Arenga obtusifolia*

Table 7.2.2. Checklist of plants utilized for Traditional handcrafts/ Agricultural tools by Tagin and Apatani tribe

1	*Liquidamba excela*	15	*Gnetum montanum*
2	*Bamboosa tulda*	16	*Lagenaria siceraria*
3	*Chimonocalamus griffithianus*	17	*Ligustrum ovalifolium*
4	*Boehmeria hamiltoniana*	18	*Livistona jenkinsiana*
5	*Calamus acantospathus*	19	*Magnolia champaca*
6	*Calamus erectus.*	20	*Pandanus furcatus*
7	*Calamus flagellum*	21	*Phragmites karka*
8	*Calamus inermis*	22	*Phyllostachys mannii*
9	*Calamus leptospadix*	23	*Pinus wallichiana*
10	*Arenga obtusifolia*	24	*Plectocomia himalayana*
11	*Caryota urens*	25	*Sida acuta*
12	*Cephallostachium capitatum*	26	*Thysanolaena latifolia*
13	*Cinnamomum bejolghota*	27	*Wallichia triandra*
14	*Dendrocalamus hamiltonii*	28	*Zea mays*

Table 7.2.3. Checklist of plants utilized for various construction by Tagin and Apatani tribe

1	*Albizia lebeck*	12	*Livistona jenkinsiana*
2	*Albizia chinensis*	13	*Magnolia champaca*
3	*Liquidamba excela*	14	*Musa acuminate*
4	*Arenga micrantha*	15	*Musa aurantiaca*
5	*Bamboosa tulda*	16	*Phyllostachys mannii*
6	*Caryota urens*	17	*Pinus kesiya*
7	*Castanopsis faberi*	18	*Pinus wallichiana*
8	*Chimonocalamus griffithianus*	19	*Rhus chinensis*
9	*Dendrocalamus hamiltonii*	20	*Spondias pinnata*
10	*Duabanga grandiflora*	21	*Tectona grandis*
11	*Exbucklandia populnea*	22	*Terminalia myriocarpa*

Table 7.2.4. Checklist of plants utilized as taboos and conservation ethics by Tagin and Apatani tribe

1	*Ipomoea batatas*	7	*Cucurbita pepo*
2	*Phoebe bootanica*	8	*Dioscoria alata*
3	*Prunus persica*	9	*Glycine Max*
4	*Solanum nigrum*	10	*Dendrocalamus hamiltonii*
5	*Zanthoxylum rhetsa*	11	*Cucumis sativus*
6	*Artopcarpus heterophyllus*	12	*Clerodendrum colebrookeanum*

Table 7.2.5. Checklist of plants utilized as poisoning by Tagin and Apatani tribe

1	*Aconitum ferox*	7	*Trichosanthes tricuspidata*
2	*Aesculus assamica*	8	*Juglans regia*
3	*Albizia lebeck*	9	*Persicaria pubescens*
4	*Canarium strictum*	10	*Persicaria hydropiper*
5	*Dryopteris felix- mas*	11	*Zanthoxylum acanthopodium*
6	*Gynocardia odorata*	12	*Zanthoxylum rhetsa*

CHAPTER 9

DISCUSSION

9.1. Demography and ethnobotanical knowledge of the informants

Out of the 300 informants interviewed from 150 households (75 from Apatani and 75 from Tagin inhabiting areas), 156 informants were male and 144 informants were female recorded from 75 households each. Present studies have reported 333 plant species of ethnobotanical importance belonging to 245 genera and 107 plant families. The literacy rate of the informant was found higher (70%) among the male informants from Apatani tribe and 71% among the Tagin community. Nonetheless, the Apatani literacy rates among the female (57%) informants were found to be lower than that of the Apatani male and the same goes for the female informants of Tagin tribes (51%) respectively. In general, it was found that the female members of both the tribes had lower literacy levels. The percentages of illiterate people were lower in both the genders. The informants' knowledge and skill level were unaffected by the literacy rate, despite the fact that illiterate male was much higher than illiterate female. Furthermore, the present finding showed that literacy level had no bearing on traditional ethnobotanical knowledge or skills because the older, illiterate informants were also found to possess a substantial level of ethnobotanical knowledge as elderly people have long term personal experience of plant utilization knowledge.

Additionally, it was investigated and revealed that most male informants (n=156) from both communities were found to be of age group between 55-65 years, whereas comparatively less number of female informants (n=144) were falls within age group 35-55 years of age. More insight and information about traditional rules and practices relating to plants were provided by the informants of over 45 age group than by the under 45 age group. According to the study, the female informant was more knowledgeable about both the theoretical and practical importance of foraging for edible wild and cultivated edible plants, agricultural tools and techniques, farming, medicinal uses of plants, plants used for reproductive health and other topics related to the traditional insight of plants, whereas the male informant was more knowledgeable about the theoretical and practical magico-religious plants, customary laws, building, handmade crafts, hunting and fishing, and therapeutic knowledge of the community. According to the survey and data documented most informants were the, priests, hunters, farmers,

house wife's, village head, herbal healers, govt. employee, private sector worker, and so on. Several research on ethnobotany have shown that women are more likely to be knowledgeable about food and medicinal plants utilized in the home, that are often found closer to home, in home gardens and other nearer habitats, however males are more knowledgeable about and make use of timber plants, typically for construction or profitable uses. These species may be extensively distributed over the landscape and far-away from the location of dwelling (Costa et al., 2021).

9.2. Taxonomic diversity of ethnobotanical species and their applications

In the current cross-cultural ethnobotanical study of two community in the two different districts of Arunachal Pradesh, Lower and Upper Subansiri, the Apatani and Tagin Biocultural Landscapes, a good number of plant families (n=107) have been identified. These species, which represent 245 genera and 333 ethnobotanical plant species, are widely distributed along various altitudinal gradients. The top 10 most dominant plant families with highest number of genera and species recorded to be Asteraceae (20 sp.), as also mentioned by previous workers that the Asteraceae family dominated the medicinal category when it came to treating human illnesses in North East Region of India (Saklani & Jain, 1994), (Kala, 2005), (Murtem & Chaudhry, 2016). Also members of the Asteraceae family are widely distributed, cosmopolitan, and extremely adaptivedue to small seed size and large number of seed production with high rate of seed viability (Mabberley, 2017). Rosaceae which is represented by 17 species, is a family which includes trees, bushes, and herbs, yielding a wide range of valuable and profitable products, including a large number of delicious fruits (Ali, 2023), and followed by Poaceae (14 sp.), Cucurbitaceae (13 sp.), Urticaceae (12 sp.), Arecaceae (12 sp.), Solanaceae (11 sp.), Fabaceae (10 sp.), Polygoniaceae (9 sp.), and Rutaceae (9 sp.). Among these family, some of them like Asteraceae, Rosaceae, Poaceae, Cucurbitaceae, Arecaceae, and Solanaceae were reported to be high medicinal and economic significance for the local communities (Tagin and Apatani) and they could ensure the sustenance of livelihood of the local residents' as food and medicine. Additional minor plant families identified to be important from a cultural and economic standpoint were Zingiberaceae, Musaceae, Dioscoriaceae, Brassicaceae, Araceae, Amaranthaceae, and Amaryllidaceae.

The present study also revealed a total of 245 distinct plant genera recorded from the two study sites, namely Apatani and Tagin biocultural landscape of Lower and Upper

Subansiri district of Arunachal Pradesh which includes fungi, gymnosperms, angiosperms, and pteridophytes. Within the ethnobotanically relevant plant genera, the highest numbers of species were reported for *Rubus* (7 species), *Solanum* (6 species), *Allium* (5 species), *Calamus* (5 species), *Ficus* (5 species), and *Persicaria* (5 species). The next species in order of less than three (>three sp.) were *Begonia* (4 species), *Citrus* (4 species), *Cucurbita* (4 species), *Piper* (4 species), and *Saurauia* (4 species). Current findings also demonstrated that the Apatani and Tagin communities employ highest number of angiosperm dicots (245 species) as ethnobotanical resources, compared to angiosperm monocots (70 species), 10 species from pteridophyte, 4 species were reported under gymnosperms, while only 4 species have been reported under mushrooms/fungi group. This suggests that the high presence of angiosperm dicot in the Apatani and Tagin biocultural landscapes indicates their continued significance as key ethnobotanical resourcesfor the sustenance of rural livelihood.

9.3. Habit, habitat and distribution along different altitudinal gradient

The current cross-cultural investigations of two communities revealed that the herb categories which are mostly employed as vegetables, medicines, and fodders are dominating life forms among the ethnobotanical species reported which approximately accounts for 39.3% (n=131) of the total plant species (n=333) reported. The second primary habit form reported are the trees species, and majority of which offer fruit, fuel, and timber which accounts for 27% (90 species)of the total collections, even though trees are mostly thought of as sources of timber, recent research has shown that some tree species have therapeutic benefits (Doley et al., 2011), which is followed by shrubs with 14.4% (48 species), sub shrubs with 4% (14 species), climbers with 3% (11 species), lianas with 2% (7 species), fungi with 4% (1 species), and runners with 1% (1 species), which spanning across wide range of altitudinal gradients (agroclimatic zones) in the study sites.

Subsequently, the habitat with the highest number of species were reported in forest habitat which accounts for 61.8% (206 sp.) as forest creates an ideal surroundings for a variety of plant species to flourish and the Apatani inhabitants have a firm relationship with the forests, and several ceremonial events and festivities have a direct bearing on the preservation of the forest species (Bamin & Gajurel, 2015). Meadows and open forest came in second with 28.2% (94 sp.), followed by wetland/bog with 12 % (40sp.) and barren/tundra with the lowest species coverage, at 4.8% (16 sp.).

The study also demonstrated that the majority of ethnobotanically useful plants were found distributed in Tropical forest within an altitudinal range of 100-1000 m with a total of 46 % (154 species) as this forests type receives a lot of rainfall, which makes the environment perfect for a variety of plant life which is followed by temperate forest with 22 % (73 sp.) which falls within the altitudinal range of 2000-3000 m, since the temperate forest supports a wide range of evergreen trees as well as deciduous tree, and tree as habit form has reported as second highest habit type in the current study sites. There is a great diversity of tree flora, including enormous species, in tropical and temperate forests in particular (Doley et al., 2011).The temperate forest is followed by Subtropical Forest type which ranges between 1000 -2000 m reveled a total of 17 % (57 sp.), and tropical to subtropical forest of about 9.6% (32 sp.), However, the subtropical to temperate and Alpine altitudinal range revealed less plant species diversity of ethno-botanical importance with a total of 4.5% (15 sp.), and 0.6% (2 sp.), respectively.

9.4. Observation of Abundance and the local distribution status of plants (DAFOR Scale (Sutherland, 1996)

The DAFOR Scale (Sutherland, 1996) was used to visually assess local distribution status of 333 ethnobotanical species reported in present studies. Of these, the highest number i.e.,154 plant species was recorded under the Frequent (F) category, 124 under the Occasional (O) category, 37 under the Abundant (A) category, 13 under the Rare (R) category, and 5 under the Dominant (D) category. The majority of the plant species reported from both the study sites (Tagin and Apatani inhabited area) could be frequently seen along diverse habitat while few species were observed as rare and dominant species and such rare species were *Cannavis sativa* L., *Coptis teeta* Wall., *Fragaria nubicola* (Lindl. ex Hook.f.) Lacaita, *Juglans regia* L., *Morchella esculenta* Fr., *Morus alba* L., *Ophiocordyceps sinensis* (Berk.) G.H.Sung, J.M.Sung, Hywel-Jones & Spatafora (2007), *Paris polyphylla* Sm., *Rhododendron arunachalense* D.F. Chamb. & Rae, *Solena heterophylla* Lour., *Taxus wallichiana* Zucc., *Thladiantha ziroensis* Yanka H & Arup K. Das, and *Triticum aestivum* L. Additionally, a few species were highly valued for both medicinal and culinary purposes; yet, because of their small population, but of immense conservation and ethnobotanical. The species like *Coptis teeta* Wall. and *Juglans regia* L., were also reported as rare (Sanjay, 2021). The dominant species includes *Ageratum conyzoides* (L.) L., *Chromolaena odorata* (L.) R.M. King & H. Rob., *Mikania micrantha* Kunth, *Selaginella biformis* A. Braun ex Kuhn, and *Urena lobata* L.

9.5. Ethnobotanical species, plant part harvest and use categories

The investigation on different plant parts harvested and usage revealed that under plant parts used category it has shown that leaves accounts for highest percentage (42.3%; 141 sp.),as leaves were frequently harvested as both edible and medicinal purposes followed by fruits, which is also reported from Apatani tribe by previous workers (Kala, 2005 & Khongsai, 2011).which is followed by fruit which accounts for with 31.83% (106 sp.), stem 17.1% (57 sp.), whole part 10.5%(35 sp.), seeds 6.6% (22 sp.), flower 3.3% (11 sp.) and tender shoot 3%(10 sp.).

Then, under the plant use categories, the most significant proportion (31%, 103 species) have been reported for economic purposes. Following the economic category is the Medicinal use category with 101 species (30.03%). There have been reports of more than 500 types of therapeutic plants from Arunachal Pradesh and many of them are noteworthy from an ethnobotanical standpoint, and some of them have immense commercial significance (SFRI Information Bulletin No.12, 2011). The Tagin community has been reported to be rich in herbal medicines which are primarily used for treating and preventing illness (Goshwami et al., 2009). The wild edible vegetable accounts for 23.72 % (79 sp.) reported in present studies. This implies the significance of wild edible plants in ensuring rural livelihood security. In rural India, using wild edibles for food is a common practice and the previous studies also reported different communities have consumed over 1400 species from 184 families used by the tribal communities of India (Ray et al., 2020). The wild edible fruit harvest accounts for 17.7 (59 sp.), as wild fruits that are readily edible and nutritious and they are found readily available at reasonable prized natural resources that can improve dietary practices and nutritional benefits for the well-being of local populations of the communities (Bhagat et al., 2019). In the present studies, 12.9% (43 sp.) of ethnobotanical species were recorded under Fodder and under magico-religious belief category, 9% (30 sp.) under cultivated vegetables category and 9 % (28 sp.) under Traditional handcrafts, 7.21% (27 sp.) have been recorded for the cultivated fruit, 7.2% (24 sp.) were recorded for the Fuel, 6.9% (23 sp.) for Construction, 6.6% (22 sp.) were recorded for the miscellaneous use category, Biofencing with 4.2 % (14 sp.) and Stupefacient/ poison (3.6%, 12 sp.), Spice and condiments (3.6%, 12 sp.), and 3.3% (11 sp.) were reported under Beverages/wine category.

9.6. Ethnomedicinal species recorded under various ailments category

Among the 101 ethnomedicinal plant species that were identified under 12 categories of ailments, 45 species were reported under gastrointestinal disorders which is highest among all the categories reported, while the 22 species were reported under cut and injuries, wounds, and swelling, 14 species under cough, cold, fever, and headaches, 12 species under blood pressure, amnesia and hypercholesterolemia, 10 species under dermatological disorders, 7 species under veterinary disorders; and 6 species under skeletal-muscular disorders. While rest of the ailments category were reported to be less than 6 species and they were optical disorder, Oral & Dental disorder, anemia, Appetizer and Mammary & gynecological disorder.

Similar kinds of report under gastrointestinal disorders, cuts and wounds categories were also observed among the Adi communities residing in Siang belt of Arunachal Pradesh (Momang et al., (2019). According to Kala (2005), the greater majority of plant species were used for curing gastrointestinal disorders includes constipation, indigestion, and next were cough/cold, cuts and wounds.

Some common plants species used by theApatani community for various gastrointestinal disorders are *Acmella oleracea, Allium hookeri*, *Allium tuberosum, Crassocephalum crepidioides*, *Cardamine hirsuta, Centella asiatica, Cephallostachium capitatum, Clerodendrum colebrookeanum, Cucumis sativus, Diplazium esculentum, Houttuynia cordata, Hydrocotyle javanica, Impatiens racemosa, Impatiens latifolia, Litsea cubeba, Magnolia champaca, Oenanthe javanica*, *Oxalis corniculata*, *Paederia foetida, Piper hamiltonii, Piper pedicellatum, Plantago asiatica, Solanum violaceum, Thladiantha ziroensis, Zingiber officinale, Rhus chinensis*, and *Zanthoxylum acanthopodium.* This study revealed that the plants such as *Allium hookeri*, *Cucumis sativus, Curcuma longa, Dillenia indica, Dioscoria alata, Diplazium esculentum, Mikania micrantha, Paederia foetida, Psidium guajava*, *Terminalia chebula, Thladiantha ziroensis, Tinospora cordifolia,* to be commonly used by Tagin tribesmen against various gastrointestinal disorders.

Kala (2005) also mentioned about the usage of *Paederia foetida* for stomach disorders by the Tagin and Apatani tribes (Srivastava et al., 2009). Wangpan et al., (2019) also documented 26 medicinal plants that were very actively treated using medicinal herbs by the Tagin and Galo's including *Brassica juncea, Cucumis sativus, Solanum nigrum, Urtica pulcherrima, Cannabis sativa* for curing various gastrointestinal

disorder. *Clerodendrum colebrookeanum* were commonly used for lowering the blood pressure by both the community, which is also reported by earlier workers (Goshwami et al., 2009; Tilling et al., 2015; Ayam, 2017; Wangpan et al., 2019).

9.7. Quantitative analysis of ethnobotanical data

9.7.1. Use value index (UVI)

The term "use value index" describes a technique used in ethnobotany and botany to rate the relative worth or utility of a certain species of plants to a given population or situation. This tool aids researchers in determining which plants are most valuable to humans in terms of their medical, nutritional, cultural, or economic importance.

This study revealed that the ethnobotanical species' Use value (UV) indices (n=152) were found to be ranging from from 0.006 to 0.05 for Apatani tribe and it was found that the highest UV indices were recorded for the species *Phyllostachys mannii* with (0.05) and *Pinus wallichiana* (0.05), which is followed by *Elusine coracana* (0.04) *Magnolia champaca* (0.03) *Zingiber officinale* (0.03), (0.02), *Amaranthus caudata* (0.02), *Castanopsis faberi* (0.02), *Clerodendrum colebrookeanum*.(0.02), and *Cucurbita pepo* (0.02).. This study found that ethnobotanical species with low UV indices (0.01-0.006) were more abundant (89 species) than those with higher UV indices (0.02-0.05).

Similarly, for the Tagin tribe the ethnobotanical species' Use value (UV) indices (n =283) ranged from 0.006 to 0.05, and the highest UV indices were recorded for the species *Dendrocalamus hamiltonii* (0.05) which is followed by *Zanthoxylum rhetsa* (0.04) *Curculigo capitulata* (0.03), *Calamus erectus* (0.03), *Bauhinia purpuria*.(0.03), *Bauhinia variegata* (0.03), *Cucurbita pepo* (0.03), *Zingiber officinale* (0.03), *Artimisia nilagirica* (0.03), and *Albizia chinensis* (0.02). This study found that ethnobotanical species with low UV indices (0.01-0.006) were more abundant (196 species) than those with higher UV indices (0.02-0.05).

The above mentioned plants with higher UV indices were identified as culturally significant species commonly used by the Apatani and Tagin tribe for food, medicine, and other essential purposes in their day to day life. This suggests that UV indices tend to increase in case of ethnobotanical species which are frequently cited by informants.

9.7.2. Informant consensus factor (ICF)

A quantitative metric called the Informant Consensus Factor (ICF) is employed in ethnobotanical research to evaluate the level of agreement among the informants on the medical applications of plants for general therapeutic purposes or within a particular category of ailments. Created by Michael Logan and Robert Trotter (1986), the ICF highlights plants that are often utilized by several informants for similar types of ailments in an effort to find plants with potential pharmacological or therapeutic value.

The informant consensus factor (ICF) index of the disease categories reported by informants against ethnomedicinal plants reported ranges from lowest (0.87) to highest (0.99) for Apatani tribes. The ailments categories with highest ICF values recorded were for Oral & Dental disorder (ICF: 0.99), followed by Skeleton-muscular (ICF: 0.97), Optical disorder (ICF: 0.97), Dermatological (ICF: 0.96), Anemia (ICF: 0.95), The disease group with IFC scores ranging from mild to high (0.87-0.92) with high use reports were Cuts and wounds (ICF:0.87; Nur:113, Ns:15), followed by High Blood pressure/Amnesia/Hypercholesterolemia (ICF: 0.89; Nur: 75, Ns: 9), Cough/cold/fever/headaches (ICF: 0.91; Nur: 95, Ns: 9), Gastrointestinal ICF: 0.92; Nur: 339; Ns: 27).

For the Tagin tribes, the informant consensus factor (ICF) index of the ailments categories noted by informants against ethnomedicinal plants ranged from lowest (0.82) to highest (0.98). The ailments categories with highest ICF values recorded were for Mammary & gynaecological (0.98), followed by Oral & Dental disorder (ICF: 0.98), Skeleton-muscular (ICF: 0.95), Dermatological (ICF: 0.95), Anemia (ICF: 0.94), Veterinary (ICF: 0.94). The disease group with IFC scores ranging from mild to high with high use reports were Gastrointestinal ICF: 0.91; Nur: 297; Ns: 26).

When ICF value is nearer 1 or 1, it signifies that informants were more inclined to provide information about the medicinal qualities of a certain plant species and that their consent was highest when the plant was used to treat a specific ailment category. In the present findings, gynaecological and breast related ailment category showed highest ICF values (0.98). Only one species, *Clerodendrum colebrookeanum* has been reported to be used for treatment of breast and gynaecological disorders. The fact that only a small number of plants species were utilized by the general public to cure particular disease categories and also shows uniformity in plant usage (Boro et al., 2023). Additionally, high ICF values suggested that the species is historically used to treat certain ailments

which confers scopes for screening of bioactive phytochemicals of therapeutic importance (Zarli et al., 2021).In the Northeast India, especially in Arunachal Pradesh, the tribal communities use *Clerodendrum colebrookeanum* for treating high blood pressure and similar uses were also reported by earlier workers

9.7.3. Relative frequency of citation (RFC)

Relative frequency of citation is a measure based on the number of informants describing a certain plant species how important or popular it is in a given community. It aids in determining which plants are most important in the traditional knowledge of a society.

In this study, the Relative Frequency of Citations (RFC) was found to be ranging ranges from a minimum of 0.04 and a maximum of 0.88 for Apatani tribes. The species most frequently cited was *Acmella oleracea* with 0.88 RFC, which is followed by *Houttuynia cordata* (0.86), *Thladiantha ziroensis* (0.84), *Zingiber officinale* (0.81) *Centella asiatica* (0.80), *Clerodendrum colebrookeanum,* (0.74), *Allium hookeri, Oenanthe javanica* (0.73), *Elusine coracana* (0.69) and *Rhus chinensis* (0.62). The least RFC was reported for *Taxus wallichiana* (0.04), *Solanum myriacanthum* (0.08) and *Ranunculus sceleratus* (0.11)

However that the Relative Frequency of Citation (RFC) varies between a minimum of 0.05 and a maximum of 0.87 for Tagin tribe. The highest RFC was reported for *Ageratum conyzoides* with 0.87 RFC, which is followed by *Paederia foetida* (0.85), *Acmella oleracea* (0.79), *Zingiber officinale* (0.71), *Solanum nigrum* (0.64), *Mikania micrantha* (0.59), *Dryopteris felix-mas* (0.57), *Psidium guajava* (0.52), *Begonia aborensis* (0.51) and *Dendrocalamus hamiltonii* (0.49). The least RFC was found for *Rohdea nepalensis* (0.05), *Rheum nobile* (0.07) and *Juglans regia* (0.07).

Higher RFC values shows that the traditional knowledge has been retained from their ancestors and is being smoothly transmitted among the local population (Tounekti et al., 2019). It has been reported that leaf of *Houttuynia cordata* is eaten raw and used to treat diarrhoea, cholera, blood shortages, and blood purification by the people of North-east India (Kumar et al., 2014). The leaves of *Ageratum conyzoides* L. have been reported to be frequently used by the tribal communities across the world for the treatment of burns, cut and wounds, and also reported as prominent ingredient in Ayurvedic medications for the treatment of fever, earaches, colds, headaches,

rheumatism, diabetes, infertility, blood clotting, diarrhoea, and ear infections (Makokha et al., 2017).

9.7.4. Fidelity level (FL)

Fidelity level describes how much weight or favour particular plants receive in a community or among traditional healers when it comes to curing particular ailment. The current study of fidelity level (FL%) measures the relative healing potential of medicinal plants species reported to be used for treating various ailments among the Apatani and Tagin tribe of Arunachal Pradesh. The study reported that the plant with highest fidelity level in Apatani tribe was found to *Houttuynia cordata* with 93.7% which were reported as effective against Stomach pain. It is then followed by *Zingiber officinale* (92.8%) effective against headache and cold/coughs/fever, *Thladiantha ziroensis* (92.5%) for stomach pain, *Centella asiatica* (88.9%) for gastritis, *Clerodendrum colebrookeanum* (83.6%) for high bloos pressure, *Crassocephalum crepidioides* (80%) for stomach pain, *Diplazium esculentum* (80%) for constipation, *Phoebe bootanica* (74%) for high pressure, *Hydrocotyle javanica* (73%) and *Oenanthe javanica* (72%) for stomach pain.
In Tagin tribes *Rheum nobile* with 100% indicates strong tribal agreement on their medicinal benefits with which were reported as effective against headache. It is then followed by *Zingiber officinale* 86.7% reported as effective against headache and cold/coughs/fever, *Ageratum conizoides* (85.8%) for cuts and wounds, *Terminalia chebula* (83%) for stomach pain, *Mikania micrantha* (82%) for cuts and wounds, *Solanum spirale* (80%) for high blood pressure, *Diplazium esculentum* (76%) for constipation, *Dendrocalamus hamiltonii* (73%) for cuts and wounds, *Chromolaena odorata* (72.7%) for cuts and wounds, *Artemisia nilagirica* (70%) for fever/cold/headache. The plant with lowest fidelity level was reported for *Taxus wallichiana* and *Curcuma caesia* was discovered to be the plant with the lowest fidelity level 0% and 14% from Apatani and Tagin tribes.

The majority of the plants reported with high fidelity level reported to be effective against the stomach pain, followed by high blood pressure, gastritis, cuts ad wounds, cough and cold, Hypercholesterolemia and insomnia. The least fidelity level with 0 fidelity level was found for Anti-cancer. The high-fidelity value of FL represents the significance of a specific plant species over different plants for the treatment of specific ailments. The low value of FL indicates which plant species are used medicinally and confirming that these species are not frequently used against a specific ailment by the

informants (Roy & Janbandhu, 2020). Low FL% plants, however, shouldn't be overlooked as there is a chance, they might lose their knowledge and they might also be valuable to future generations (Malik et al., 2018).

9.7.5. Jaccard similarity index

Jaccard's Index of Similarity of the present study on the ethnobotanical plant species used by Tagin and Apatani community reveals a similarity index of 31.2 % suggesting a moderate degree of resemblance between their ethnobotanical methods. Out of 333 plant species cited by the informants, 102 species are shared among the tribesmen of both the community, meanwhile 152 species are only used by the Apatani people and 283 plants are used in Tagin community. The value of Jaccard's index can be influenced by variables including vegetation variety, microclimatic conditions, and sample size (Kebede et al., 2019).

9.7.6. Rahmans similarity Index

Rahmans Similarity Index of the present study on the ethnobotanical species used by Tagin and Apatani tribe reveals a similarity index of 19.04 % on the number of common plant species used for similar ailment which is suggesting a low degree of resemblance between their ailments treated. Out of 101 medicinal plant species cited by the informants of both the tribes, 19 species are found common in both the community, meanwhile 37 species are only unique to Apatani and 45 plants species are unique to Tagin community.

The study revealed a total of 16 plant species of same medicinal uses and they are *Ageratum conyzoides* (L.) L.*, Allium hookeri* Thwaites, *Anisomeles indica* (L.) Kuntze, *Artemisia indica* Willd., *Begonia roxburgii* A.DC., *Centella asiatica* (L.) Urb., *Crassocephalum crepidioides* (Benth.) S.Moore, *Clerodendrum colebrookeanum* Walp., *Diplazium esculentum* (Retz.) Sw., *Houttuynia cordata* Thunb., *Paederia foetida* L, *Piper pedicellatum* C. DC., *Solanum aethiopicum* L, *Solanum americanum* Mill., *Thladiantha ziroensis* Yanka H & Arup K. Das, and *Zingiber officinale* Roscoe.

9.8. Ethnobotanical novelties

A critical appraisal of existing literature on Apatani and Tagin reported by Murtem (2004), Murtem & Chaudhry (2016), Goshwami et al., 2009, Wangpan et al., (2019), Jha (2017), Srivastava et al., 2010, Doley et al., 2014., Asha & Singh, 2020, Kala

(2005), Tilling et al, 2015, Ayam (2017), Khongsai et al., (2011), Jha (2015), Yanka et al., 2019, Chaudhry & Murtem (2016), Sundriya et al., (2002), Yakang et al., (2013, 2015, & 2017), Yamang (2022), Jha (2016) has revealed that in the present studies, we have reported few ethnobotanical species which are being reported for the first time from Tagin and Apatani biocultural landscape for various ethnobotanical uses. The ethnobotanical novelties of the plant species used by the Tagin tribesmen are *Clerodendrum colebrookeanum,* which are reported to be used for treating the breast and backpain during the period of breast feeding. It is also reported that the *Juglans regia* leaf pastes are used to treat ringworm, while *Hellenia speciosa* is reported that eye irritation can be relieved by putting the liquid juice that was taken from the stem to the eye. *Portulaca oleracea* when consumed fresh, is good for high blood pressure and improve blood circulation and treating furuncles, or boils, is reported to benefit from the leaves of *Persicaria nepalensis.* The Tagin tribe living near the border have stated that the Caterpillar Fungus - *Ophiocordyceps sinensis* is able to treat a variety of ailments and *Morchella esculenta* is consumed as a food. They utilize the leaves of *Berberis napaulensis* in religious ceremonies, and they store the bark and leaves around the corners of their homes to ward off evil spirits. The dried leaves of *Artemisia nilagirica* are widely used as pillow cushion while the seeds of *Fagophyrum cymosum* stored and grinded into powder to make Chappatias well as local beverages is also made from the seeds. It is also reported that *Curculigo capitulata* leaves are used to clean swords and blades to remove rust. Tagin tribes utilize dried leaves of *Zanthoxulum armatum* as scented insence in a variety of traditional rituals. The leaf sheath of *Livistona jenkinsiana* is used as local handmade broom, *Furcraea selloana* is planted as a fence to block the animals to enter the surrounding and the leaves of *Pandanus furcatus* is used as outer cover for bag of local sword called '*orek bugi'*

While among the Apatani tribesmen it has been reported that *Colocasia esculenta and Amaranthus caudatus* is believed to boost haemoglobin and treat anaemia. The folkhealers from Apatani reported that the crushed fruit of *Solanum myriacanthum* and their paste is applied as a leech-prevention strategy while the *Dichrocephla integrifolia* leaf paste is applied to cuts and wounds and to stop the bleeding. The tender leaves of *Nasturtium microphyllum* and *Hibiscus syriacus* have been reported to be edible. The study also reported a small farming tool called a "Kedu," which has a single sharp edge and a holder, is likewise made from sturdy stems of *Ligustrum ovalifolium* and in addition, the huskof *Zea mays*, is made into a broom for floor cleaning. The study also

recorded that the trunk fiber of *Arenga obtusifolia* has been widely used during ancient days which shields the traditional bag packs called '*lera /naara*' and the overall bag pack is called *lecha* (Apatani) and *taash naara/ raaming* (Tagin).

Some of these ethnobotanical species exhibit moderate to high UV, RFC, and Fidelity level (FL%), indicating the ethnomedicinal and cultural relevance of ethnobotanical species in meeting the basic needs of the surrounding inhabitants and could be targeted for the further phytochemical studies which might result in the identification of new phyto drugs that are effective against some of the ailments reported in current study sites. In many rural locations, there are still such ethnobotanically useful plant species that remain unrecorded despite offer research that have been done and published on the Apatani and Tagin tribes in recent decades. Thus, these unique use of ethnobotanical species reported from the current study adds to our understanding of the local bioresources that contribute sustainable livelihood of the local communities and made an important addition to the existing documented knowledge system already accessible regarding the ethnobotanical usefulness of each species listed as ethnobotanically significant for the target communities.

9.9. Ethnobotanical plant species of high economic and conservation significance

From the current ethnobotanical study and market survey we have documented a total of 103 plant species and majority of them were wild plants collected from their neighboring forest, paddy fields and few were cultivated in their home garden. One of the most important sources of livelihood for the Apatani and Tagin population in Arunachal Pradesh, beside farming and hunting, is the sale of natural plant resources found in their community forest and agricultural field. Some of the economically significant wild and cultivated edible plants sold in the folk market of Apatani and Tagin community are, *Actinidia callosa, Allium chinense, Amaranthus viridis, Amaranthus spinosus, Amomum dealbatum, Ananas comosus, Artopcarpus heterophyllus*, *Arenga obtusifolia, Baccaurea ramiflora, Brassica juncea, Brassica oleracea, Breynia androgyna, Capsicum annum, Capsicum frutescens, Carica papaya, Chenopodium album, Castanopsis indica, Cardamine hirsuta, Choerospondias axillaris, Cinnamomum tamala, Citrus reticulata, Coriandrum sativum, Cucumis sativus, Cucurbita pepo, Elusine coracana, Eryngium foetidum, Glycine max, Gonostegia hirta, Ipomoea batatas, Litsea cubeba, Mackaya neesiana, Malva verticillata, Manihot esculenta, Musa balbisiana, Saccharum officinarum, Sechium edule, Selaginella biformis, Solanum aethiopicum, Zanthoxulum*

armatum, Zanthoxylum rhetsa, Zea mays. While some of the highly prioritized medicinal plant species reported to be sold in the folk market were *Acmella oleracea, Allium hookeri, Centella asiatica, Clerodendrum colebrookeanum, Dioscoria alata, Dioscorea pentaphylla, Diplazium esculentum, Gonostegia hirta, Phoebe cooperiana, Piper pedicellatum,* and *Thladiantha ziroensis*.

The plant species such as *Bamboosa tulda, Dendrocalamus hamiltonii, Livistona jenkinsiana, Phyllostachys mannii, Pinus wallichiana, Thysanolaena latifolia* are frequently utilized for household construction and traditional handcrafts items were also found to be sold in the folk market. Wild mushroom especially *Pleurotus ostreatus* and *Agaricus bisporus* were found to be widely sold by the local folks. Establishment and management of locally governed protected zones where these plants can flourish without much disturbance from human activities are in dire need for improved harvesting practices and sustainable uses of some of the economically significant plant species used for home utilities, food, or medicinal. *Litsea cubeba, Magnolia champaca, Rubia manjith, Zanthoxyllum armatum, Piper pedicellatum, Myrica esculenta, Clerodendrum colebrookeanum, Phyllostachys mannii, Solanum myriacanthum, Choerospondias axillaris,* and other plant species of high commercial and significance have been reportedfrom the Apatani community which contribute their socioeconomic development (Yakang et al., 2013). Prioritizing certain species that can provide significant economic benefits to the local population and obtaining data on their ecological state can be very beneficial to the management of these species (Sharma et al., 2014).

9.10. Culturally Significant Plants

Beyond the food and medicinal plants used by the Tagin and Apatani tribes of Arunachal Pradesh in Northeast India, uses various plant species that hold an immense cultural significance. These tribes celebrate their close relationship with the earth and its abundance via a rich heritage of folk songs, dances, and religious ceremonies which are accomplished with the effective utilization of the plant species of their natural surroundings. Plants have been found to play significant role in festivals and religious ceremonies of both the tribal community.

9.10.1. Plants utilized for Magico-religious of high conservation significance

For instance, some plant species are utilized as special offerings to Gods and also utilized for decorations during traditional festivals of Tagin called Si-Donyi, and Myoko, Murung and Dree festivals of Apatani, signifying their thanks giving and reverence for the nature. During celebration of traditional rites and festivals, bamboo species such as *Dendrocalamus hamiltonii* Nees & Arn., *Phyllostachys mannii* Gamble, and *Bamboosa tulda* Roxb. Are exclusively used as poles or frequently utilized to build altars or as a component of traditional dances and festivities during festivals. Traditional clothing and decorations for cultural celebrations are also made from bamboo. Leaves of *Castanopsis faberi* Hance*, Castanopsis indica* (Roxb. ex. Lindl.) A. DC., *Phrynium pubinerve* Blume, *Phrynium imbricatum* Roxb., *Calamus erectus* Roxb, *Calamus flagellum* Griff. ex Mart.are some of the species frequently utilize for making altars in various traditional religious ceremony.

Albizia chinensis (Osbeck) Merr., *Artemisia nilagirica* (C.B.Clarke) Pamp., *Berberis napaulensis* (DC.) Spreng., *Carex cruciata* Wahlenb., *Ensete glaucum* (Roxb.) Cheesman *Gymnosphaera gigantea* (Wall. ex Hook.) S.Y.Dong, *Pinanga gracilis* Blume, *Lycopodiella cernua* (L.) Pic. Serm., *Musa balbisiana* Colla, *Prunus persica* Linn., *Saurauia punduana* Wall, *Saurauia roxburghii* Wall., *Smilax laurifolia* L., *Zingiber officinale* Rosc., *Plectocomia himalayana* Griff., *Zanthoxylum armatum* DC., *Tripidium arundinaceum* (Retz.) Welker, Voronts, & E.A. Kellogg, *Elusine coracana* (L.) Gaertn, *Lagenaria siceraria* (Molina) Standl., are the plants used by Tagin tribe in various religious ceremonies. In Apatani tribe, the folk use of plants such as *Arenga obtusifolia* Mart*., Calamus acantospathus* Griff*, Curculigo capitulata* (Lour.) Kuntze, *Ligustrum ovalifolium* Hassk., *Lycopodium clavatum* L., *Zingiber officinale* Rosc., *Lagenaria siceraria* (Molina) Standl., *Dicranopteris linearis* (Burm. f.) Underw, *Elusine coracana* (L.) Gaertn, in their traditional religious ceremonies. Some of the culturally significant plant species of high conservation values used by the five tribes of Arunachal Pradesh are also listed by Yanka et al., (2019) which includes *Saurauia punduana, Dendrocalamus hamiltonii, Saccharum spontaneum, Calamus leptospadix,* and *Calamus acanthospathus*

9.10.2. Plants utilized for Traditional Handcrafts

Some of the ethnobotanically significant plant species harvesting from the community forest of Apatani and Tribes of Arunachal Pradesh for utilization incrafting traditional carpets are *Phragmites karka* (Retz.) Trin. ex Stued and *Pandanus furcatus* Roxb. However, fewer people are relevant skills in making handmade carpets these days due to the growth and accessibility of machine crafted carpet available in the market. *Liquidamba excela* (Noronha) Oken, *Bamboosa tulda* Roxb, *Calamus flagellum* Griff. ex Mart., *Calamus inermis* T. Anderson , *Calamus erectus* Roxb, *Calamus leptospadix* Griff., *Caryota urens*L., *Arenga obtusifolia* Mart, *Dendrocalamus hamiltonii* Nees & Arn., *Gnetum montanum* Markgr, *Lagenaria siceraria* (Molina) Standl, *Livistona jenkinsiana* Griff, *Boehmeria hamiltoniana* Wedd., *Sida acuta* Burm.f., *Thysanolaena latifolia* (Roxb. ex Hornem.) Honda, *Wallichia triandra* (J.Joseph) S.K. Basu, are some of the important plant species which are widely used by the Tagin tribesmen for making traditional handcrafts. Some traditional handcrafts that are created by Tagin Folks are:

1. **Eiiri and Eiipok**: A bow and arrow for hunting wild animals.
2. **Eiipu**: A winnowing tray for cleaning rice, millet, and other consumables items**.**
3. **Duntang**: A small wooden tool for sitting.
4. **Piiching**: A large mat made of leaf which is often utilized for floor sleeping and sitting.
5. **Eiigin**: A bamboo braided head basket made for carrying rice.
6. **Eiibar**: A bamboo braided head basket for carrying firewood**.**
7. **Tungchak**: A bamboo braided basket especially utilized for paddy field purpose.
8. **Purjong**: A long funnel or conical like braided bamboo basket like used as beer or beverage stainer**.**
9. **Chingpar and Chingyi**: A customary, handcrafted wooden mortar (deeper bowl) and pestle (long and club-shaped) commonly used for grinding rice or millet.
10. **Sampiik**: A handmade leaf broom for cleaning.
11. **Dumpin**: A bamboo made headgear worn during festivals and ceremonies.
12. **Piigi**: A small bamboo braided basket attached to fire rack for keeping household items**.**
13. **Meyap**: A small leaf fan.
14. **Mabak**: A carpet made of bark of banana utilized for floor sleeping and sitting**.**
15. **Naka- Koba**: A bamboo staircase utilized for household purpose.

16. **Nara**: A braided cane bagpack worn by men for carrying some personal items and provisions on a jungle excursion.
17. **Tashe nara**: A shield made of trunk-fiber, which is waterproof and can withstand rain, is worn by visitors to the forest to guard against attacks by arrows from the enemy and dangers from untamed animals.
18. **Denluf**: An local braided hat or cap made of cane, worn especially by the Men.
19. **Da pisi**: A large, rectangular mat made of tightly woven bamboo that is used to dry different crops in the sun, such millet and paddy.
20. **Eken paapi**: A bamboo basket with loose braids carried in the forest to transport dead wild animals that have been hunted.
21. **Chedong**: A tightly braised bamboo stainer used while making local beverages**.**
22. **Porok Piiki**: An egg-laying hen's basket, fashioned with loose braiding.
23. **Porok Piitor**: A hen house or cage constructed of loosely braided bamboo with a tiny opening door for mobility.
24. **Orek bugi**: A Sword sheath made of *Pandanus* leaf**.**
25. **Tusak**: A braided bamboo basket for keeping or storing rice.
26. **Pakya**: A small braided cane basket for carrying rice or vegetables

While the Apatani uses Plants like *Arenga obtusifolia* Mart*, Chimonocalamus griffithianus* (Munro) Hsueh f. & T.P.Yi *Cephallostachium capitatum* Munro*, Plectocomia himalayana* Griff, *Calamus acantospathus* Griff*, Phyllostachys manii* Gamble, *Zea mays* L, *Magnolia champaca* (L.) Baill. ex Pierre*, Ligustrum ovalifolium* Hassk. for making traditional hand crafts. These includes handmade items like wooden Mortar and pestle, winnowing tray, Bow and arrow, sitting tool, basket of different shape and size of utilitarian purposes which are used for different purpose, such as broom, headgear, cap, sword holder and cover, handmade fan, carpet/mat, tray, flask, funnel, kitchen tong, bamboo cup, spoon, bag pack, smoking pipes, farming tool etc. The Apatani Folks produce a variety of traditional crafts, and these includes the following items:

1. **Yapar and Hunyi**: A traditional, hand-crafted wooden and mortar (deeper basin) and pestle (long and club-shaped)) that are frequently used to ground millet or rice.
2. **Paro patre**: A cage, carrier, or home for hens, it's a bamboo basket shaped like a pyramid with a little opening door for entry and exit.

3. **Pepu**: A large mat made by braiding split and sun-dried reed grass stems often utilized for floor sleeping and sitting.
4. **Pila piiro**: A long funnel or conical beer stainer made by weaving the rope made of bamboo.
5. **Pila turla**: A bamboo cup of medium size for eating and drinking rice soup.
6. **Pupiing**: A big rectangular mat braided from bamboo to dry various crops such as millet and paddy in direct sunshine.
7. **Yashi sunnanii Yaju**: A small cup made of bamboo which has stick like holder, to sip or Fetch water.
8. **Tanyi-aru epiinanii**: A broom prepared from the husk of corn for cleaning the floor.
9. **Barju**: A small head basket woven with split bamboo rope used to carry vegetables and other edible items.
10. **Entii yagii**: A large head basket created by bamboo rope specifically designed to transport rice and usually used during harvesting rice.
11. **Kedu**: A little farming tool with a holder and one pointy end made from sturdy stems employed to create holes for the planting of paddy crops.
12. **Raju**: A big head braided bamboo or cane basket utilized to carry firewood or soil in paddy fields.
13. **Yatii**: An ancient bamboo raincoat or rain shield.
14. **Nyibu pinta**: A bottle gourd flask used for serving beer, particularly to the priest during festivals, rites, and ceremonies.
15. **Mida/ giida yagii**: A head basket made of cane or bamboo rope used for carrying rice or rice grain during traditional religious ceremony.
16. **Supung pinta**: A bottle gourd flask used in ceremonies, marriages, rites, and other events. It is also used to distribute alcohol locally and keep it.
17. **Yopo**: A small closed weave cane or bamboo hand basket to carry rice grain or rice powder is used during various ceremonies.
18. **Lecha**: A shield made of trunk-fiber, which is waterproof and can withstand rain, is worn by visitors to the forest to guard against attacks by arrows from the enemy and dangers from untamed animals.
19. **Lera**: A braided cane bagpack worn by men for carrying some personal items and provisions on a jungle excursion.

20. **Byopa**: A local braided hat or cap made of cane, worn especially by the Men worn during a trip to a jungle to protect the head from dangerous creatures like snakes, to keep it clean, and to shield it from any damage.
21. **Damii**: A long stick with sharp points that is used to dig the soil for planting millet plants.
22. **Yapyo**: A winnowing tray for cleaning rice, millet, and other consumables items.
23. **O-Turla**: A large bamboo cup for drinking locally produced beer made from rice and millet.
24. **Sarse pakhe**: A big bamboo tray for drying millet or chilies over the fire rack.
25. **Mukhu sudhu**: An ancient bamboo smoking pipes used for smoking.

9.10.3. Plants utilized for Constructions

In the rural villages of Tagin locality the plants species like *Albizia lebeck* (L) Benth, *Albizia chinensis* (Osbeck) Merr, *Liquidamba excelsa* (Noronha) Oken, *Arenga micrantha* C.F.Wei, *Caryota urens* L., *Livistona jenkinsiana* Griff, *Bamboosa tulda* Roxb., *Dendrocalamus hamiltonii* Nees &Arn., *Duabanga grandiflora* (DC.) Walp, *Phyllostachys mannii* Gamble, *Musa acuminata* Colla*, Musa aurantiaca* G.Mann ex Baker, *Pinus kesiya* Royle ex Gordon, *Spondias pinnata* (L. f.) Kurz, *Terminalia myriocarpa* Van Heurck & Mull. Arg. (syn) are widely used for the construction of traditional house and bridges, etc. While the Apatani folks uses *Pinus wallichiana* A.B. Jacks, *Dendrocalamus hamiltonii* Nees &Arn., *Magnolia champaca* (L.) Baill. ex Pierre, *Chimonocalamus griffithianus* (Munro) Hsueh f. & T.P.Yi*, Exbucklandia populnea* (R. Br. ex Griff.), *Phyllostachys mannii* Gamble, *Rhus chinensis* Mill., *Castanopsis faberi* Hance, for various construction purposes such as local houses, bridges, etc.

9.10.4. Toxic plants for fish stupefying

The Tagin tribe largely relies on fishing as a vital component of their livelihood. They use various techniques to catch fishes from streams and rivers and sometimes, they capture fish using a technique that includes using pisicidal plants found in natural habitat. To release the active ingredients or toxins from plant parts, they are crushed, or subjected to various processing methods and subsequently added to the water bodies, which might be rivers, ponds, or streams. The plants which are normally used are *Aesculus assamica* Griff., *Canarium strictum* Roxb., *Dryopteris felix-mas* (L.) Schott*, Persicaria hydropiper* (L.) Spach, *Persicaria pubescens* (Blume) H. Hara, *Juglans regia*

L., *Gynocardia odorata* R.Br., *Zanthoxylum rhetsa* DC. These communities have been using these indigenous fishing techniques for many generations, and they have a deep-rooted awareness of the need to protect their resources for the future generation. While the Apatani folks rarely use poisonous plants for fishing as they culture fish in their own pond or a paddy fields. The local inhabitants of both the communities also uses rhizomes of *Aconitum ferox* Wall. ex Ser. to poison the arrows which are used during the hunting of wild animal.

9.10.5. Traditional conservation ethics and taboos

Both the tribal group has their own strong religious beliefs and taboos with relation to the plants and their surrounding nature and therefore in social, cultural, and religious contexts, they conserve these plants or do not disturb them from their natural habitat as a result they protect such plant species of cultural, ecological, economic and conservation significance to the communities. Some plants in the Tagin community have associated with traditional belief system, which they adhere to strictly in accordance with the laws of nature. It is thought that of *Artopcarpus heterophyllus* near a dwelling invite evil spirits, so they normally avoid planting such tree nearby their traditional houses.It is not permitted for anybody to consume leaves of *Clerodendrum colebrookeanum* during ceremonies or rituals as doing so would make them sick. After any religious ceremonies and rites, Tagin people refrain from consuming tubers of *Ipomoea batatas* and *Cucumis sativus* which are forbidden during religious ritual. *Cucurbita pepo* is forbidden to be consumed during certain ceremonies in the Tagin society. Tubers and bulbills of *Dioscoria alata* are not recommend to be consumed during religious rituals performed by family members or relatives. When the indigenous people of Tagin execute any religious rituals, they are prohibited from consuming *Glycine max*. It is prohibited to consume the leaves of *Solanum americanum* during any kind of ceremony or religious rituals, asthey are believed to cause illness. It is believed that any person who consumes leaves of *Zanthoxylum rhetsa* during a religious ritual will get sick. The Tagin people believes that if a family member or relative passes away, they are not allowed to consume *Phoebe bootanica* fruit for a year. After any family or social rites, cutting down of *Dendrocalamus hamiltonii* bamboo is prohibited for a year and if they violate such taboos, the person responsible for cutting down will be bitten by a snake.

In Apatani traditional belief system *Prunus persica* is considered as a sacred tree and the reason it is considered a sacred tree is that it symbolizes the main sacred altar, or

'*Myoko Yugyang'*, where important rituals, animal sacrifices, and chanting are carried out to honour the holy spirits of Myoko festival and such species are not allowed to be cut down.

The indigenous people of Upper Subansiri have been closely interacting with the environment and natural resources for thousands of years. As a result, they have developed a specialized knowledge system to perceive and understand sustainable utilization of local ethnobotanical resources for the sustenance of livelihood (Chaudhry & Murtem, 2016). The biological resources that are accessible to Apatani tribe are protected and conserved through a variety of methods, which are seen to be an effective method of bioresource management (Sundriyal & Dollo, 2004, 2008). The majority of the tribal communities of Arunachal Pradesh hold the view that maintaining positive relationships with supernatural entities that guard different kinds of flora and animals is essential to their continued co-existence with nature. In order to keep these relationships intact, they carry out a variety of religious ceremonies and festivals (2011). It is believed that some large trees, deep woods, and particular types of rocky cliffs, beautiful mountains are home to ancestors' spirits and supernatural forces. It is also reported that the Adi tribe of Siang district of Arunachal Pradesh have the traditional conservation laws in place which prohibit illegal interfere of nature and have the provisions for penalty for the wrong doers who illegally involves in harvesting of certain types of plants species of cultural and conservation significance and also have the customary laws on prohibition for controlling destructive methods of construction activities (Borang, 2001).

The tribes of Tagin and Apatani tribes of Arunachal Pradesh have a strong bond with plant kingdom, which play a significant role for sustainable existence of culture, and spirituality. As they provide insightful information on sustainable living and biodiversity conservation, their association carries deeper meaning for maintaining indigenous knowledge system of their respective biocultural landscape.

CHAPTER 10
CONCLUSION

- The current cross-cultural ethnobotanical investigations were done on 300 informants (156 Male and 144 female) during the year 2021-2023 which involved a total of thirty villages [15 from the Tagin and 15 from the Apatani] localities.
- The Apatani community, 30% percent of male informants were illiterate, whereas over 70% percent of male informants were literate. Likewise, 43% of female informants were illiterate while 57% of female informants were literate. Our study revealed that among the Tagin informants, 51% of the female informants were literate and 49% were illiterate, while 71% of the male informants were literate and 29% were illiterate.
- In both communities, the majority of male informants (n = 156) were found to be in the age range of 55-65, while the majority of female informants (n=144) were found to be in the 35-55 age range. It was discovered that these informants had extensive knowledge of the commonly utilized plant species.
- It was observed that, the female informant was more knowledgeable about the value of foraging for edible wild plants, agricultural tools and techniques, medicinal uses of plants, and other topics related to ethnobotany, whereas the male informant was more knowledgeable about magico-religious plants, customary laws, building, crafts, hunting and fishing, and therapeutic knowledge.
- More insight and information about traditional knowledge practices relating to plant utilization were provided by the informants of age group 45 years and above. Further, it was also observed that the literacy level had no bearing on traditional ethnobotanical knowledge and skills.
- Present Cross-cultural ethnobotanical study conducted in the Tagin and Apatani localities of Upper and Lower Subansiri district revealed 333 species of ethnobotanical significance belonging to 245 genera and 107 plant families distributed along different altitudinal gradient.
- The top 10 dominant families were reported to be Asteraceae (20 sp.), Rosaceae (17 sp.), Poaceae (14 sp.), Cucurbitaceae (13 sp.), Urticaceae (12 sp.) Arecaceae (12 sp.), Solanaceae (11 sp.), Fabaceae (10 sp.), Polygoniaceae (9 sp.), and Rutaceae (9 sp.)

- Within the ethnobotanically relevant plant genera, the highest numbers of species were reported in the following genera: *Rubus* (7 species), *Solanum* (6 species), *Allium* (5 species), *Calamus* (5 species), *Ficus* (5 species), and *Persicaria* (5 species). *Begonia* (4 species), *Citrus* (4 species), *Cucurbita* (4 species), *Piper* (4 species), and *Saurauia* (4 species)
- The majority of plant species have been reported under angiosperm dicots (259 sp.), followed by angiosperm monocots (65 sp.), gymnosperms (5 sp.), and fungi (4 sp.).
- Herbaceous habits were reported with highest number of species (131 sp.) which accounts for 39.3 %. This was followed by Tree (90 species; 27%), Shrub (48 sp., 14.4%), Climber (11species; 3%), Subshrub (14 species, 4%), Liana (7 species, 2%), Fungi (4 species, 1%),and Runner (3 species, 1%).
- The greater majority of 206 species (61.8%) were reported from forest habitat, followed by meadows and fields 94 species (28.1%), wetland/bog (40 species, 12%), and barren/tundra (16 species, 4.8%).
- Highest number of species (154 species, 46%) were reported from tropical forests followed by temperate forests (73 species, 22%), subtropical forests (57 species, 17%), tropical to subtropical forests (32 species, 96%), subtropical to temperate forests (15 species, 5%), and alpine (2 species, 0.6%).
- Using DAFOR Scale (Sutherland, 1996) to measure the abundance and local distribution status of ethnobotanical species, the highest number of 154 plant species were observed to be under frequent (F) category, 124 species under occasional (O), 37 species under abundant (A), 13 species under rare (R), and 5 species under dominant (D) category.
- The leafy parts were found to be frequently harvested plant parts which accounts for 42.3% (141 sp.). This is followed by fruit with 31.8% (106 sp.), stem 17.1% (57 sp.), whole part 10.5% (35 sp.), seeds 6.9% (23 sp.), flower 3.3% (11 sp.), and tender shoot 3% (10 sp.).
- Out of 333 species reported, 31% (103 sp.) of the total species have been reported to commercial relevant .This is followed by medicinal uses 30.03% (101 sp.), wild edible vegetable (23.72%; 79 sp.), wild edible fruit (17.7%; 59 sp.), traditional handcrafts (12.9%; 43 sp.), fodder (11.7%, 39 sp.), magico-religious belief (9%, 30 sp.),cultivated vegetables (7.21%, 27 sp.), cultivated fruit (6.9%, 23 sp.), construction and miscellaneous (6.9%, 23 sp.), Biofencing and Stupefacient/poison

(4.2%, 14 sp.), Spice and condiments (3.6%, 12 sp.), and Beverages/Wine (3.3%, 11 sp.).

- The 101 ethnomedicinal plant species were reported and classified under 11 categories of ailments. Highest number of 45 species were reported under gastrointestinal disorders,; 22 species for cut and wounds, swelling; 14 species for cough, cold, fever, and headaches; 12 species for blood pressure, amnesia, and hypercholesterolemia; 10 species for dermatological disorders; 7 species for veterinary disorders; and 6 species for skeletal-muscular disorders.
- Among Apatani, *Phyllostachys manii* (0.05) and *Pinus wallichiana* (0.05) have higher use value and the *Dendrocalamus hamiltonii* (0.05) was found to have high use value among Tagin tribes.
- Higher UV indices were associated with culturally relevant species that are consistently used by the informants of Apatani and Tagin for food, medicine, and other everyday requirements. In general, the UV indices tend to increase when the ethnobotanical species is more often mentioned and claimed to be utilized by the informants.
- The category of ailments with the highest ICF values was reported for in Oral and Dental (0.99) among Apatani tribe whereas the highest ICF was recorded for Mammary & gynecological and Oral & Dental with ICF 0.99 in the Tagin tribe which reveals high level of agreement among informants regarding the use of plant for specific ailments.
- The RFC of *Acmella oleracea* (0.88) in Apatani inhabitant area and *Ageratum conyzoides* and *Paederia foetida* (0.87) in Tagin inhabitant areas indicates highest score which are widely recognized and used within community for specific purpose
- The high fidelity level (FL%) for certain species such as *Houttuynia cordata* (93.7%) and *Zingiber officinale* (92.8%) in Apatani and *Rheum nobile* (100%) and *Zingiber officinale* (86.7%) in Tagin indicates strong tribal agreement on their medicinal benefits..
- A Jaccard similarity index revealed 30.63% (102 species) as cross cultural species used by both the communities while 152 species were found to be exclusively used by the Apatani and 283 species by the Tagin.
- Rahmans similarity index revealed 18.82% (19 species) of medicinal plants to be used cross culturally among both the communities (Apatani and Tagin) out of 101 medicinal plant species reported. 33 species (33%) were exclusive to Apatani, and

46 (46%) species were exclusive to the Tagin. The Rahman's similarity index also identified 16 plant species used against with similar ailments. They are *Ageratum conyzoides* (L.) L., *Allium hookeri* Thwaites, *Anisomeles indica* (L.) Kuntze, *Artemisia indica* Willd., *Begonia roxburghii* A.DC., *Centella asiatica* (L.) Urb., *Crassocephalum crepidioides* (Benth.) S.Moore, *Clerodendrum colebrookeanum* Lindl., *Diplazium esculentum* (Retz.) Sw., *Houttuynia cordata* Thunb., *Paederia foetida* L, *Piper pedicellatum* C. DC., *Solanum aethiopicum* L, *Solanum americanum* Mill., *Thladiantha ziroensis* Yanka H & Arup K. Das , and *Zingiber officinale* Roscoe.

- Jaccard's similarity index showed a moderate degree of resemblance between the species shared while Rahman's similarity index showed low degree of resemblance between the ailments treated between both the tribes
- New ethnobotanical species use report from the current study made an important addition to the existing documented knowledge systems which are reported for the first time for their food, medicinal, crafts etc. A total of 27 plant species have been reported as ethnobotanical novelties in both the communities, 9 from Apatani and 19 from Tagin tribes.
- The following are the important ethnobotanical novelties reported for plants from Apatani tribes- *Amaranthus caudatus, Colocasia esculenta, Dichrocephla integrifolia, Hibiscus syriacus, Ligustrum ovalifolium, Nasturtium microphyllum, Solanum myriacanthum, Zea mays, Arenga obtusifolia.*
- The following are the important ethnobotanical novelties reported for plants from Tagin tribes- *Artemisia nilagirica, Curculigo capitulata, Berberis napaulensis, Clerodendrum colebrookeanum, Furcraea selloana, Fagophyrum cymosum, Juglans regia, Livistona jenkinsiana, Pandanus furcatus, Persicaria nepalensis, Portulaca oleraceae, Rheum nobile, Uncaria scandens, Zanthoxulum armatum, Helenia speciosa, Smilax laurifolia, Ophiocordyceps sinensis, Morchella esculenta, Arenga obtusifolia.*
- Ethnobotanical novelties reported from Apatani tribe and their specific uses: Among Apatani tribe, *Colocasia esculenta* and *Amaranthus cruentus* is used to for treating low haemoglobin and anaemia. Fruit of *Solanum myriacanthum* is crushed and paste is used as a leech-prevention tactic. *Dichrocephla integrifolia* leaf paste is applied to wounds and cuts; tender leaves of *Nasturtium microphyllum* and *Hibiscus syriacus* have been reported to be edible. The study also reported a little farming tool called a

"Kedu," which has a single sharp edge and a holder, is likewise made from sturdy stems of *Ligustrum ovalifolium*. Husk of *Zea mays*, is designed as broom for floor cleaning. Trunk fibre of *Arenga obtusifolia* has been widely used during ancient days among the Tagin which shields the traditional bag packs called 'lera /naara' and the overall bagpack is called *lecha* (Apatani) and *taash naara/ raaming* (Tagin).

- Ethnobotanical novelties reported from Tagin tribe and their specific uses: *Clerodendrum coolebrookeanum,* used for treating the breast and back pain during the period of breastfeeding; *Juglans regia* leaf pastes are used to treat ringworm, *Hellenia speciosa* is reported that eye irritation can be relieved by putting the liquid juice that was taken from the stem to the eye; *Portulaca oleracea* is great for high blood pressure and good blood circulation, for treating furuncles, or boils, leaves of *Persicaria nepalensis* is applied. Fungus *Ophiocordyceps sinensis* is able to treat a variety of ailments; *Morchella esculenta* is consumed as a food; *Berberis napaulensis* used in ceremonies, store the bark and leaves around the corners of their homes to ward off evil spirits. Dried leaves of *Artemisia nilagirica* are widely used as pillow cushion; seeds of *Fagophyrum cymosum* stored and grinded into powder to make Chappati and local beverages is also made from the seeds; *Curculigo capitulata* leaves are used to clean swords and blades to remove rust and some Tagin tribes utilize dried leaves of *Zanthoxulum armatum* as scented insence in a variety of rituals; *Livistona jenkinsiana* leaf sheath is made into local handmade broom; *Furcraea selloana* is planted as a fence to block the animals to enter the surrounding; *Pandanus furcatus* leaves used as outer cover for bag of local sword called '*orek bugi'*
- A folk market survey revealed 103 different plant species, and majority of them were gathered from forests and rice fields, with a few species from home garden. Apart from farming and hunting, selling plants from their forest or home garden is one of the most significant sources of income for both Apatani and Tagin people.
- The folk market survey in Apatani and Tagin community have revealed some economically significant wild and cultivated edible plants some of which have also demonstrated high Use value index and these are *Actinidia Actinidia chinensis* var. *deliciosa, Allium chinense, Amaranthus viridis, Amaranthus spinosus, Amomum dealbatum, Ananas comosus, Artopcarpus heterophyllus*, *Arenga obtusifolia, Baccaurea ramiflora, Brassica juncea, Brassica oleracea, Breynia androgyna, Capsicum annum, Capsicum frutescens, Carica papaya, Chenopodium album,*

Castanopsis indica, Cardamine hirsuta, Choerospondias axillaris, Cinnamomum tamala, Citrus reticulata, Coriandrum sativum, Cucumis sativus, Cucurbita pepo, Elusine coracana, Eryngium foetidum, Glycine Max, Gonostegia hirta, Ipomoea batatas, Litsea cubeba, Mackaya neesiana, Malva verticillata, Manihot esculenta, Musa balbisiana, Saccharum officinarum, Sechium edule, Selaginella biformis, Solanum aethiopicum, Zanthoxulum armatum, Zanthoxylum rhetsa, Zea mays. While some of the highly prioritized medicinal plant species reported to be sold in the folk market were *Acmella oleracea, Allium hookeri, Centella asiatica, Clerodendrum colebrookeanum, Dioscoria alata, Dioscorea pentaphylla, Diplazium esculentum, Gonostegia hirta, Phoebe bootanica, Piper pedicellatum,* and *Thladiantha ziroensis.*

- A total of 38 plant species were found to be used for magico-religious, 28 for traditional handcrafts and agricultural equipment, 22 for construction, 11 for poisoning and hunting, and 12 plant species were found to be associated with conservation ethics and taboos.
- This study documented some culturally significant plant species such as *Dendrocalamus hamiltonii* Nees & Arn., *Phyllostachys manii* Gamble, and *Bamboosa tulda* Roxb., *Castanopsis faberi* Hance*, Castanopsis indica* (Roxb. ex. Lindl.) A. DC., *Phrynium pubinerve* Blume, *Calamus erectus* Roxb, *Calamus flagellum* Griff. ex Martwhich are commonly used during festivals, or in the construction of religious altars. *Altingia excela* (Noronha) Oken, *Bamboosa tulda* Roxb, *Calamus acantospathus* Griff*, Dendrocalamus hamiltonii* Nees & Arn., *Phyllostachys mannii* Gamble, *Lagenaria siceraria* (Molina) Standl, *Livistona jenkinsiana* Griff, *Plectocomia himalayana* Griff were found to be widely utilized for making traditional handcrafts. *Livistona jenkinsiana* Griff, *Bamboosa tulda* Roxb., *Duabanga grandiflora* (DC.) Walp, *Magnolia champaca* (L.) Baill. ex Pierre, *Phyllostachys mannii* Gamble, *Pinus wallichiana* A.B. Jacks, *Tectona grandis* L. f., *Terminalia myriocarpa* Van Heurck & Mull. Arg. (syn) were found to be used for various construction purposes. *Aesculus assamica* Griff., *Dryopteris felix-mas* (L.) Schott*, Persicaria hydropiper* (L.) Spach, *Juglans regia* L., *Gynocardia odorata* R.Br., *Zanthoxylum rhetsa* DC. Were reported as fish poisoning ingredients. *Artopcarpus heterophyllus* Lam., *Prunus persica* Linn, *Zanthoxylum rhetsa* DC., *Phoebe bootanica* (Meisn.)M. Gangop. , *Dendrocalamus hamiltonii* Nees & Arn. ex

Munro were reported to be associated with traditional conservation ethics and taboos.

- This study revealed that the Tagin and Apatani tribes of Arunachal Pradesh have a deep connection with plant kingdom, which is integral to their culture, spirituality, and livelihood. Their close association with ethnobotanical resources emphasizes the importance of preserving indigenous knowledge and practices for sustainable development and livelihood.
- The present study may broaden our knowledge of the variety of human-plant interactions by comparing and creating plant uses across cultures. This may provide light on similarities and differences in traditional knowledge systems related to plants used among the Tagin and Apatani tribes ofArunachal Pradesh.
- Through information exchange, tribes can improve their understanding of the regional flora and its possible uses, which may result in innovation in food, agriculture, medicine etc. Many traditional medicines and nutritional practices are derived from ethnobotanical knowledge which may contribute to pharmaceutical and nutraceutical development.

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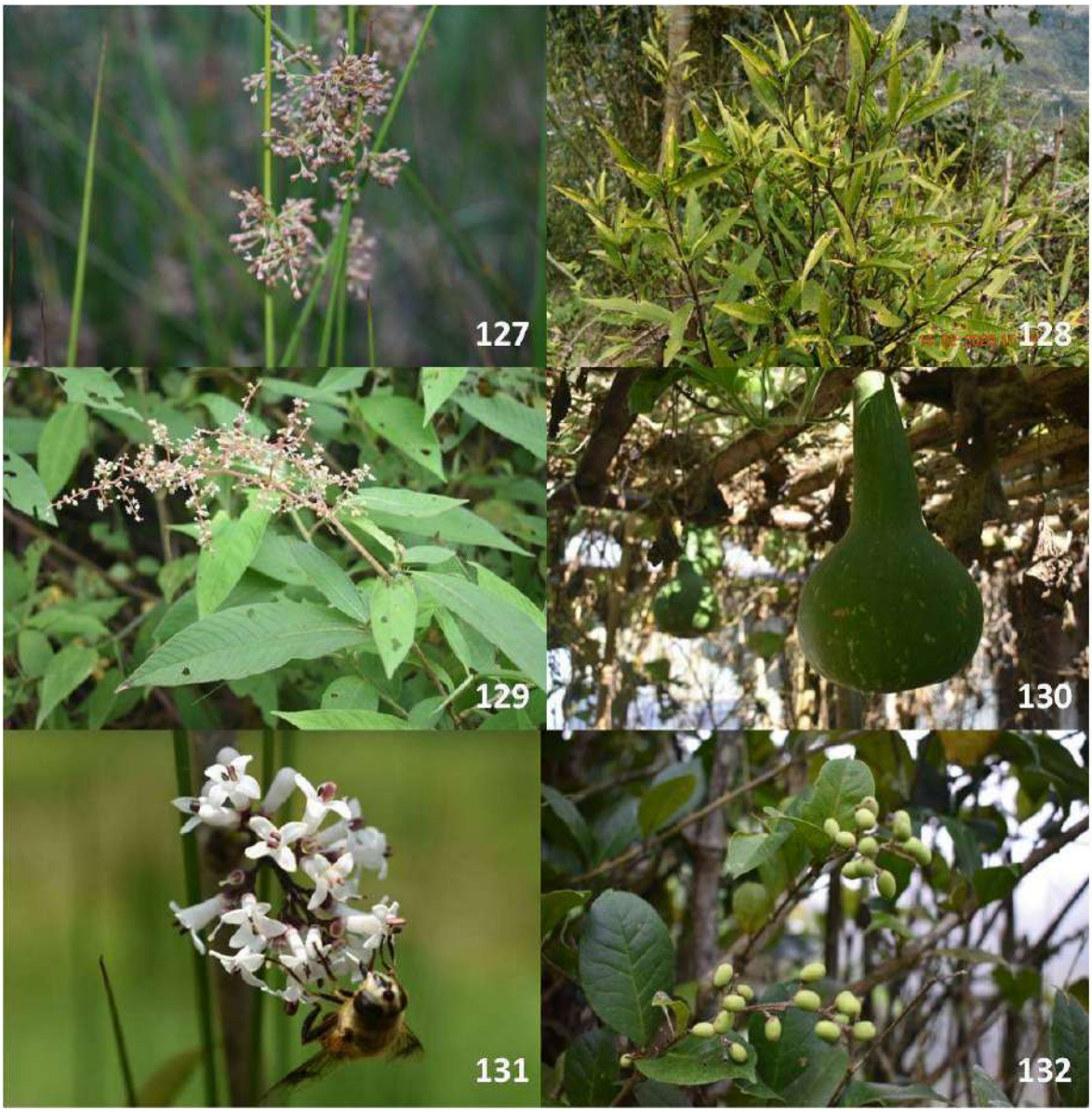

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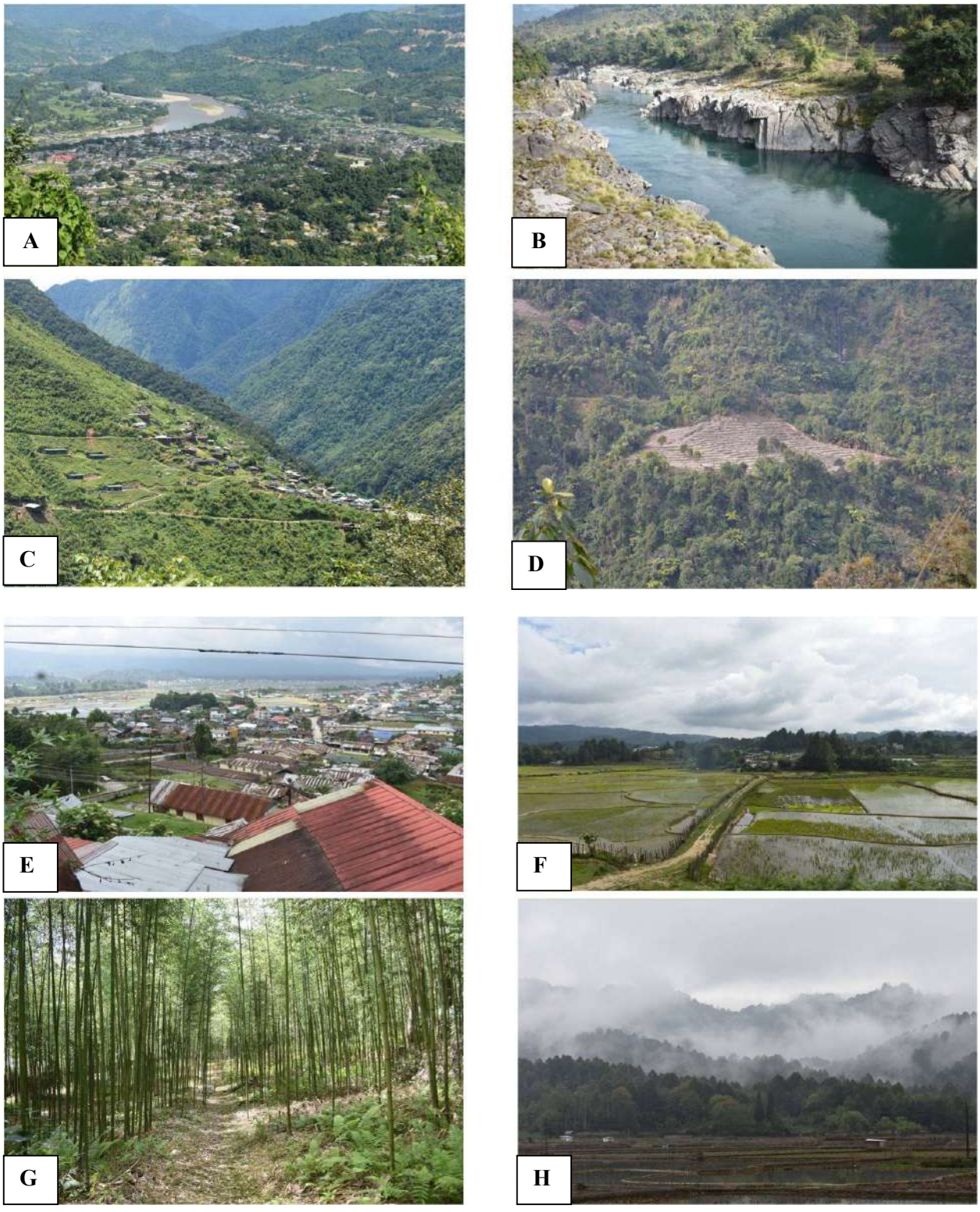

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Fig I. An interaction session with the local informants and documenting traditional knowledge

Fig II. A field visit with the local knowledge holder

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Fig IV. An interaction and market survey in the folk market of Apatani and Tagin tribes

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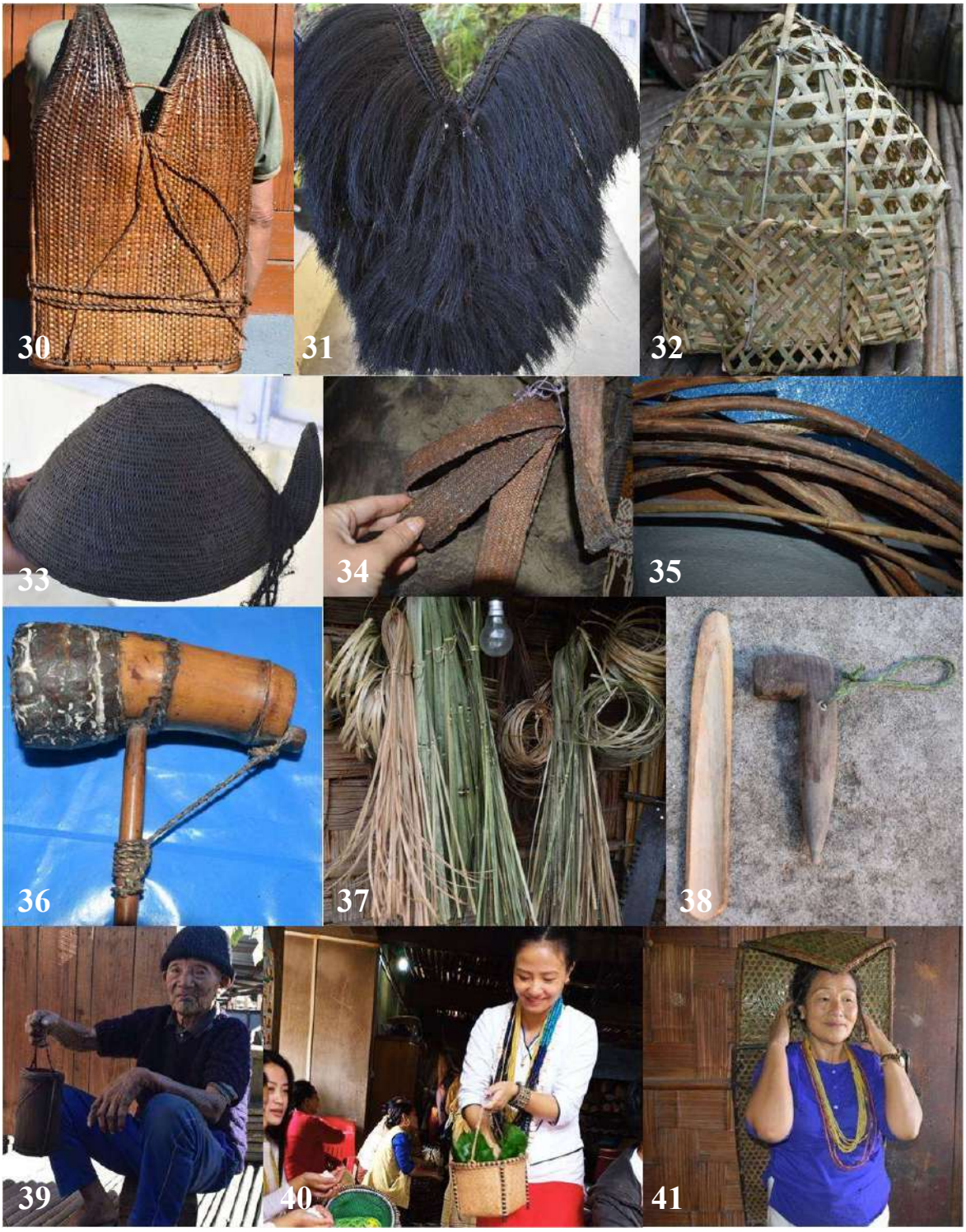

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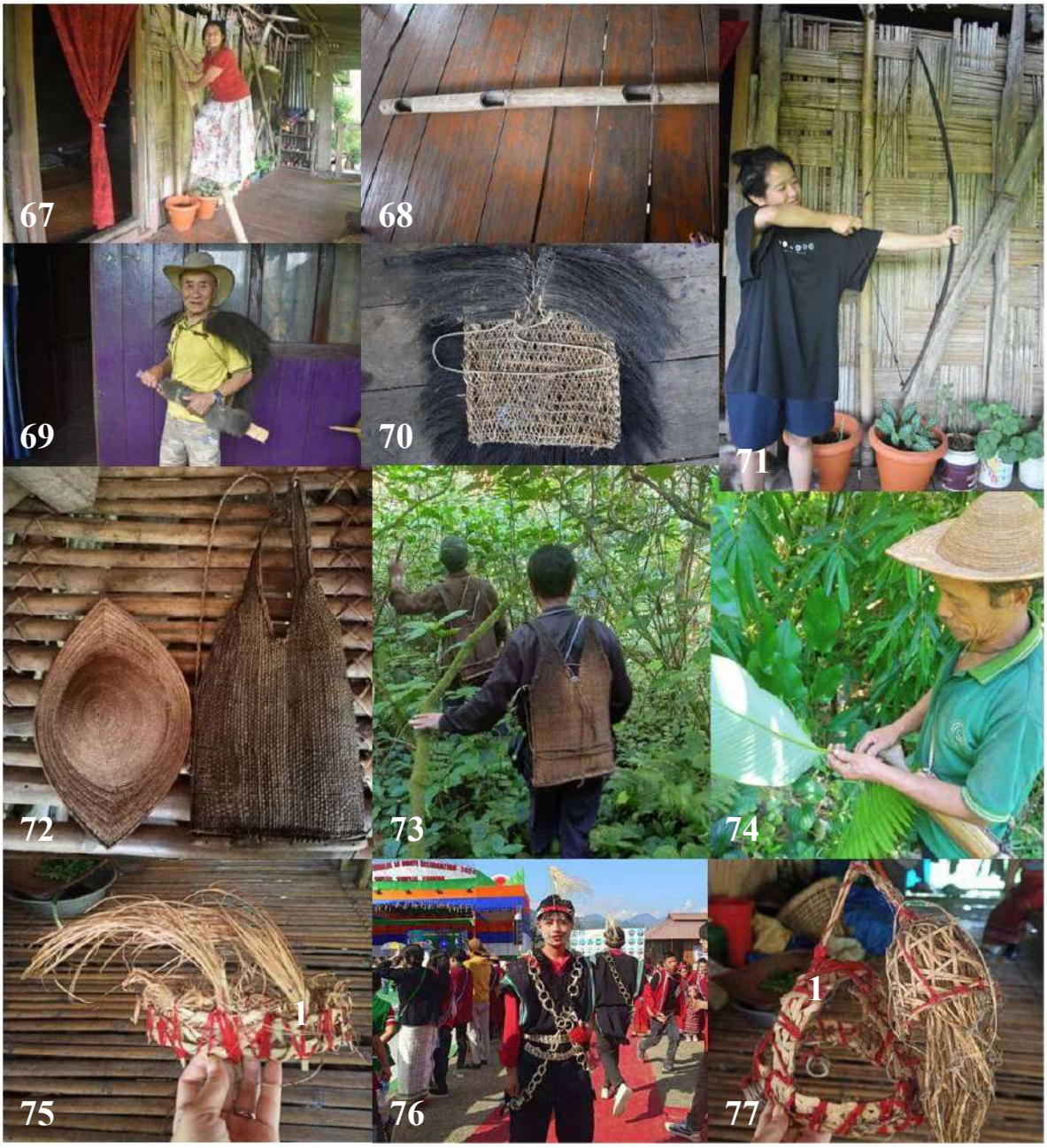

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Solanum torvum Sw. 163
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ANNEXURE-I

Botanical Names	DAFOR SCALE
Acmella oleracea (L.) R.K.Jansen	Frequent
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Frequent
Aconitum feroxWall. ex Ser.	Occasional
Acorus calamus L.	Occasional
Actinidia callosa Lindley	Occasional
Aesculus assamica Griff.	Occasional
Agaricus bisporus (J.E.Lange) Imbach	Occasional
Ageratum conizoides (L.) L.	Dominant
Albizia chinensis (Osbeck) Merr.	Frequent
Albizia lebeck (L) Benth.	Frequent
Allium cepa L.	Frequent
Allium chinense G.Don	Frequent
Allium hookeri Thwaites	Frequent
Allium sativum L.	Frequent
Allium tuberosum Rottler ex Spreng	Frequent
Alnus nepalensis D. Don	Abundant
Alocasia acuminata Schott	Frequent
Alocasia macrorrhizos (L.) G.Don	Frequent
Alpinia nigra (Gaertn.) Burtt	Frequent
Amaranthus caudatus L.	Frequent
Amaranthus spinosus Linn.	Frequent
Amaranthus viridis L.	Frequent
Amomum dealbatum Roxb.	Occasional
Amomum maximum Roxb.	Occasional
Ananas comosus (L.) Merr.	Frequent
Anaphalis margaritacea (L.) Benth. & Hook.f	Occasional
Angiopteris evecta (G. Forst.) Hoffm.	Abundant
Anisomeles indica (L.) Kuntze	Occasional
Aralia armata (Wall. Ex G.Don)	Occasional
Arenga micrantha C.F.Wei	Occasional
Arenga obtusifolia	Occasional
Artemisia indica Willd.	Frequent
Artimisia nilagirica(C.B.Clarke) Pamp.	Frequent
Artopcarpus heterophyllus Lam.	Frequent
Azadirachta indica A.Juss.	Frequent
Baccaurea ramiflora Lour.	Occasional
Bamboosa tulda Roxb.	Frequent
Bauhinia purpuria L.	Abundant
Bauhinia variegata L.	Occasional
Begonia aborensis Dunn	Abundant
Begonia burkillii Dunn	Occasional
Begonia palmata D.Don	Occasional
Begonia roxburgii A.DC.	Occasional
Berberis napaulensis (DC.) Spreng.	Occasional
Berberis wallichiana DC.	Frequent
Bergera koenigii L.	Frequent
Boehmeria hamiltoniana Wedd.	Abundant
Boehmeria macrophylla Hornem.	Abundant
Boeica fulva C.B Clarke.	Frequent
Brassaiopsis glomerulata (Blume) Regl.	Occasional
Brassica juncea (L.) Czern.	Frequent
Brassica oleracea L.	Frequent
Breynia androgyna (L.) Chakrab. & N.P.Balakr.	Frequent
Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl	Frequent
Buddleja asiatica Lour.	Occasional

Calamus acantospathus Griff .	Occasional
Calamus erectus Roxb.	Frequent
Calamus flagellum Griff. Ex Mart.	Occasional
Calamus inermis T.Anderson	Frequent
Calamus leptospadix Griff.	Occasional
Callicarpa *rubella* Lindl.	Occasional
Canarium strictum Roxb.	Occasional
Canna indica L.	Frequent
Cannavis sativa L.	Rare
Capsicum annum L.	Frequent
Capsicum frutescens L.	Occasional
Cardamine hirsuta L.	Frequent
Carex cruciata Wahlenb.	Frequent
Carica papaya L.	Frequent
Caryota urens L.	Occasional
Castanopsis faberi Hance	Occasional
Castanopsis indica (Roxb. ex. Lindl.) A. DC.	Occasional
Centella asiatica (L.) Urb.	Frequent
Cephallostachium capitatum Munro	Occasional
Chenopodium album L.	Frequent
Chimonocalamus griffithianus (Munro) Hsueh f. & T.P.Yi	Occasional
Choerospondias axillaris (Roxb.) B.L.Burtt and A.W.Hill.	Occasional
Chromolaena odorata (L.) R.M.King &H.Rob.	Dominant
Cinnamomum bejolghota (Buch.Ham.) Sweet	Occasional
Cinnamomum tamala (Buch.-Ham.) T.Nees & C.H.Eberm.	Frequent
Cinnamomum zeylanicum Breya.	Occasional
Circium spinosissimum (L.) Scop.	Abundant
Citrus × *aurantiifolia* (Christm.) Swingle	Frequent
Citrus maxima (Burm.) Merr.	Frequent
Citrus medica L.	Occasional
Citrus reticulata Blanco	Abundant
Clerodendrum colebrookeanum Walp.	Frequent
Colocasia affinis Schott	Frequent
Colocasia esculenta (L.) Schott	Frequent
Colocasia falax Schott	Occasional
Coptis teta Wall.	Rare
Coriandrum sativum L.	Frequent
Crassocephalum crepidioides (Benth.) S.Moore	Abundant
Cucumis sativus L.	Frequent
Cucurbita ficifolia Bouché	Occasional
Cucurbita melo L.	Frequent
Cucurbita pepo L.	Frequent
Cupressus torulosa D.Don ex Lamb.	Occasional
Curculigo capitulata (Lour.) Kuntze	Occasional
Curcuma caesia Roxb.	Occasional
Curcuma longa L.	Occasional
Cyclanthera pedata (L.) Schrad.	Occasional
Cynoglossum lanceolatum Forssk.	Frequent
Dalhousiea bracteata (Roxb.) Benth.	Frequent
Debregeasia longifolia (Burm.f.) Wedd.	Frequent
Dendrocalamus Hamiltonii Nees & Arn. ex Munro	Frequent
Dichrocephla integrifolia (L.f.) Kuntze	Frequent
Dicranopteris linearis (Burm. F.) Underw.	Abundant
Dillenia indica Linn.	Occasional
Dioscorea pentaphylla L.	Frequent
Dioscorea deltoidea Wall. ex Griseb.	Frequent
Dioscorea glabra Roxb.	Frequent
Dioscoria alata L.	Frequent
Dioscoria bulbifera L.	Occasional

Diplazium esculentum (Retz.) Sw.	Abundant
Docynia indica (Colebr. ex Wall.) Decne.	Occasional
Drymaria cordata (L.) Willd. Ex Schult.	Frequent
Dryopteris felix- mas (L.) Schott	Abundant
Duabanga grandiflora (DC.) Walp.	Frequent
Elatostema sessile Frost.	Abundant
Eleagnus latifolia L.	Occasional
Eleocarpus floribundus Blume.	Frequent
Eletostema platyphyllum Wedd.	Abundant
Elusine coracana Gaertn	Frequent
Ensete glaucum (Roxb.) Cheesman	Occasional
Erigeron Canadensis L.	Frequent
Erigeron floribundus (Kunth) Sch.Bip.	Frequent
Eryngium foetidum L.	Frequent
Euphorbia hirta Linn.	Frequent
Euphorbia neriifolia L.	Frequent
Euphorbia pulcherrima Willd. ex Klotzsch	Frequent
Exbucklandia populnea (R. Br. ex Griff.)	Occasional
Fagophyrum esculentum Moech	Frequent
Ficus auriculata Lour.	Frequent
Ficus fistulosa Reinw. ex Blume	Occasional
Ficus hirta Vahl	Frequent
Ficus hispida L.f.	Frequent
Ficus semicordata Buch.-Ham. Ex Sm.	Frequent
Fragaria nubicola(Lindl. ex Hook.f.) Lacaita	Rare
Furcraea selloana K.Koch	Occasional
Galinsoga parviflora Cav.	Occasional
Galium aparine L.	Occasional
Garcinia lanceifolia Roxb.	Occasional
Girardinia diversifolia (Link) Friis	Frequent
Glycine Max Linn. Merr.	Occasional
Gnetum montanum Markgr.	Occasional
Gonostegia hirta (Blume) Miq.	Frequent
Gymnosphaera gigantea (Wall. ex Hook.) S.Y.Dong	Frequent
Gynocardia odorata R.Br.	Occasional
Gynura cosimbua (D.Don) S.Moore	Frequent
Gynura nepalensis DC.	Frequent
Hedychium speciatum Sm.	Frequent
Hedychium stenopetalum Lodd.	Frequent
Helenia speciosa (J.Koenig) S.R.Dutta	Frequent
Helianthus annuus L.	Occasional
Heptapleurum ellipticum (Blume) Seem	Occasional
Hibiscus syriacus L.	Frequent
Hodgsonia macrocarpa (Blume) Cogn.	Occasional
Houttuynia cordata Thunb.	Abundant
Hydrocotyle javanica Thunb.	Frequent
Impatiens racemosa DC.	Frequent
Impatients latifolia L	Frequent
Imperata cylindrica (L.) Raeusch.	Frequent
Ipomoea batatas (L.) Lam.	Abundant
Juglans regia L.	Rare
Juncus effusus L.	Abundant
Justicia gendarussa Burm.f.	Occasional
Koenigia mollis var. rudis (Meisn.) T.M.Schust. & Reveal	Frequent
Lagenaria siceraria(Molina) Standl.	Occasional
Ligustrum ovalifolium Hassk.	Abundant
Liquidambar excela (Noronha) Oken	Frequent
Litsea cubeba (Lour.) Pers.	Occasional
Livistona jenkinsiana Griff.	Abundant

Lobelia nummularia Lam.	Occasional
Lophiolepis veruta (D. Don) Bures, Del Guacchio, Iamonico & P.Caputo	Frequent
Luffa acutangula (L.) Roxb.	Frequent
Lycopodiella cernua (L.) Pic. Serm.	Abundant
Lycopodium clavatum L.	Occasional
Lycopodium complanatum L.	Abundant
Macaranga denticulata (Blume) Müll.Arg.	Frequent
Machilus glaucescens (Nees) Wight	Occasional
Mackaya neesiana (Wall.) Das	Frequent
Maesa indica (Roxb.) A. DC.	Frequent
Magnolia champaca (Linnaeus) Bailon ex Pierre	Occasional
Mallotus Paniculatus (Lam.) Mull.Arg.	Frequent
*Malus domestica (*Suckow) Borkh.	Occasional
Malva verticillata L.	Occasional
Manihot esculenta Crantz	Abundant
Mastersia assamica Benth.	Frequent
Melastoma malabathricum L.	Frequent
Mikania micrantha Kunth	Dominant
Momordica charantia L.	Frequent
Morchella esculenta Fr.	Rare
Morus alba L.	Rare
Musa acuminate Colla	Frequent
Musa aurantiaca G.Mann ex Baker	Frequent
Musa balbisiana Colla	Frequent
Musa paradisiacal L.	Frequent
Mussaenda roxburgii Hook.f.	Abundant
Mycetia longifolia (Wall.) Kuntze	Occasional
Myrica esculenta Buch.-Ham. ex D.Don	Occasional
Nasturtium microphyllum (Boenn.) Rchb.	Frequent
Nicotiana tabacum L.	Occasional
Oenanthe javanica (Blume) DC.	Frequent
Ophiocordyceps sinensis (Berk.) G.H.Sung, J.M.Sung, Hywel-Jones & Spatafora	Rare
Opuntia tuna (L.) Mill.	Occasional
Osbeckia stellata Buch.-Ham. ex D.Don	Frequent
Osbekia nutans Wall. Ex C.B. Clarke	Occasional
Oxalis debilis Kunth	Frequent
Oxalis corniculata L.	Frequent
Oxyspora cenua Hook.f. &Thomson ex Triana	Frequent
Paederia foetida L.	Abundant
Pandanus furcatus Roxb.	Frequent
Panicum miliaceum L.	Occasional
Paris polyphylla Sm.	Rare
Perilla frutescens (L.) Britton	Occasional
Persicaria barbata (Linnaeus) H. Hara	Frequent
Persicaria capitata (Buch.-Ham. Ex D.Don) H.Gross	Frequent
Persicaria nepalensis (Meisn.) H.Gross	Frequent
Persicaria runcinata (Buch.-Ham. ex D.Don)	Frequent
Persicaria hydropiper (L.) Delarbre	Frequent
Phaseolus vulgaris L.	Frequent
Phaseolus coccineus L	Frequent
Phlogacanthus thyrsiformis (Roxb. ex Hardw.) Mabb	Frequent
Phoebe bootanica (Meisn.) M. Gangop.	Occasional
Phragmites karka (Retz.) Trin. ex Stued.	Occasional
Phrynium imbricatum Roxb	Frequent
Phrynium pubinerve Blume	Frequent
Phyllantus emblica L.	Occasional
Phyllostachys manii Gamble	Abundant
Physalis peruviana L.	Occasional
Phytolacca acinosa Roxb.	Occasional

Pilea insolens Wedd	Frequent
Pilea pumila A.Gray	Abundant
Pilea umbrosa Blume	Frequent
Pinanga gracilis Blume	Occasional
Pinus kesiya Royle ex Gordon	Occasional
Pinus roxburgii Sarg.	Occasional
Pinus wallichiana A.B.Jacks.	Abundant
Piper hamiltonii C. DC.	Occasional
Piper nigrum L.	Occasional
Piper pedicellatum C. DC.	Abundant
Piper peepuloides Roxb	Frequent
Plantago asiatica L.	Abundant
Plantago asiatica subsp. *erosa* (Wall.) Z.Yu Li	Abundant
Plectocomia himalayana Griff.	Occasional
Pleurotus ostreatus (Jacq.) P. Kumm.	Abundant
Pogostemon yatabeanus (Makino) Press	Occasional
Portulaca oleraceae L.	Frequent
Potentilla indica (Andrews) Th.Wolf	Frequent
Pouzolzia sanguinea (Blume) Merr.	Frequent
Primula denticulate Sm.	Occasional
Prunus cerasoides (Buch.-Ham.ex D.Don) S.Y.Sokolo	Frequent
Prunus domestica L.	Frequent
Prunus persica Linn.	Frequent
Pseudodissochaeta assamica (C.B. Clarke) M.P. Nayar	Occasional
Pseudognaphalium affine (D.Don) Anderb.	Frequent
Psidium guajava L.	Frequent
Pteris tripartite Sw.	Abundant
Punica granatum L.	Occasional
Pyrus communis L.	Frequent
Pyrus pashia Buch.-Ham. ex D.Don	Frequent
Pyrus pyrifolia (Burm.f.) Nakai	Frequent
Ranunculus sceleratus L.	Frequent
Rheum nobile Hook. F. & Thomson	Occasional
Rhododendron arboreum Sm.	Occasional
Rhododendron arunachalense D.F.Chamb. & Rae	Rare
Rhus chinensis Mill.	Occasional
Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC.	Frequent
Ricinus communis L.	Frequent
Rohdea nepalensis (Raf.) N.Tanaka	Occasional
Rubia manjith Roxb.	Abundant
Rubus acuminatus Smith.	Occasional
Rubus calycinus Wall. ex D. Don	Frequent
Rubus ellipticus Sm.	Abundant
Rubus niveus Thunb.	Frequent
Rubus rosaefolius Sm.	Occasional
Rubus sumatranus Miq.	Occasional
Rubus buergeri Miq.	Occasional
Rumex nepalensis Spreng	Abundant
Saccharum officinarum L.	Occasional
Sambucus canadensis L.	Occasional
Saurauia roxburgii Wall.	Occasional
Saurauia armata Kurz	Occasional
Saurauia nepaulensis DC.	Occasional
Saurauia punduana Wall.	Occasional
Selaginella biformis A.Braun ex Kuhn	Dominant
sesamum indicum L.	Occasional
Setaria italica (L). P. Beauv.	Occasional
Sicyos edulis Jacq.	Frequent
Sida acuta Burm.f.	Frequent

Smilax laurifolia L.	Occasional
Solanum torvum Sw.	Frequent
Solanum aethiopicum L.	Frequent
Solanum nigrum L.	Frequent
Solanum myriacanthum Dunal	Frequent
Solanum spirale Roxb.	Frequent
Solanum violaceum L.	Frequent
Solena heterophylla Lour.	Rare
Spondias pinnata (L. f.) Kurz	Frequent
Stauntonia coriacea (Diels) Christenh.	Occasional
Stellaria wallichiana Haines	Frequent
Sterculia hamiltonii (Kuntze) Adelb.	Frequent
Stixis suaveolens (Roxburgh) Pierre	Occasional
Symplocos paniculata (Thunb.) Miq.	Occasional
Syzygium cumini (L.) Skeels	Occasional
Tamarindus indica L.	Frequent
Taxus wallichiana Zucc.	Rare
Tectona grandis L. f.	Frequent
Terminalia chebula Retz.	Frequent
Terminalia myriocarpa Van Heurck &Mull. Arg. (syn)	Frequent
Tetrastigma serrulatum (Roxb.) Planch.	Occasional
Thalictrum foliolosum DC.	Rare
Thelypteris parasitica (L.) Tardieu	Occasional
Thladiantha ziroensis Yanka H & Arup K. Das	Rare
Thysanolaena latifoli (Roxb. ex Hornem.) Honda	Frequent
Tinospora cordifolia (Willd.) Hook.f. & Thomson	Occasional
Tithonia diversifolia (Hemsl.) A. Gray	Frequent
Trichosanthes tricuspidata Loureiro	Occasional
Tripidium arundinaceum (Retz.) Welker, Voronts, & E.A.Kellogg	Occasional
Triticum aestivum L.	Rare
Uncaria scandens (Sm.) Wall.	Occasional
Urena lobata L.	Dominant
Urtica ardens Link	Abundant
Viburnum foetidum Wall.	Occasional
Viola hamiltoniana D.Don	Occasional
Wallichia triandra (J.Joseph) S.K. Basu	Occasional
Zanthoxulum armatum DC.	Occasional
Zanthoxylum acanthopodium DC.	Occasional
Zanthoxylum rhetsa DC.	Occasional
Zea mays L.	Frequent
Zingiber officinale Rosc.	Frequent
Zizyphus mauritiana Lam.	Abundant

ANNEXURE-II

Structured Questionnaire Format

(For Collection & Evaluation of Ethnobotanical/Ethno-Ecological Information of Food and Medicinal Flora/Economic Plants Used by the Tagin and Apatani Tribal Communities of Arunachal Pradesh)*

1. Name of Local Informant : Mr/Mrs……
2. Gender : Male Female
3. Community : Tagin Apatani
4. Age of Informant : 15 – 30 Years, 30 – 45 Years, 45 – 60 Years, 60 – 75 Years, 75 – 90 Years
5. Literacy Level : Literate Illiterate
6. Name of Village/Dist.& Altitude, Latitude & Longitude:

   ……

   ……..…….....

   .....
7. Contact Detail/House No:

   ……
8. Occupation : Farmer Healer Professional Herbalist Business/Contractors Govt. Servant
9. Level of Knowledge/Skill : Theoretical Dimension Knowledge Practical Dimension Knowledge Both
10. Name of Species:

    ……
11. Collection No. & Date:

    ……
12. Place of Collection:

    ……
13. Geographical Coordinates:

    ……..……..……..
14. Altitude:

    ……..…….
15. Local Name:

    ……
16. Habit :Herb Shrub Climber Liana Tree
17. Lifeform : Hydrophyte Mesophyte Geophyte Hemiepiphytic Epiphytic

18. Habitat : Open Forest Shade under forest floor

19. Cultivation Status : Domesticated Wild Introduced Others

20. Frequency of Occurance : Dominant Abundant Frequent Occasional Rare

21. Agroclimatic Zone : Tropical Subtropical Temperate Alpine

22. Ethnobotanical Uses : Food, Medicinal, Organic Manure, Fodder, Rituals, Construction, Handicraft, Fishing, Hunting, Agriculture, Clothing, any other..[tick √ in relevant words]

23. Name of Ailments Cured:

……

24. Mode of treatment:

……

……

25. Category of ethnomedicinal plant : Plants exclucively used as ethnomedicines plants used as both food and ethnomedicines Plants used as both cultural materials and ethnomedicines

26. Plant Part used : Root/Tuber Stem Branch Leaves Flower Fruits Seeds Whole plants Resins/Gum

27. Crude drug type : Paste powder sliced cooked Tincture

28. No of times plant is Used : No. of ailments treated……..
Other Uses…….

29. Harvesting Frequency : Daily Weekly Occasional Once in a year

30. Quantity of Harvest : > 1 kg/day >5 kg/day >10 kg/day >30 kg/day

31. Name of Interviewer:

……..

32. Signature & Date of Interviewer:

……..……..

**** This format is valid to be used for only one species and for one informant at a time during field work.***

Seminar/Conference Certificate

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COOCH BEHAR ASSOCIATION FOR CULTIVATION OF AGRICULTURAL SCIENCES
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13 & 14 March, 2020

Certificate of Participation

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of Rajiv Gandhi University, Arunachal Pradesh
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Dr. Anga Padu
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SHORT COMMUNICATION

Medicinal plants used by the Apatani and Tagin tribes of Arunachal Pradesh for the treatment of stomach disorders

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Abstract

Present study enumerated 16 species of medicinal plants effective against stomach related disorders popularly used by the traditional herbal healers of the Apatani and Tagin tribes of the Subansiri district of Arunachal Pradesh. We interviewed 35 key informants (15 from Apatani and 20 from Tagin tribes) from 6 villages who were specialized in treatment of digestive diseases. Of the total 16 species recorded, *Houttuynia cordata, Paederia foetida* and *Thladiantha ziroensis* have been reported as most potential species effective against severe dysentery, diarrhea and gastritis while rest 13 species were found used in traditional home remedies for constipation, indigestion, liver diseases and loss of appetite. The *Allium hookeri, Diplazium esculentum, Houttuynia cordata* and *Acmella oleracea* were frequently harvested and sold in the local market and have been found commercially viable species potential to ensure rural livelihood security. However, *Thladiantha ziroensis* was found rare in their natural habitat which need conservation attention.

Keywords: Medicinal Plants; Traditional Healers; Stomach Disorders; Apatani and Tagin; Subansiri; Arunachal Pradesh

1. Introduction

The state of Arunachal Pradesh is one among the top 12 Global Biodiversity Hotspot (Myers et al., 2000). It is endowed with rich diversity of flora and faunal species of medicinal, economics and cultural significance to the 25 major tribal communities and more than 110 sub-tribal groups living in close association with nature since time immemorial (Tag and Das, 2007). The Apatani and Tagin tribes of Arunachal Pradesh are mainly belonging to the Abotani tribal groups and they are found inhabiting in the Lower and Upper Subansiri District of Arunachal Pradesh and they are reported as rich in traditional culture and ethnobotanical knowledge heritage (Yakang et al., 2013; Murtem and Pradeep, 2016; Rinyo, 2018). The digestive and gastrointestinal diseases are reported as one of the major contributing factors for high rate of human mortality across the world in both developed and developing countries including India (WHO, 2020). The most common digestive disorders identified in the rural and urban localities of Arunachal Pradesh of North East India include dysentery, diarrhea, indigestion, acid reflux and gastritis, and they are mostly treated by using traditional herbal medicines as major remedies in the rural localities (Kala, 2005; Jambey et al., 2017). The Apatani and the Tagin tribes of Arunachal Pradesh are belonging to Mongoloid racial stocks and they fall within the Tibeto-Burman linguistic group. They are predominantly found in the tropical, subtropical and temperate region of Lower and Upper Subansiri district located at the elevation ranging between 400 m – 3200 m from mean sea level (Ashan, 2006; Palaniappan, 2019). However, they are vulnerable to tropical borne diseases including dysentery, diarrhea and gastrointestinal disorders due to microbial infections and some other causes (Tag et al., 2008; Rinyo et al., 2018). Present study enumerates medicinal plants used by the Apatani and Tagin tribes of Arunachal Pradesh for the treatment of stomach and digestive related disorders.

2. Materials and methods

2.1. Study site and ethnomedicobotanical field survey

Ethnomedicobotanical field survey was conducted during the year 2020 – 2021 in the selected localities of the Apatani dominated Ziro Valley and the Tagin dominated Upper Subansiri district of Arunachal Pradesh (Figure 1) and documented their medicinal plant resources used for the treatment of stomach disorders following the method suggested by Martin (1995). A total of 35 key informants (15 from Apatani and 20 from Tagin tribe) were interviewed from 6 villages. We visited 3 villages in the Apatani dominated area in Lower Subansiri, namely, Siiro, Hija and Lempia [27.63°N 93.83°E], and another 3 villages, namely, Riddi, Limeking and Radding [28.3349° N, 93.9878° E] were visited in the Tagin dominated area of Upper Subansiri district of Arunachal Pradesh. The ethnomedicinal information was gathered using semi-structured questionnaire format, open ended interview and transect walk in the community forest with the traditional herbal healers. The local names, medicinal

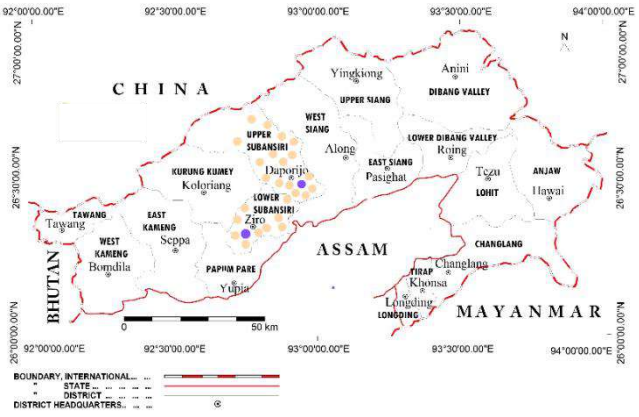

Figure 1. Map showing location of study site where Tagin and Apatani tribes inhabits Lower Subansiri and Upper Subansiri District of central Arunachal Pradesh, North East India.

usage, parts harvested and herbal formulation methods were recorded in the field notebook and semi-structured questionnaire format. The voucher specimens were collected from community forest area. The specimens were dried and pasted in the herbarium sheet bearing collection number, place and date of collection following Jain and Rao (1977) method. Digital photographs were taken for each species using Nikon CoolPix Camera (Model No.: Coolpix P900). Voucher specimen were identified by consulting district flora, namely, *Flora of Lower Subansiri District, Arunachal Pradesh (India)* Vol. 1 & 2 by Pal (2013), and *Flora of Kurung Kumey District, Arunachal Pradesh* by Dash & Paramjit (2017). The accepted name and distribution range were verified in POWO: Plant of the World Online (https://powo.science.kew.org/). The voucher specimens were deposited in the Herbarium of Arunachal University (HAU), Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh-791112, Arunachal Pradesh for future reference.

3. Results

3.1. Enumeration of ethnomedicinal plants

Present studies have recorded 16 species of ethnomedicinal plants used by the Apatani (Ap) and the Tagin (T) tribes of Arunachal Pradesh for the treatment of stomach and digestive disorders which are enumerated as follows:

1. *Acmella oleracea* (L.) R.K. Jansen
Family: Asteraceae
Collection: HAU/RR/820/21.02.2021/Lempia
Habit and habitat: Herb; subtropical and tropical
Local name: *Yorkhung hamang (Ap)/Marcha (T)*
Traditional uses: Leaves and stem are taken as remedy for constipation and severe gastritis.

2. *Allium tuberosum* Rottler ex Spreng.
Family: Amaryllidaceae
Collection: HAU/RR-936/10.06.2020/Hija
Habit and habitat: Herb; subtropical
Local name: *Lepi hamang (A)*
Traditional uses: Leaves are taken in raw form as stimulant and used as remedy for gastritis and indigestion.

3. *Allium hookeri* Thwaites
Family: Amaryllidaceae
Collection: HAU/RR- 910/04.05.2020/Lempia
Habit and habitat: Herb; subtropical
Local name: *Taley (Ap), Talap (T)*
Traditional uses: Leaves and roots are taken in raw form as stimulant and used as remedy for gastritis and indigestion.

4. *Begonia aborensis* Dunn
Family: Begoniaceae
Collection: HAU/RR-MT827/04.05.2020/Radding
Habit and habitat: Herb; tropical
Local name: *Rebe (Ap)*
Traditional uses: Petiole are harvested and peel are removed and then taken orally in raw form as remedy for gastritis, indigestion, low appetite and mouth ulcer.

5. *Cardamine hirsuta* L.
Family: Brassicaceae
Collection: HAU/RR-903/25.08.2020/Lempia
Habit and habitat: Herb; tropical and subtropical
Local name: *Padw hamang (Ap)/Roji-romi (T)*
Traditional uses: Whole plant are taken in both raw and boil form to relieve gastritis.

6. *Crassocephalum crepidioides* (Benth.) S. Moore
Family: Asteraceae
Collection: HAU/RR-MT884/25.08.2020/Riddi
Habit and habitat: Herbs; tropical and subtropical
Local name: *Genda, Kochi, Halyang hamang (Ap)/Ingkayeng (T)*
Traditional uses: Fresh and cooked leaves are taken as remedy for severe constipation.

7. *Centella asiatica* (L.) Urb.
Family: Apiaceae
Collection: HAU/RR-MT884/28.07.2021/Radding
Habit and habitat: Herb; tropical and subtropical
Local name: *Ngilyang Khiko hamang (Ap)*
Traditional uses: Fresh and decoction of leaves are taken as remedy for gastritis, dysentery and indigestion.

8. *Diplazium esculentum* (Retz.) Sw.
Family: Aspleniaceae
Collection: HAU/RR-MT866/28.06.2021/Hija
Habit and habitat: Herb, tropical and subtropical
Local name: *Hwka hamang (Ap)/Pakyaraya (T)*
Traditional uses: Tender leaves are boiled and soup are used for treatment of digestive problems, liver disorders and also taken during constipation.

9. *Houttuynia cordata* Thunb.
Family: Saururaceae
Collection: HAU/RR-MT870/07.06.2021/Lempia
Habit and habitat: Herb; tropical and subtropical
Local name: *Siya hamang (Ap)/Hwngna, honya (T)*

Traditional uses: Raw as well as decoction of whole herb is used for treatment of indigestion, dysentery, diarrhea and lung inflammation.

10. *Magnolia champaca* (L.) Baill. ex Pierre
Family: Magnoliaceae
Collection: HAU/RR-929/10.07.2021/Lempia
Habit and habitat: Tree; subtropical
Local name: *Salyo (Ap)*
Traditional use: Seeds are used for treatment of stomach ache and indigestion.

11. *Oenanthe javanica* (Blume) DC.
Family: Apiaceae
Collection: HAU/RR-917/15.08.2020/Hija
Habit and habitat: Herb; subtropical
Local name: *Hugung hamang (Ap)/Aguhama (T)*
Traditional Use: Raw leaves are taken during gastric pain and indigestion

12. *Oxalis corniculata* L.
Family: Oxalidaceae
Collection: HAU/RR-906/18.05.2021/Lempia
Habit and habitat: Herb; Tropical and subtropical
Local name: *Okhui hamang (Ap)*
Traditional uses: Raw and decoction of leaves are taken to treat stomach ache, dysentery and diarrhea, and also used as appetizer.

13. *Plantago asiatica* L.
Family: Plantaginaceae
Collection: HAU/RR/907/22/06/2020/Limeking
Habit and habitat: Herb; subtropical
Local name: *Mepi Hamang (Ap)/Talak O (T)*
Traditional uses: Fresh leaves are cooked and taken during stomach ache, indigestion and constipation.

14. *Paederia foetida* L.
Family: Rubiaceae
Collection: HAU/RR/1031/10.07.2021/Riddi
Habit and habitat: Climber; tropical, subtropical
Local name: *Upteer nemi* (T)
Traditional uses: The fresh juice extracts are taken during diarrhea and dysentery. Leaves are cooked and consumed as vegetables.

15. *Rhus chinensis* Mill.
Family: Anacardiaceae
Collection: HAU/RR-937/14.08.2021/Siiro
Habit and habitat: Tree; tropical, subtropical
Local name: *Tamo (Ap)/Tangme (T)*
Traditional uses: Ripen fruits are taken during gastritis and dysentery.

16. *Thladiantha ziroensis* Yanka H & Arup K. Das
Family: Cucurbitaceae
Collection: HAU/RR939/16.08.2021/Lempia
Habit and habitat: Climber; subtropical
Local name: *Rwko (Ap)/Rwk (T)*
Traditional uses: Dried stem are chopped into pieces and grinded to powder and then mixed with hot water and taken orally to treat dysentery, gastric trouble, and low appetite.

Informant Category	Frequency of age (Years)	No. of informants	No. of stomach disorders treated	No. of plant species used
Male	15 – 30	3	4	12
	30 – 45	7	6	15
	45 – 60	4	8	16
	60 – 75	1	5	07
	75 – 90	2	7	13
Female	15 – 30	2	3	05
	30 – 45	5	6	11
	45 – 60	7	9	16
	60 – 75	2	8	10
	75 – 90	1	3	05

Table 1. Age frequency of the key informants (n=35) interviewed, number of stomach disorders treated and number of plants species recorded for treatment of each disorder category from Apatani and Tagin biocultural landscape of Lower and Upper Subansiri district of Arunachal Pradesh.

4. Discussion

Present investigation revealed 16 species of medicinal plants belonging to 14 genera and 12 angiosperm plant families and 01 pteridophyte family used by the traditional herbalists of the Apatani and the Tagin tribes for the treatment of stomach related disorders. Majority of the medicinal plant species (14 sp.) reported were herbs. 01 tree species (*Rhus chinensis*) of Anacardiaceae and 01 climber species (*Thladiantha ziroensis)* of Cucurbitaceae were found occasionally harvested for medicinal purposes. The whole plant of *Houttuynia cordata* (Figure 2) was found frequently harvested and used for the treatment of variety of ailments such as pneumonia and skin diseases, and also used as blood purifier among the Apatani and Tagin tribes.

In the present study, a maximum of 9 and minimum of 3 stomach related disorders were found treated by a total of 35 herbalists belonging to age group 15 – 90 years using all 16 species of medicinal plants recorded from both the Apatani and Tagin tribes irrespective of their age and gender (Table 1). Furthermore, a minimum of 5 and maximum of 16 species of medicinal plants were found used by both male and female informants recorded under age group between 15-90 years. Under male informant category, a minimum of 7 and maximum of 16 species were used while in the female informant category, a minimum of 5 and maximum of 16 species of medicinal plant species were used for the treatment of 3 – 9 types of stomach related disorders. It was also observed that both male and female informants (herbalists) of both the Apatani and Tagin tribes were equally skilled and competent in plant identification and diagnosis of digestive diseases leading to effective treatment.

Literature corroboration also confirmed that majority of the herbs such as *Allium hookeri, Centella asiatica, Crassocephalum crepidioides, Plantago asiatica,* and *Paederia foetida* reported in the present studies are also reported by the previous workers as anti-oxidant, anti-inflammatory, anti-diabetic, anti-ulcer, anti-cancer, anti-diarrhea, anti-dysentery, anti-septic and wound healing agents by the tribal herbal healers of Arunachal Himalayan region (Tag and Das, 2007; Tag et al., 2012; Jambey et al., 2017). Recently, two bioactive phytocompounds, namely, the 6-Hydroxyondansetron and Quercitrin have been identified from *Houttuynia cordata* which inhibits three replication proteins of SARS-CoV-2, that is, Main protease (Mpro), Papain-Like protease (PLpro) and ADP ribose phosphatase (ADRP) which control the DNA replication of corona virus (Sanjib et al., 2022). *Centella asiatica* was reported as blood purifier, appetizer, and found effective against diarrhea, leprosy and tuberculosis (Yakang et al., 2013). *Allium hookeri* was reported for the treatment of allergies, skin eruptions, skin inflammation and livestock diseases while *Magnolia champaca* was reported as stimulant

and appetizer, and also used as remedies for liver disorders among the Apatani tribe (Kala, 2005; Srivastava, 2010).

Stem of *Thladiantha ziroensis* was reported to be used against throat pain, cough and cold, and infections (Yanka et al., 2017). Flowers and leaves of *Acmella oleracea* have been reported as appetizer, and alternatively used for the treatment of tooth ache, and also used for deworming of the intestinal worms (Kala, 2005; Yakang et al., 2013). Leaves of *Plantago asiatica* was reported as blood coagulating agent and also used for the treatment of freshly cuts and wounds (Yakang et al., 2013). The saponin and tannin rich *Diplazium esculentum* was found commonly consumed among the local residents as vegetable and the decoction are orally taken for the treatment of liver and lose motion.

Thladiantha ziroensis was another rare but medicinally useful species observed in the secondary and primary dense forest floor. The stem climber was found harvested by traditional herbalists and then smock dry, and the decoctions were used as digestive tonic, appetizer, and also used for the treatment of diarrhea and dysentery.

There is a need for conservation of these rare plant species of immense medicinal and economics significance through conservation of community forest land in the Tagin and Apatani biocultural landscape for cheap and affordable rural healthcare and sustenance of community livelihood.

5. Conclusion

Present investigations have identified 9 types of stomach related disorders prevalent among the Apatani and Tagin tribes living in tropical, subtropical and temperate region of Lower and Upper Subansiri district of Arunachal Pradesh. In the absence of modern health care facilities in the rural localities, the local residents collect medicinal plants of their localities including these 16 species of both wild and cultivated medicinal plants, mostly herbs which are primarily used for the treatment of stomach and digestive disorders ranging from diarrhea, dysentery, constipation, indigestion, gastric ulcer, gastritis and acid reflux and liver diseases. The four species, namely, *Allium hookeri, Diplazium esculentum, Houttuynia cordata* and *Acmella oleracea* have been identified as commercially viable species regularly sold in the local vegetable market and have been found potential to ensure rural livelihood security. *Thladiantha ziroensis* was found rare in their natural habitat which need conservation priority. Present studies concluded that majority of the medicinal plant species documented from the Tagin and Apatani biocultural landscape are wild and edible which are commonly sold in the rural and urban market. Further studies are needed to unveil the bioactive phytochemicals responsible for effective treatment of the digestive and gastrointestinal diseases reported in present studies.

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Authors' contributions

The first author (RR) generated the field data and prepared the draft manuscript. The second and the third authors (PKH and HT) are Ph.D. supervisors and mentors who formulated the research design and contributed for intellectual approach, and critically reviewed and finalized the draft manuscript.

Conflict of interests

The authors have no conflict of interest.

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Figure **2.1.** *Oenanthe javanica* (Apiaceae); **2.** *Acmella oleracea* (Asteraceae); **3.** *Thladiantha ziroensis* (Cucurbitaceae); **4.** *Houttuynia cordata* (Saururaceae) with flowers; 5. *Paederia foetida* (Rubiaceae), a tropical climber popularly used as anti-diarrhea and anti-dysentery agent. 6. *Crassocephalum crepidioides* (Asteraceae); **7.** *Allium hookeri* (Amayrillidaceae) with roots and leaves; **7a.** Inflorescence of *Allium hookeri* with closeup view of individual flower showing tepals, ovary, stamen with anthers and carpels; **8.** Scholar with village herbalists; **9.** *Diplazium esculentum* (Aspleniaceae) harvested and sold in the local market. **10.** Seeds of *Magnolia champaca* (Magnoliaceae); 11. Branch of *Magnolia champaca*.

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Wild edible plants used by Tagin and Apatani Tribes of Arunachal Pradesh (India)

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Abstract

This paper discusses on some wild edible plants used by two major ethnic communities of Arunachal Pradesh viz., Apatani and Tagin tribes. The study was carried out in selected villages of the tribe through random survey using structured and semi-structured questionnaire, a focused group discussion, open ended discussion, and participants' observation. It revealed the identity of 44 species of comestible plants. The study of such cultural diversity helps to reveal the outline of plant use in different societies and exchange of local knowledge.

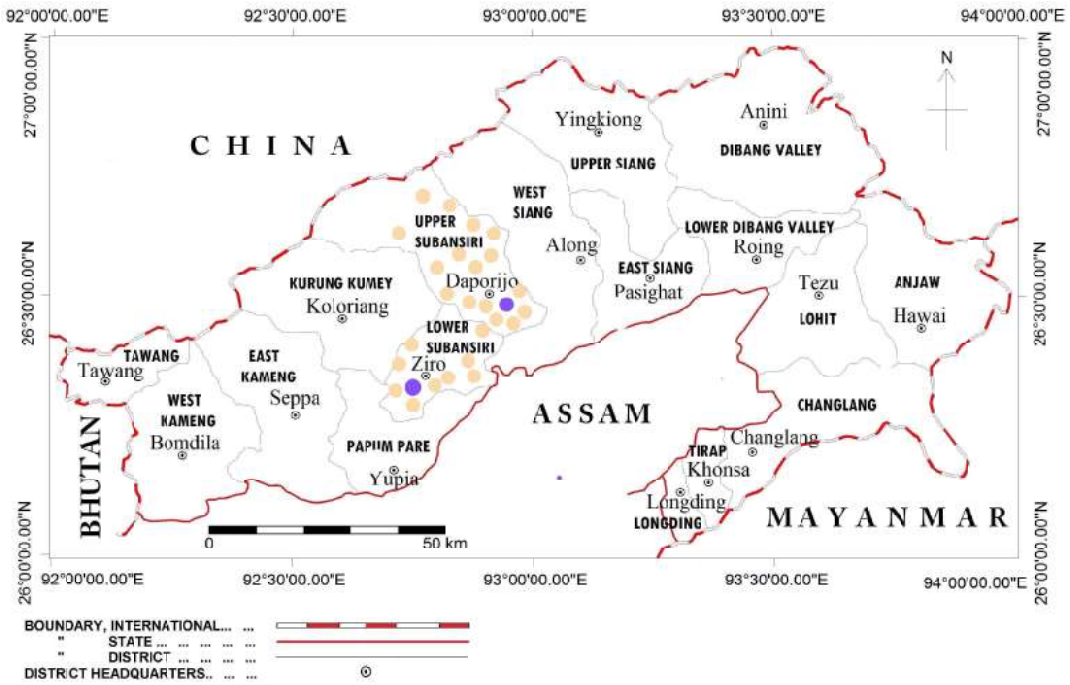
Key words: Apatani tribe, Tagin tribe, Wild edible plants, Arunachal Pradesh

INTRODUCTION

Plants were generally considered as wild until it had been selectively domesticated by people after discovering its usefulness to the human society. The tribal people gather plants from the wild and has long been fed by such local flora. The Tagin and Apatani, two significant ethnic tribes of Arunachal Pradesh, have relied heavily on their environment for survival since their inception. The Tagin people dwell on Upper Subansiri district and their region is sanctified with diverse type of forest ranging from tropical wet evergreen to subtropical, temperate and moist alpine forests (Map - 1). The elevation of the district ranges from 600 to 3800 m AMSL. Again, the ethnic Apatani tribe inhabit in Lower Subansiri district which has subtropical to temperate forests and lies at an elevation of 1600 to 2500 m AMSL. The Kamle district separates the two regions. Although, till date, wide range of valuable plants have been identified from these regions, yet most of those are still not considered appropriate for domestication.

Numerous researches have also shown that the ethnic people of Arunachal Pradesh had widely used wild plants in their day-to-day life. Angami *et al.* (2006) recorded 118 wild edible plants of Arunachal Pradesh; Lungphi *et al.* (2018) worked on Tangsa community living in the Changlang district; Eko *et al.* (2020) studied on Digaru Mishmi tribe. Studies on wild edible plants of Tagin and Apatani tribes has also been recorded earlier by Singh and Hage (2017) on five districts of Arunachal Pradesh viz. Lower Subansiri, Lower Dibang Valley, Upper Subansiri, Kra Daadi and West Siang; Yakang *et al.* (2013) recorded non-timber forest product of Apatani community; Murtem and Chaudhry (2016) also studied some wild edible plants of Upper Eastern Himalaya i.e., Upper subansiri district.

However, no such combined study on wild edible food used by these two ethnic tribes i.e, Tagin and Apatani have been reported and recorded as of today. The current study mainly highlights the utilization of plants available in these two different localities. The purpose of such studies is to reveal some hidden knowledge of wild plants and document it. This study would also enable us to recognize these wild edible plants with their ethnic names.



Map-1. Location map of the study area, Upper and Lower Subansiri districts of Arunachal Pradesh (India)

MATERIALS AND METHODS

The study was carried out in two districts of Arunachal Pradesh, namely Upper Subansiri and Lower Subansiri districts (Figure 1). The survey was conducted in the tropical and subtropical belt of rural localities of Upper and Lower Subansiri districts during the months of May – August 2022 to document their indigenous knowledge system related to the diverse uses of wild edible plants. During the survey, 70 local informants were selected randomly and interviewed using structured and semi-structured questionnaire (Martin 1995). This was done through group discussion, open ended discussion, and participant observation. Wild edible plants were recorded, identified, along with their local names, habit, plant-parts used, and mode of preparation. Methods suggested by Jain and Rao (1997) and Das (2021) were followed for the collection of voucher specimens and processing those into mounted herbarium-sheets. The plant species were identified with the help of taxonomic experts, relevant taxonomic literature including Hooker (1875 – 1897), Kanjilal *et al.* (1934 – 1940), Hajra *et al.* (1996), Giri *et al.* (2008) and Chowdhery *et al.* (2009). And, for updated nomenclature, www.plantsofworldonline.org and www.ipni.org were consulted. Digital photography of each plant species was taken and their associated traditional knowledge was documented.

RESULTS AND DISCUSSION

The current study revealed a total of about 44 wild plant species that are considered as edible by Tagin and Apatani people in the target area (Table 1). These plants are representing 41 genera and 34 families of plant kingdom. Rosaceae (6 spp.) appeared as the dominating family in the list and is followed by Amaranthaceae, (2 spp.), Malvaceae (2 spp.), Apiaceae (2 spp.), Brassicaceae (2 spp.), Asteraceae (2 spp.) and Actinidiaceae (2 spp.). As much as 24 (54.55 %) of the recorded wild species are herbs. Other habit groups include trees (13 spp., 29.54 %),

Table 1. Checklist of wild edible plants used by the Tagin and Apatani tribes of Upper and Lower Subansiri Districts of Arunachal Pradesh

[*Abbreviations used*: Ap = Apatani; T = Tagin]

Scientific name [Family]; Voucher specimen	Local Name	Habit	Part used	Mode of consumption
Allium hookeri Thwaites [Amaryllidaceae]; HAU/RR- 910	*Taley (Ap)*	Herb	Leaves	Raw; cooked as vegetable
Amaranthus cruentus L. [Amaranthaceae]; HAU/RR-911	*Laancha-tai,Haalyang-tai-hamang(Ap); Deta-oo (T)*	Herb	Leaves	Cooked as vegetable
Amaranthus viridis L. [Amaranthaceae]; HAU/RR-905	*Tai hamang (Ap); Deta-oo (T)*	Herb	Leaves	Cooked as vegetable
Aralia armata (Wall. ex G.Don) Seem. [Araliaceae]; HAU/RR-891	*Bibu-Domrak (T)*	Tree	Tender leaves	Cooked as vegetable
Boeica fulva C.B.Clarke. [Gesneriaceae]; HAU/RR-892	*Joke-oo (T)*	Shrub	Tender leaves	Cooked as vegetable
Bauhinia variegata L. [Fabaceae]; HAU/RR-901	*Gaayi shein(T)*	Tree	Tender leaves	Cooked as vegetable
Begonia roxburghii (Miq.) A.DC. [Begoniaceae]; HAU/RR-922	*Bukhu (Ap)*	Herb	Stem	Raw
Berberis napaulensis (DC.) Spreng. [syn.: *Mahonia napaulensis* DC.] [Berberidaceae]; HAU/RR-932	*Taamin (Ap)*	Tree	Fruits	Raw
Canna indica L. [Cannaceae]; HAU/RR-902	*Polengi/ Taleng (T)*	Herb	Rhizome	Cooked as vegetable
Cardamine hirsuta L.[Brassicaceae]; HAU/RR-903	*Padw hamang(Ap); Roji-romi (T)*	Herb	Whole plant	Raw; cooked as vegetable
Centella asiatica (L.) Urb. [Apiaceae]; HAU/RR-923	*Ngilyang Khiko (Ap); Nguri (T)*	Herb	Leaves	Raw; cooked as vegetable
Chenopodium album L. [Amaranthaceae]; HAU/RR-924	*Tai hamang (Ap); Teya oo (T)*	Herb	Leaves	Cooked as vegetable
Clerodendrum glandulosum Lindl. [Lamiaceae]; HAU/RR-904	*Pato hamang (Ap); Taapetaala/ taapin (T)*	Shrub	Leaves	Cooked as vegetable
Colocasia esculenta (L.) Schott [Araceae]; HAU/RR-912	*Enge (Ap); Nyirik(T)*	Herb	Leaves, corm	Leaves cooked as vegetable; corm boiled and roasted
Curculigo capitulata (Lour.) Kuntze [syn.: *Molineria capitulate* (Lour.) Herb.] [Hypoxidaceae]; HAU/RR-895	*Doek (T)*	Herb	Seeds	Raw
Dichrocephala integrifolia (L.f.) Kuntze [Asteraceae]; HAU/RR-931	*Jee tami hamang (Ap)*	Herb	Leaves	Cooked as vegetable
Dioscorea pentaphylla L. [Dioscoreaceae]; HAU/RR-930	*Hula (Ap); Hüli (T)*	Climber	Tuber	Cooked, boiled and also roasted
Docynia indica (Colebr. ex Wall.) Decne. [Rosaceae]; HAU/RR-925	*Pecha (Ap)*	Tree	Fruits	Raw; cooked and boiled
Elatostema platyphyllum Wedd. [Urticaceae]; HAU/RR-893	*Hwpe hamang (Ap);Huji (T)*	Herb	Leaves	Cooked as vegetable
Hibiscus syriacus L. [Malvaceae]; HAU/RR-913	*Halyaang sankha melyaan(Ap)*	Shrub	Tender leaves	Cooked as vegetable
Maesa indica (Roxb.) Sweet [Primulaceae]; HAU/RR-894	*Lobi (T)*	Tree	Fruits	Raw

Scientific name [Family]; Voucher specimen	Local Name	Habit	Part used	Mode of consumption
Magnolia champaca (L.) Baill.ex Pierre [Magnoliaceae]; HAU/RR-929	*Salyo (Ap)*	Tree	Fruits	Raw; Cooked as local dish
Malva verticillata L. [Malvaceae]; HAU/RR-915	*Nwle hamang (Ap)*	Herb	Leaves	Cooked as vegetable
Morus alba L.[Moraceae]; HAU/RR-933	*Gende (Ap); Latek shein (T)*	Tree	Ripe/ green fruits	Raw
Musa aurantiaca G.Mann ex Baker [Musaceae]; HAU/RR-896	*Kodok (T)*	Herb	Ripe fruits	Raw
Nasturtium microphyllum (Boenn.) Rchb.[Brassicaceae]; HAU/RR-916	*Hwraang padw hamang (Ap)*	Herb	Leaves	Cooked as vegetable
Oenanthe javanica (Blume) DC. [Apiaceae]; HAU/RR-917	*Hugu hamang (Ap); Aguhama oo (T)*	Herb	Leaves	Raw; cooked as vegetable
Oxalis corniculata L. [Oxalidaceae]; HAU/RR-906	*O- khui hamang (Ap); Pak Hukku(T)*	Herb	Whole plant	Raw
Phoebe cooperiana P.C.Kanjilal & Das [Lauraceae]; HAU/RR-900	*Sampwr (Ap); Sechar (T)*	Tree	Fruits	Raw; cooked as vegetable and also as chutney
Phytolacca acinosa Roxb. [Phytolaccaceae]; HAU/RR-918	*Ooi tanyi (T)*	Herb	Leaves	Cooked as vegetable
Plantago asiatica L. [Plantaginaceae]; HAU/907	*Mepi hamang (A); Talak-oo/ Siibe-richi (T)*	Herb	Leaves	Raw; cooked as vegetable
Potentilla indica (Andrews) Th.Wolf [Rosaceae]; HAU/RR-908	*Kwdi nyimung (Ap); Nenye pepror (T)*	Herb	Fruits	Raw
Pseudognaphalium affine (D.Don) Anderb. [syn.: *Gnaphalium affine* D.Don] [Asteraceae]; HAU/RR-914	*Mwyang hamang(Ap)*	Herb	Leaves	Raw;cooked as vegetable
Prunus cerasoides Buch.-Ham. ex D.Don [Rosaceae]; HAU/RR-926	*Semo/sembo sanw (Ap)*	Tree	Fruits	Raw
Pseudodissochaeta assamica (C.B. Clarke) M.P. Nayar [Melastomataceae]; HAU/RR-897	*Dapu-dai (T)*	Shrub	Tender leaves	Raw
Pyrus pashia Buch.-Ham. ex D.Don [Rosaceae]; HAU/RR-927	*Pwta sanw (Ap); Kean shein (T)*	Tree	Fruits	Raw
Rhus chinensis Mill. [Anacardiaceae]; HAU-RR-928	*Taamo (Ap)*	Tree	Fruits	Raw
Rumex nepalensis Spreng. [Polygonaceae]; HAU/RR-919	*Tajang lyiho hamang (Ap); Yalak oo (T)*	Herb	Leaves	Cooked as vegetable
Rubus rosaefolius S.Vidal [Rosaceae]; HAU/RR-921	*Hitung bulung (Ap)*	Shrub	Ripe fruits	Raw
Rubus acuminatus Sm. [Rosaceae]; HAU/RR-909	*Tae (T)*	Shrub	Ripe fruits	Raw
Saurauia armata Kurz [Actinidiaceae]; HAU/RR-898	*Aeru (T)*	Tree	Ripe fruits	Raw
Saurauia roxburgii Wall. [Actinidiaceae]; HAU/RR-934	*Tahring aai (Ap)*	Tree	Ripe fruits	Raw
Selaginella biformis A.Braun ex Kuhn [Selaginellaceae]; HAU/RR-899	*Hosum (T)*	Creeper	Leaves	Cooked as vegetable
Solanum nigrum L. [Solanaceae]; HAU/RR-920	*Hwro-hamang (Ap); Horee (T)*	Herb	Leaves	Cooked as vegetable

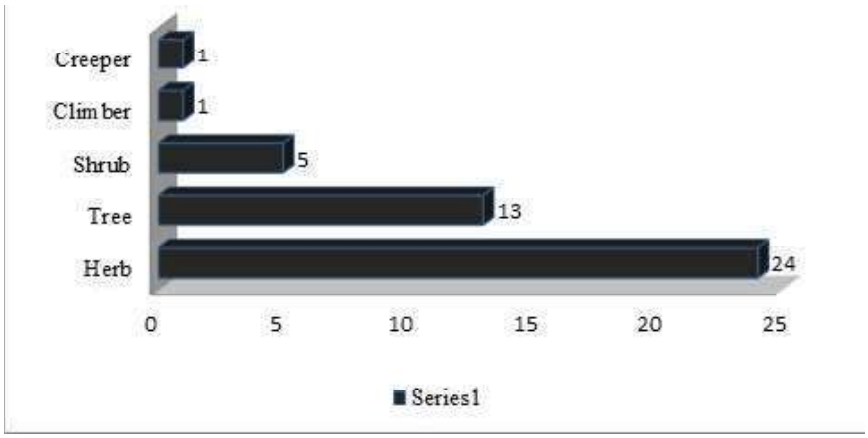


Figure 1. Representation of different habit group categories

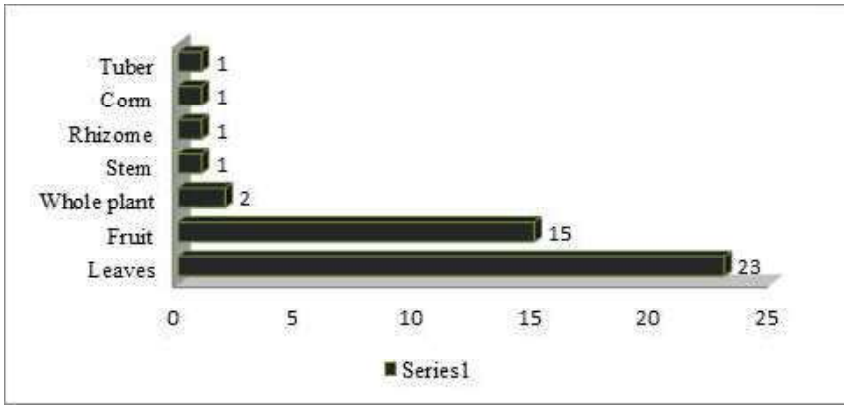


Figure 2. Representation of different plant parts used

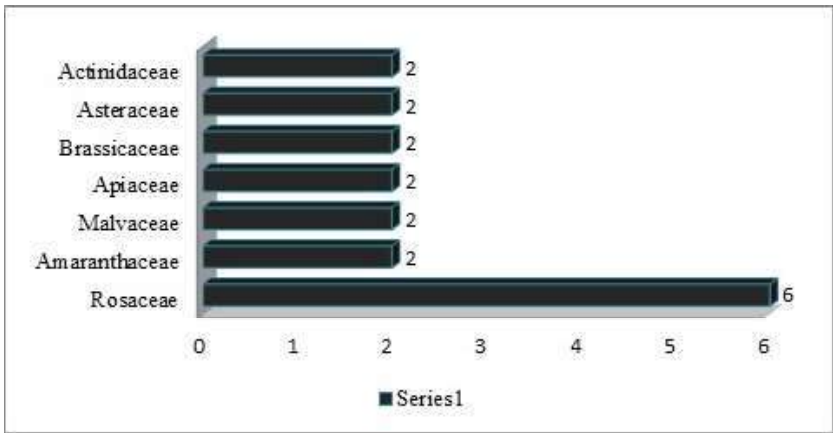


Figure 3. Representation of major taxonomic families

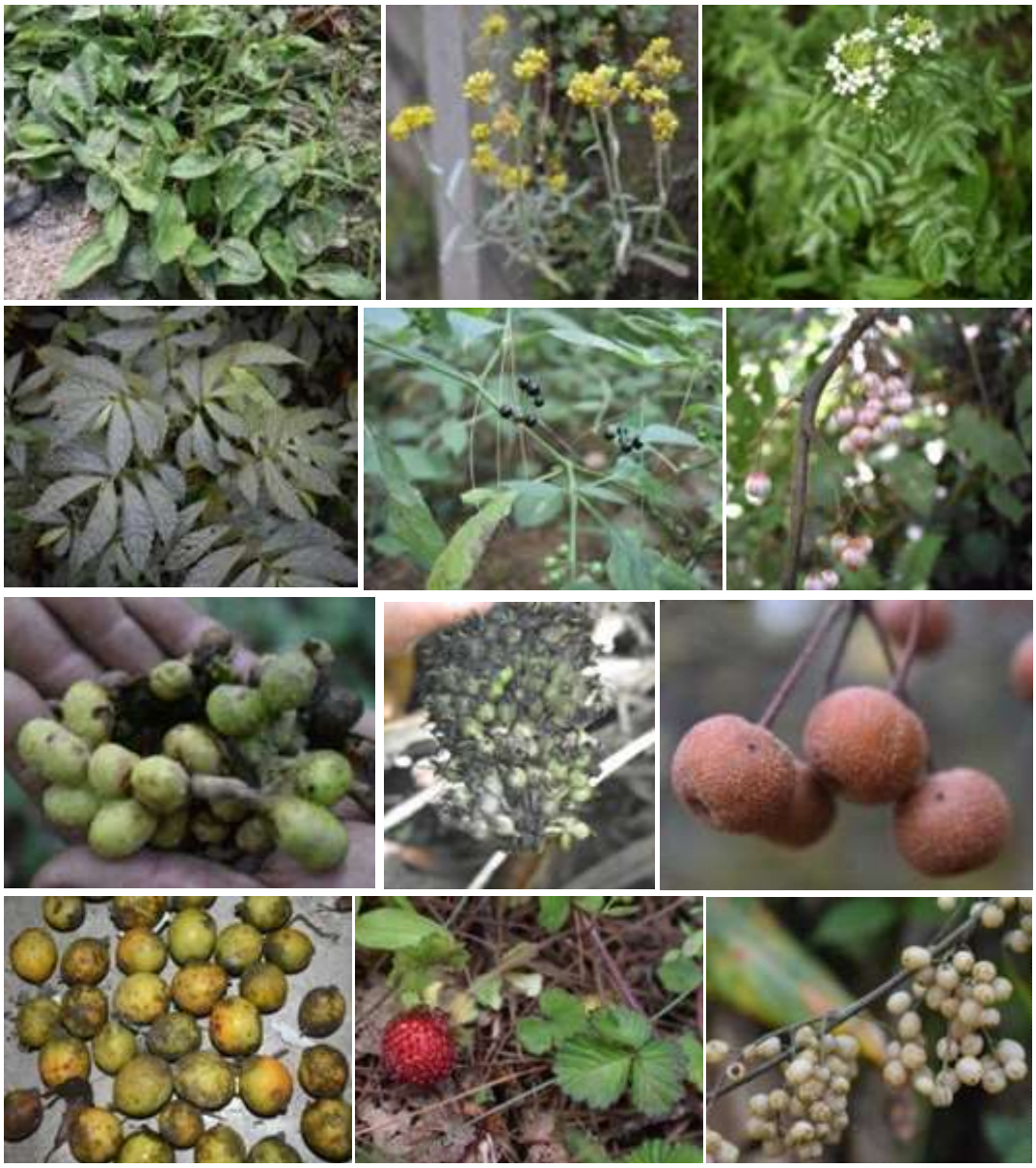


PLATE I: Some wild edible plants used by Tagin and Apatani tribes of Upper and Lower Subansiri Districts of Arunachal Pradesh: **A.** *Plantago asiatica*; **B.** *Pseudognaphalium affine*; **C.** *Nasturtium microphyllum*; **D.** *Elatostema platyphyllum*; **E.** *Solanum nigrum*; **F.** *Saurauia roxburgii*; **G.** *Magnolia champaca*; **H.** *Curculigo capitulata*; **J.** *Docynia indica*; **K.** *Potentilla indica*; **L.** *Maesa indica*

shrubs (5 spp., 11.36 %) and climbers/ creepers (2 spp., 4.54 %). The leaves (23 spp.) were the most commonly used plant-part by these people compared to other plant parts like fruit (15 spp.), whole plant (2 spp.) stem (1 sp.), rhizome (1 sp.), and seed (1 sp.). Occasionally, the plant parts are added to salads or pickles, cooked as vegetables, or consumed raw.

The study also disclosed that in addition to their nutritional values, some of these wild plants are also used medicinally like *Allium hookeri*, *Elatostema platyphyllum*, *Oenanthe javanica*, *Rhus*

chinensis, *Solanum nigrum*, *Clerodendrum glandulosum*, and *Plantago asiatica* which are widely believed to cure various digestive problems among the people of Apatani tribe (Hage *et al.* 2020, 2021). On the other hand, the plants like *Cardamine hirsuta*, *Centella asiatica*, *Elatostema platyphyllum*, *Oenanthe javanica*, *Selaginella biformis* are also widely sold in local market and are of great economic importance for the locals.

Most of these plants are easily available in their surrounding vegetation. Few species like *Allium hookeri*, *Clerodendrum glandulosum*, *Canna indica* (syn. *C. edulis*), *Malva verticillata*, *Pyrus pashia*, etc. they grow near their houses. Now, in most of the areas many of these plants and/or plant products are marketed which economically help the villagers living in remote areas.

CONCLUSION

The current study exposed 44 wild plants with their ethnic names which are widely consumed by the two traditional group of people. The investigation also revealed that some of these wild plants are utilized medicinally in addition to their nutritional values. The tribes are also very much dependent on wild plants for their source of revenue. The investigation also revealed that some plants were unknown to and unutilized by other the tribes. There may not be enough exploitation of plants among them due to lack of knowledge, varied climatic zones, settlement patterns, and plant availability and dispersion. Furthermore, the study revealed more utilization of wild edible plants between these two tribes and other significant utilization of plant species. They pass on their cultural knowledge generally in linear fashion through oral transmission and by observing the activities of other people within the community. The local names of plants play an important role in acknowledging the plants and its significance by the natives and other community.

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CROSS CULTURAL ETHNOBOTANY OF TAGIN AND APATANI TRIBES OF ARUNACHAL PRADESH

A thesis submitted in partial fulfilment of the requirement for the award of the Degree of Doctor of Philosophy in Botany under the Faculty of Life Science,
Rajiv Gandhi University

Submitted By

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2024

CHAPTER 10
CONCLUSION

- The current cross-cultural ethnobotanical investigations were done on 300 informants (156 Male and 144 female) during the year 2021-2023 which involved a total of thirty villages [15 from the Tagin and 15 from the Apatani] localities.
- The Apatani community, 30% percent of male informants were illiterate, whereas over 70% percent of male informants were literate. Likewise, 43% of female informants were illiterate while 57% of female informants were literate. Our study revealed that among the Tagin informants, 51% of the female informants were literate and 49% were illiterate, while 71% of the male informants were literate and 29% were illiterate.
- In both communities, the majority of male informants (n = 156) were found to be in the age range of 55-65, while the majority of female informants (n=144) were found to be in the 35-55 age range. It was discovered that these informants had extensive knowledge of the commonly utilized plant species.
- It was observed that, the female informant was more knowledgeable about the value of foraging for edible wild plants, agricultural tools and techniques, medicinal uses of plants, and other topics related to ethnobotany, whereas the male informant was more knowledgeable about magico-religious plants, customary laws, building, crafts, hunting and fishing, and therapeutic knowledge.
- More insight and information about traditional knowledge practices relating to plant utilization were provided by the informants of age group 45 years and above. Further, it was also observed that the literacy level had no bearing on traditional ethnobotanical knowledge and skills.
- Present Cross-cultural ethnobotanical study conducted in the Tagin and Apatani localities of Upper and Lower Subansiri district revealed 333 species of ethnobotanical significance belonging to 245 genera and 107 plant families distributed along different altitudinal gradient.
- The top 10 dominant families were reported to be Asteraceae (20 sp.), Rosaceae (17 sp.), Poaceae (14 sp.), Cucurbitaceae (13 sp.), Urticaceae (12 sp.) Arecaceae (12 sp.), Solanaceae (11 sp.), Fabaceae (10 sp.), Polygoniaceae (9 sp.), and Rutaceae (9 sp.)

- Within the ethnobotanically relevant plant genera, the highest numbers of species were reported in the following genera: *Rubus* (7 species), *Solanum* (6 species), *Allium* (5 species), *Calamus* (5 species), *Ficus* (5 species), and *Persicaria* (5 species). *Begonia* (4 species), *Citrus* (4 species), *Cucurbita* (4 species), *Piper* (4 species), and *Saurauia* (4 species)
- The majority of plant species have been reported under angiosperm dicots (259 sp.), followed by angiosperm monocots (65 sp.), gymnosperms (5 sp.), and fungi (4 sp.).
- Herbaceous habits were reported with highest number of species (131 sp.) which accounts for 39.3 %. This was followed by Tree (90 species; 27%), Shrub (48 sp., 14.4%), Climber (11species; 3%), Subshrub (14 species, 4%), Liana (7 species, 2%), Fungi (4 species, 1%),and Runner (3 species, 1%).
- The greater majority of 206 species (61.8%) were reported from forest habitat, followed by meadows and fields 94 species (28.1%), wetland/bog (40 species, 12%), and barren/tundra (16 species, 4.8%).
- Highest number of species (154 species, 46%) were reported from tropical forests followed by temperate forests (73 species, 22%), subtropical forests (57 species, 17%), tropical to subtropical forests (32 species, 96%), subtropical to temperate forests (15 species, 5%), and alpine (2 species, 0.6%).
- Using DAFOR Scale (Sutherland, 1996) to measure the abundance and local distribution status of ethnobotanical species, the highest number of 154 plant species were observed to be under frequent (F) category, 124 species under occasional (O), 37 species under abundant (A), 13 species under rare (R), and 5 species under dominant (D) category.
- The leafy parts were found to be frequently harvested plant parts which accounts for 42.3% (141 sp.). This is followed by fruit with 31.8% (106 sp.), stem 17.1% (57 sp.), whole part 10.5% (35 sp.), seeds 6.9% (23 sp.), flower 3.3% (11 sp.), and tender shoot 3% (10 sp.).
- Out of 333 species reported, 31% (103 sp.) of the total species have been reported to commercial relevant .This is followed by medicinal uses 30.03% (101 sp.), wild edible vegetable (23.72%; 79 sp.), wild edible fruit (17.7%; 59 sp.), traditional handcrafts (12.9%; 43 sp.), fodder (11.7%, 39 sp.), magico-religious belief (9%, 30 sp.),cultivated vegetables (7.21%, 27 sp.), cultivated fruit (6.9%, 23 sp.), construction and miscellaneous (6.9%, 23 sp.), Biofencing and Stupefacient/poison

(4.2%, 14 sp.), Spice and condiments (3.6%, 12 sp.), and Beverages/Wine (3.3%, 11 sp.).

- The 101 ethnomedicinal plant species were reported and classified under 11 categories of ailments. Highest number of 45 species were reported under gastrointestinal disorders,; 22 species for cut and wounds, swelling; 14 species for cough, cold, fever, and headaches; 12 species for blood pressure, amnesia, and hypercholesterolemia; 10 species for dermatological disorders; 7 species for veterinary disorders; and 6 species for skeletal-muscular disorders.
- Among Apatani, *Phyllostachys manii* (0.05) and *Pinus wallichiana* (0.05) have higher use value and the *Dendrocalamus hamiltonii* (0.05) was found to have high use value among Tagin tribes.
- Higher UV indices were associated with culturally relevant species that are consistently used by the informants of Apatani and Tagin for food, medicine, and other everyday requirements. In general, the UV indices tend to increase when the ethnobotanical species is more often mentioned and claimed to be utilized by the informants.
- The category of ailments with the highest ICF values was reported for in Oral and Dental (0.99) among Apatani tribe whereas the highest ICF was recorded for Mammary & gynecological and Oral & Dental with ICF 0.99 in the Tagin tribe which reveals high level of agreement among informants regarding the use of plant for specific ailments.
- The RFC of *Acmella oleracea* (0.88) in Apatani inhabitant area and *Ageratum conyzoides* and *Paederia foetida* (0.87) in Tagin inhabitant areas indicates highest score which are widely recognized and used within community for specific purpose
- The high fidelity level (FL%) for certain species such as *Houttuynia cordata* (93.7%) and *Zingiber officinale* (92.8%) in Apatani and *Rheum nobile* (100%) and *Zingiber officinale* (86.7%) in Tagin indicates strong tribal agreement on their medicinal benefits..
- A Jaccard similarity index revealed 30.63% (102 species) as cross cultural species used by both the communities while 152 species were found to be exclusively used by the Apatani and 283 species by the Tagin.
- Rahmans similarity index revealed 18.82% (19 species) of medicinal plants to be used cross culturally among both the communities (Apatani and Tagin) out of 101 medicinal plant species reported. 33 species (33%) were exclusive to Apatani, and

46 (46%) species were exclusive to the Tagin. The Rahman's similarity index also identified 16 plant species used against with similar ailments. They are *Ageratum conyzoides* (L.) L., *Allium hookeri* Thwaites, *Anisomeles indica* (L.) Kuntze, *Artemisia indica* Willd., *Begonia roxburghii* A.DC., *Centella asiatica* (L.) Urb., *Crassocephalum crepidioides* (Benth.) S.Moore, *Clerodendrum colebrookeanum* Lindl., *Diplazium esculentum* (Retz.) Sw., *Houttuynia cordata* Thunb., *Paederia foetida* L, *Piper pedicellatum* C. DC., *Solanum aethiopicum* L, *Solanum americanum* Mill., *Thladiantha ziroensis* Yanka H & Arup K. Das , and *Zingiber officinale* Roscoe.

- Jaccard's similarity index showed a moderate degree of resemblance between the species shared while Rahman's similarity index showed low degree of resemblance between the ailments treated between both the tribes
- New ethnobotanical species use report from the current study made an important addition to the existing documented knowledge systems which are reported for the first time for their food, medicinal, crafts etc. A total of 27 plant species have been reported as ethnobotanical novelties in both the communities, 9 from Apatani and 19 from Tagin tribes.
- The following are the important ethnobotanical novelties reported for plants from Apatani tribes- *Amaranthus caudatus, Colocasia esculenta, Dichrocephla integrifolia, Hibiscus syriacus, Ligustrum ovalifolium, Nasturtium microphyllum, Solanum myriacanthum, Zea mays, Arenga obtusifolia.*
- The following are the important ethnobotanical novelties reported for plants from Tagin tribes- *Artemisia nilagirica, Curculigo capitulata, Berberis napaulensis, Clerodendrum colebrookeanum, Furcraea selloana, Fagophyrum cymosum, Juglans regia, Livistona jenkinsiana, Pandanus furcatus, Persicaria nepalensis, Portulaca oleraceae, Rheum nobile, Uncaria scandens, Zanthoxulum armatum, Helenia speciosa, Smilax laurifolia, Ophiocordyceps sinensis, Morchella esculenta, Arenga obtusifolia.*
- Ethnobotanical novelties reported from Apatani tribe and their specific uses: Among Apatani tribe, *Colocasia esculenta* and *Amaranthus cruentus* is used to for treating low haemoglobin and anaemia. Fruit of *Solanum myriacanthum* is crushed and paste is used as a leech-prevention tactic. *Dichrocephla integrifolia* leaf paste is applied to wounds and cuts; tender leaves of *Nasturtium microphyllum* and *Hibiscus syriacus* have been reported to be edible. The study also reported a little farming tool called a

"Kedu," which has a single sharp edge and a holder, is likewise made from sturdy stems of *Ligustrum ovalifolium*. Husk of *Zea mays*, is designed as broom for floor cleaning. Trunk fibre of *Arenga obtusifolia* has been widely used during ancient days among the Tagin which shields the traditional bag packs called 'lera /naara' and the overall bagpack is called *lecha* (Apatani) and *taash naara/ raaming* (Tagin).

- Ethnobotanical novelties reported from Tagin tribe and their specific uses: *Clerodendrum coolebrookeanum,* used for treating the breast and back pain during the period of breastfeeding; *Juglans regia* leaf pastes are used to treat ringworm, *Hellenia speciosa* is reported that eye irritation can be relieved by putting the liquid juice that was taken from the stem to the eye; *Portulaca oleracea* is great for high blood pressure and good blood circulation, for treating furuncles, or boils, leaves of *Persicaria nepalensis* is applied. Fungus *Ophiocordyceps sinensis* is able to treat a variety of ailments; *Morchella esculenta* is consumed as a food; *Berberis napaulensis* used in ceremonies, store the bark and leaves around the corners of their homes to ward off evil spirits. Dried leaves of *Artemisia nilagirica* are widely used as pillow cushion; seeds of *Fagophyrum cymosum* stored and grinded into powder to make Chappati and local beverages is also made from the seeds; *Curculigo capitulata* leaves are used to clean swords and blades to remove rust and some Tagin tribes utilize dried leaves of *Zanthoxulum armatum* as scented insence in a variety of rituals; *Livistona jenkinsiana* leaf sheath is made into local handmade broom; *Furcraea selloana* is planted as a fence to block the animals to enter the surrounding; *Pandanus furcatus* leaves used as outer cover for bag of local sword called '*orek bugi'*
- A folk market survey revealed 103 different plant species, and majority of them were gathered from forests and rice fields, with a few species from home garden. Apart from farming and hunting, selling plants from their forest or home garden is one of the most significant sources of income for both Apatani and Tagin people.
- The folk market survey in Apatani and Tagin community have revealed some economically significant wild and cultivated edible plants some of which have also demonstrated high Use value index and these are *Actinidia Actinidia chinensis* var. *deliciosa, Allium chinense, Amaranthus viridis, Amaranthus spinosus, Amomum dealbatum, Ananas comosus, Artopcarpus heterophyllus*, *Arenga obtusifolia, Baccaurea ramiflora, Brassica juncea, Brassica oleracea, Breynia androgyna, Capsicum annum, Capsicum frutescens, Carica papaya, Chenopodium album,*

Castanopsis indica, Cardamine hirsuta, Choerospondias axillaris, Cinnamomum tamala, Citrus reticulata, Coriandrum sativum, Cucumis sativus, Cucurbita pepo, Elusine coracana, Eryngium foetidum, Glycine Max, Gonostegia hirta, Ipomoea batatas, Litsea cubeba, Mackaya neesiana, Malva verticillata, Manihot esculenta, Musa balbisiana, Saccharum officinarum, Sechium edule, Selaginella biformis, Solanum aethiopicum, Zanthoxulum armatum, Zanthoxylum rhetsa, Zea mays. While some of the highly prioritized medicinal plant species reported to be sold in the folk market were *Acmella oleracea, Allium hookeri, Centella asiatica, Clerodendrum colebrookeanum, Dioscoria alata, Dioscorea pentaphylla, Diplazium esculentum, Gonostegia hirta, Phoebe bootanica, Piper pedicellatum,* and *Thladiantha ziroensis.*

- A total of 38 plant species were found to be used for magico-religious, 28 for traditional handcrafts and agricultural equipment, 22 for construction, 11 for poisoning and hunting, and 12 plant species were found to be associated with conservation ethics and taboos.
- This study documented some culturally significant plant species such as *Dendrocalamus hamiltonii* Nees & Arn., *Phyllostachys manii* Gamble, and *Bamboosa tulda* Roxb., *Castanopsis faberi* Hance*, Castanopsis indica* (Roxb. ex. Lindl.) A. DC., *Phrynium pubinerve* Blume, *Calamus erectus* Roxb, *Calamus flagellum* Griff. ex Martwhich are commonly used during festivals, or in the construction of religious altars. *Altingia excela* (Noronha) Oken, *Bamboosa tulda* Roxb, *Calamus acantospathus* Griff*, Dendrocalamus hamiltonii* Nees & Arn., *Phyllostachys mannii* Gamble, *Lagenaria siceraria* (Molina) Standl, *Livistona jenkinsiana* Griff, *Plectocomia himalayana* Griff were found to be widely utilized for making traditional handcrafts. *Livistona jenkinsiana* Griff, *Bamboosa tulda* Roxb., *Duabanga grandiflora* (DC.) Walp, *Magnolia champaca* (L.) Baill. ex Pierre, *Phyllostachys mannii* Gamble, *Pinus wallichiana* A.B. Jacks, *Tectona grandis* L. f., *Terminalia myriocarpa* Van Heurck & Mull. Arg. (syn) were found to be used for various construction purposes. *Aesculus assamica* Griff., *Dryopteris felix-mas* (L.) Schott*, Persicaria hydropiper* (L.) Spach, *Juglans regia* L., *Gynocardia odorata* R.Br., *Zanthoxylum rhetsa* DC. Were reported as fish poisoning ingredients. *Artopcarpus heterophyllus* Lam., *Prunus persica* Linn, *Zanthoxylum rhetsa* DC., *Phoebe bootanica* (Meisn.)M. Gangop. , *Dendrocalamus hamiltonii* Nees & Arn. ex

Munro were reported to be associated with traditional conservation ethics and taboos.

- This study revealed that the Tagin and Apatani tribes of Arunachal Pradesh have a deep connection with plant kingdom, which is integral to their culture, spirituality, and livelihood. Their close association with ethnobotanical resources emphasizes the importance of preserving indigenous knowledge and practices for sustainable development and livelihood.
- The present study may broaden our knowledge of the variety of human-plant interactions by comparing and creating plant uses across cultures. This may provide light on similarities and differences in traditional knowledge systems related to plants used among the Tagin and Apatani tribes ofArunachal Pradesh.
- Through information exchange, tribes can improve their understanding of the regional flora and its possible uses, which may result in innovation in food, agriculture, medicine etc. Many traditional medicines and nutritional practices are derived from ethnobotanical knowledge which may contribute to pharmaceutical and nutraceutical development.