2. REVIEW OF LITERATURES

2.1. **Traditional medicine in ancient cultures:** There is a vast literature available on the ancient traditional medicine systems from different regions of the world. For instances, the Egyptians, Babylonians, Greeks, Chinese and people of the Indo-Pakistan having their own characteristic Materia Medica. The Sumerians of the Tigris and Euphrates (presently called Iraq) around 4000 BC from their cuneiform writing on clay tablets are reported to have used opium, liquorice, thyme, mustard and the chemical element sulphur as medicine. The Babylonians who apparently followed the Sumerians in this field added senna, coriander, saffron, cinnamon and garlic were among the other herbs in their formulation (Farooqi and Sreeramu, 2001). The first written records of medicinal plants therapy on clay tablets in cuneiform are from Mesopotamia which dates back to 2600 BC. One of the earliest recorded uses of plants are found in Babylon circa 1770 BC in the Code of Hammurabi, a comprehensive set of civil laws carved in stone listed with several medicinal herbs and in ancient Egypt circa 1550 BC. Medicinal plants from that period, believed to have utility even in the life after dead of the Pharaohs and have been recovered from the Giza Pyramids. Schultes (1960), in his paper mentioned about the ancient ethnobotanical works like those of the Sumerian ideograms, dating back to 4000 BC which refers to uses of plants. The Ebers Papyrus (*Cyperus aquaticus*) written in Egypt about 1500 BC is a rich and one of the oldest survival medical text or ethnobotanical manuscript. It is reported to contain ancient medicinal knowledge since 3000 BC. This medical handbook covered all sorts of illnesses and includes empirical as well as symbolic forms of treatment. It contains about 870 prescriptions and 700 formulae (Okigbo, 2009) including aloe, wormwood, peppermint, henbane, myrrh, hemp, dogbane, castor oil and mandragora. It was the
Arabs who were responsible for the preservation of much of the Greco-Roman expertise. Avicenna, the Persian pharmacist, physician, philosopher and poet contributed much to the sciences of pharmacy and medicine throughout the works such as *Canone medicinae*, regarded as the “final codification of all Greco-Roman medicine”. It includes elements of other healing cultures and forms the basis for a distinct Islamic healing system known today as Unani - Tibb. *Allium cepa* (Onion), *Astracantha gummifera* (Tragacanth), *Carthamus tinctorius* (Saf-flower), *Carum carvi* (Caraway), *Ferula assafoetida* (Asofoetida), *Lawsonia inermis* (Henna), *Papaver somniferum* (Opium poppy), *Peganum harmala* (Syrian rue), *Prunus dulcis* (Almond), *Punica granatum* (Pomegranate), *Ricinus communis* (Castor oil plant), etc. are some of the important medicinal plants of the Middle East and Egypt. From these ancient cultures, some of the knowledge reached Mediterranean countries through traders and migrations. It was in Hippocrates (460-377 BC) time that pharmacognosy reached a summit in Greece (Robert and Wink, 1998). Theophrastus (ca 300 to 322 BC), who was philosopher and naturalist was the first to deal with the history of plants which later on helped in the classification of plants including herbs. Pedanius Dioscorides, a Greek physician (ca 40-90 AD) produced ‘De Materia Medica’ in 78 AD, which was a catalogue of about 600 plants in the Mediterranean. It included illustrations and information on the plants used by the Greeks especially for medicinal purposes. It was also thought that he have taken many of his ideas from India.

Further, Asia represents one of the most important centres of knowledge with regard to the use of plant species for treatment of various diseases. Examples are the Ayurveda, Amchi (traditional healing system of Tibet and mountainous areas of
Nepal), Siddha, Unani and Chinese system of medicinal care (Karki, 2002; Kala et al., 2004). The Chinese Pharmacopoeia, Pen-T Sao Keng Mu, is one of the oldest records of herbal medicine and is reported to have been written by the Chinese Emporer Shen Nung (3737-2697 BC). This ancient record described the used of Ephendra or Mahuang to improve circulation, reduce fevers, help urinary functions, suppress coughs and relieve the lungs of bronchial disorders. Its active ingredient ephedrine (an alkaloid) is now used in modern pharmaceuticals to relieve breathing difficulties and other symptoms of asthma, hay-fever and common cold. Other Chinese sources includes Erh-ya, a book on nature studies written in 3000 BC and also in the book of poems, the Svu-ching of 1000 BC and Ben-tsao and early herbal dating from 1250 AD. In ancient China, medicines were called ‘Ben Cao’ (Chinese Materia Medica). The oldest herbal medicinal book, Shen Nong Ben Cao was written in the late Han Dynasty. It recorded 365 types of herbs including 252 plants. Till date, approximately 12,807 kinds of medicinal materials from natural sources have been recorded in China. Among them 11,146 are of plant origin (Ming-Wei et al., 2007). The spread of traditional Chinese medicine to most continents has undoubtedly contributed to the current popularity of herbal medicines throughout the world. The most complete reference to Chinese herbal prescription is the Modern Day Encyclopedia of Chinese materia medica published in 1977. It lists nearly 6000 drugs out of which 4800 are of plant origin. Examples of famous Chinese medicinal herbs are Angelica polymorpha var. sinensis (dang gui), Artemisia annua (qing hao), Ephedra sinica (ma huang), Paeonia lactiflora (bai shao yao), Panax ginseng (ren shen) and Rheum palmatum (da huang).

In India, the history of medicines can be traced back to the oldest repository of
human knowledge, the Ayurveda (2500 BC – 900 BC). Ayurveda is derived from the Indian words ‘Ayur’ (life) and ‘Veda’ (knowledge or science) and hence Ayurveda means the science of life. It is perhaps the most ancient of all medicinal traditions, probably older than traditional Chinese medicine and is considered to be the origin of systemized medicine. Medicinal preparations in Ayurveda are invariably complex mixtures derived from plant and animal products as well as minerals and metals. Plants form a dominant part of Ayurvedic pharmacopoeia. Ayurvedic materia medica has stated that there is no plant which has got no medicinal value. It is also evident from the story of Vishagacharia “Jibaka” who was asked by his Acharya to collect plant from forest which has got no medicinal value but virtually Jibaka had to return with empty handed. The principles of Ayurvedic medicines and the medicinal uses of plants are contained in thousands of poetic hymns in the Rig Veda. The Ayurveda mentioned several medicinal plants and their uses including the hallucinogenic mushrooms *Amanita muscaria* and *Rauwolfia serpentina* used to treat snakebite, epilepsy, mental disorders, etc. The root of this plant is the source of a very important plant drug reserpine (an alkaloid) widely used as a tranquillizer and hypertensive agent in modern pharmacy. Other famous Ayurvedic medicinal plants includes *Azadirachta indica* (neem), *Centella asiatica* (gotu kola), *Cinnamomum camphora* (camphor), *Elettaria cardamomum* (ela or cardamomum), *Rauwolfia serpentina* (Indian snake root), *Santalum album* (Sandalwood), *Terminalia* species (myrobolan) and *Withania somniferum* (Aswargandha), etc. After the Vedas about 1000 years later then appeared the two most important works on Indian System of medicines, the Charaka Samhita and Susruta Samhita. The Charaka Samhita, an encyclopaedia of Indian medicine is a comprehensive record of medicinal plants and their uses.
2.2. **Ethnopharmacology and phytochemical investigations**: The medicinal value of plants lies in phytochemical substances that produce a definite physiological action in human body. The most important of these pharmacologically bioactive compounds are alkaloids, phenolic compounds, saponins and terpenoids (Weimann and Heinrich, 1997; Atindehou et al., 2002; Edeoga et al., 2005; Harborne, 1973). For example, antimalarial drug quinine (quinoline alkaloid) was isolated from the bark of *Cinchona officinalis* in 1820 by Caventou and Pelletier. The plant had long been used by the indigenous people in the Amazone region for treating fevers and was first introduced into Europe in the early 1600 for the treatment of malaria. Artemisinin, a sesquiterpene lactone, another potent antimalarial drug isolated from *Artemisia annua* (Quinhaosu) was reported to have been used in traditional Chinese medicine for treating fevers. The analgesic drug morphine isolated from opium poppy, *Papaver somniferum* that have long been used in ancient Mesopotamia, laid the basis for alkaloid chemistry. Evidence has been established for the medicinal use of this plant dated back to 8000 years (Stockwell, 1989; Lewington, 1990). Indole alkaloid antihypertensive agent reserpine was isolated from *Rauwolfia serpentina*. The plant has been used in Ayurvedic medicine for the treatment of snakebite and other ailments. Similarly, ephedrine first isolated from *Ephedra sinica*, a plant long been used in traditional Chinese medicine and the basis for the synthesis of anti-asthmatic agents salbutamol and salmetrol. The anticancer drugs vinca alkaloids i.e. vinblastine and vincristine (a Bis-indole alkaloids) isolated from Madagascar periwinkle, *Catharanthus roseus* which have been traditionally used in various cultures for the treatment of diabetes. An active anti-tumor agent podophyllotoxin, a lignan was also isolated from various species of the genus *Podophyllum*. This plant has long history of medicinal use by early American and Asian cultures including the
treatment of skin cancer and warts. Other important examples of plant-derived therapeutic agents which were originally discovered through the study of traditional cures and folk knowledge of indigenous people include aspirin, atropine, colchicine, digoxin, physostigmine, pilocarpine and quinidine (Gelani and Atta-Ur-Rahman, 2005).

Alkaloids are the most therapeutically bioactive compounds found in traditionally used medicinal plants. Many alkaloids have traditionally been used as purgatives, antitussives, sedatives and other treatments for various ailments in the form of medicinal plant extracts (Kutchan, 2000). It also acts as stimulators, inhibitors and growth terminators (Waller, 1978; Nazrullaev et al., 2001). Further a number of alkaloids exhibit the antimicrobial and antiparasitic properties (Caron et al., 1988; Molinski, 1993; Lindsay et al., 2000; Faizi et al., 2003). Moreover, they are also found often toxic to man and many have dramatic physiological activities, hence their wide use in medicine for the development of drugs (Harborne, 1973; Okwu, 2005). In addition to therapeutic agents, plants also provides an important source of toxic bioactive products used by the traditional communities throughout the world for hunting and fishing poisons for millennia and many are used even today. One of the most well documented examples is the curare used by some traditional communities of South America for centuries as arrow poison for hunting. The extract is prepared from the bark of the rainforest vine Chondrodendron tomentosum and the most potent constituent in the extract is an alkaloid tubocurarine.

The chemical investigation of plants on scientific lines started from 1800 AD onwards and the important discoveries in this regard were narcotine by French chemist Derosne and analgesic drug morphine by Sertturner, a German pharmacist in
1803 from the opium poppy plant *Papaver somniferum* that have long been used in ancient Mesopotamia and laid the basis for alkaloid Phytochemistry. Pelletier and Caventon isolated emetine in 1817 and colchicines in 1819. In 1820, they discovered quinine from the *Cinchona officinalis* bark universally used for treating malarial fever. Other important discovery of alkaloids from vegetable drug includes strychnines-1817; brucine, piperine and caffeine-1819; cinchonine-1820; conine-1826; papaverine-1821 and thebaine-1835. Alkaloid represents the largest single class of plant secondary substances and the number is growing over the year. The number of plant-derived alkaloids characterized was approximately 1000 in 1950, 3300 in 1973 and by 1989, the Dictionary of Alkaloids (Southon and Buckingham, 1989) listed details of 10,000 alkaloids. Following the dramatic advances in spectroscopic techniques in the past 30 years, an analysis of the NAPRALERT database indicated 26,900 known alkaloid structures from a variety of sources (plant, fungi, marine organisms, mammals, etc.) out of about 150,000 characterized natural products (Cordell *et al.*, 2001).

One of the earliest reported organized efforts to screen plant material for alkaloids was conducted by Webb. The results for a total of 1793 species indigenous to Queensland were reported in 1949 and in 1952. In 1954 Arthur reported the results of screening 205 species of plants indigenous to North Borneo for alkaloids, cyanogenetic compounds, saponins, triterpenoids and steroids. More than 600 different species of Papua and New Guinea plants were examined for alkaloids in the field and reported in 1955 by Webb. Approximately 9% of the species examined in this study contain alkaloids. About 888 different species of higher plants representing 1000 plant extracts were screened for the presence of alkaloids and observed that 202
or 22.8% species were detected with positive test (Smolenski et al., 1972). A total of 56 species representing 46 genera and 31 families were screened of which flavonoids were detected in (55%), alkaloids (55%), steroids or triterpenoids (55%), saponins (33%), tannins (32%), cardiac glycosides (7%) and cyanogenic glycosides (5%) (Bandoni et al., 1971). Fifteen species from the family Chenopodiaceae have been analyzed for their chemical constituents: alkaloids, anthraquinones, coumarins, flavonoids, saponins, sterol and or terpenes and tannins. The result showed that alkaloids are detected 100%, sterol and or terpenes 73%, flavonoids 66%, saponins 66%, coumarins 53%. No anthraquinones were detected in this family (Al-Saleh et al., 1997). About 100 different medicinal plants from Lombok belonging to 48 family and 88 genera were screened for the present of alkaloids and 23% of the plants were tested positively for alkaloids (Surya and Bremner, 2001).

2.3. Ethnobotanical explorations: Although the science of ethnobotany or its practical knowledge has been in existence since the beginning of human civilization when people relied more on plants as a way of survival. However, the study developed into a more specialized subject only during the 19th century when botanical exploration reached its peak. Historically, the field of ethnobotany belonged to the explorers and adventurers of Europe who observed and documented the uses of plants by the aboriginal peoples they encountered on their travels. The pioneer worker in this field of study was Hernandery (1570-1575). He studied the flora and fauna of Mexico in relation to human beings and published his works in 16 folio volumes. A number of economically important plants such as tobacco (Nicotiana spp.), corn (Zea mays), cocoa (Theobroma cacao), rubber (Hevea brasiliensis), sugarcane (Saccharum officinarum), tea (Camellia sinensis), coffee (Coffee arabica),
etc. that were originally used by the indigenous peoples of both the New and Old Worlds were discovered as a result of ethnobotanical observations and many of these plants were introduced in Europe during the Middle Ages. During the period from 1663-1870, some famous naturalists such as John Josselyn, Charles Darwin, Richard Spruce, etc. also organised expeditions into the New World and recorded ethnobotanical data in a more scientific ways. However, the first modern ethnobotanical work was conducted by Leopold Glueck (Choudhary et al., 2008), a German physician working in Sarajevo and published his work on traditional medicinal uses of plants by rural people in Bosnia (1896). Until 1899, when Bayer introduced aspirin, ethnomedicine was the basis of health care for humankind (Cordell and Colvard, 2012). Towards the beginning of the 20th century, the field of ethnobotany experienced a shift from the raw compilation of data to a greater methodological and conceptual reorientation. This is also the beginning of academic ethnobotany. The founding father of this discipline is Richard Evan Schultes. Since then considerable attentions have been focused not only on how plants are used, but also on how they are perceived and managed, and on the reciprocal relationships between human societies and the plants on which they depend. The first book on ethnobotany “An Introduction to Ethnobotany” was compiled by Faulk (1958) and deals with the goods and services obtained from vegetation, physical and psychological troubles caused by vegetation, influence of man on vegetation by way of destruction, conservation, etc. and relationship of vegetation with human civilization. Another important book “The Nature and Status of Ethnobotany” by Ford (1978) contains 16 papers on various issues of ethnobotany while the concept of ethnobotany has been elaborately dealt with in some of the papers, others are mostly of anthropological origin. By the middle of 1980, ethnobotany had become widely
recognised in the USA and the American based Society of Ethnobiology was formed with first issue of its *Journal of Ethnobiology* was published in 1981. In Europe, the two most important contributions in the field of ethnobotanical studies include ethnopharmacology i.e the scientific evaluation of traditional medicines and palynology (a branch of archaeobotany) or the study of fossilised pollen. The study of this fossilized pollen greatly contributed in the field of palaeoethnobotany. Towards the beginning of the last decade of the 20th century, ethnobotanical studies gathered considerable momentum and is now developed into a truly multidisciplinary field of natural science encompassing a wide range of ethnoscientific botanical studies. The study is now increasingly playing an important role in areas such as bioprospecting, conservation and sustainable management of the biodiversity resources.

In India, the history of ethnobotanical study is about four centuries old when Garcia (1563) published his ‘Os coloquis’ giving an account of the indigenous medicinal plants in India, but without using the term ethnobotany. One of the earliest works on ethnobotanical studies in India was compiled by Basu in 1918 on “Indian Medicinal Plants” which he later revised with Kirtikar in 1935. Although the study received more attention in the country since 1920 as more publications on ethnobotanical data on traditional herbal medicine become to intensified, however it was Janaki Ammal in 1954 who first initiated the ethnobotanical studies in the country. She studied subsistence food plants of certain tribal of South India (Ammal, 1955). The famous ethnography (Schultes, 1960) work “Tapping our Heritage of Ethnobotanical Lore” provides a great sense of urgency for the studies and researches into folklore medicine. However, an organized ethnobotanical study in India was carried out by S. K. Jain and his colleagues. They conducted their studies on the tribal people of
central India viz., Madhya Pradesh and Bihar in their natural habitats and recorded empirical knowledge about the uses of plants through field observations (Jain 1963b; 1964c; Jain and Tarafder, 1970). During the first three decades of the fifties, sixties and seventies of the 20th century, most of the publications on ethnobotany were small inventories. Since the beginning of the eighties, emphasis has been laid on more specific work like indigenous used of plant in food, medicine, culture and even on faith or tradition related to conservation of bio-resources and a particular disease or ethnic groups. A national level studies on wild edible plants was done by Singh and Arora (1978). In 1981, Jain edited the first book on Indian Ethnobotany “Glimpses of Indian Ethnobotany” which is a valuable compilation of the works of various eminent scholars from different phytogeographical areas of India and is the first book dealing with the Indian Ethnobotany. The book contains tribal uses of more than 1500 plants from different parts of our country. Another important book by Jain (1996) “Ethnobiology in human Welfare” is based on proceedings of the IVth International Congress of Ethnobiology and contains 111 papers grouped into 7 sections namely food, health, conservation and biodiversity, regional studies, methodology, socio-economic aspects and general studies. In 1982, the Department of Environment, Government of India sponsored an “All India Coordinated Research Project on Ethnobotany” and this resulted in publication of over 400 research papers on Indian ethnobotany. A review on the Indian ethnobotanical work of nearly two decades (1982-2000) was conducted by Jain and Srivastava (2001) and recorded 1250 publications with 30 books and 25 theses. Work also has been published on over 125 ethnic groups. Since then starting from the 1970, a number of publications on ethnobotanical studies were reported from different parts of the country.
2.3.1. **Northeast India:** The region has the richest reservoir of plant diversity in India and is one of the ‘biodiversity hotspots’ of the world. About 50% of the total 17,500 flowering plants in India hails from the region and 40% of them are endemic (Mao *et al.*, 2009). Comparatively ethnobotanical studies in the region are of recent origin and are mostly involved in just listing of the various plants used by different tribes. Although the region harbors a rich heritage on traditional herbal remedies, comprehensive studies on the subject started only in the early eighties. The region including Sikkim is inhabited by over 130 major tribes and 300 sub-tribes or groups (Kala, 2005), however the ethnobotanical studies have been reported from a very limited number of tribes of the region viz. Ler, Mikir, Karbis, Miris, Khasi, Jaintia, Garo, Monpas, Nishi, Apatani, Reangs, etc. (Dutta and Dutta, 2005). Thus, the region still remained largely unexplored mainly due to inaccessibility because of remoteness, difficult terrain, poor communication system and insurgent groups from different communities. Hence, there is still a vast scope for ethnobotanical field exploration in the region.

Few early works on ethnobotanical studies listing wild edible plants and fruits, ethnomedicine and bio-folklore from the region was reported by (Carter and Carter, 1921; Borthakur, 1976). At present a number of published literatures on ethnobotany of various other tribes of the region are available from this part of the country. Saklani and Jain (1989) reported 60 plants of ethnobotanical importance for food and medicine from northeastern India. Tripathi and Goel (2001) studied the ethnobotanical uses of 43 taxa of the genus *Zingiber* from the region. Dutta and Dutta (2005) reported about the uses of 665 species of food plants from the entire north east India. Tushar *et al.*, (2010) also documented about 34 different species
belonging to 9 genera of the family Zingiberaceae that are used to treat 25 type of ailments from north eastern region of India. Some ethnic fermented vegetables of the region such as gundruk, sinki, goyang, inziang, khalpi, anishi, etc. and fermented bamboo shoot products like mesu, soidon, soibum, soijin, ekung, eup, hiring and lung-siej was reported by (Tamang and Tamang, 2009). Although the traditional knowledge on the use of plants as medicine is fairly well documented in the region, however the knowledge on the use of wild plants as food is very limited. Of late there has been a revival of interest in medicinal and wild food plants during the last few decades among the ethno­botanists. Some recent published works on the ethnobotany particularly the tribal communities of the region were reported by different workers adding more number of plants and newer information about its ethnobotanical uses.

In terms of plant diversity richness among the different states in the region, Arunachal Pradesh is the richest with about 5000 species of angiosperms has been recorded (Haridasan et al., 2003). A fairly good number of published works on ethnobotany from different tribal groups of the state have been reported by different workers. Dam and Hajra (1981) conducted an observation on the ethnobotany of the Monpas of Kameng district, Arunachal Pradesh and enumerated 76 species from 65 genera. About 50 folk medicinal plant species used by various tribes of different ethnic groups like Nocte, Khamti, Tangsa, Singphow, etc., in Tirap district of Arunachal Pradesh was reported by Nath and Bardoloi (1989). Haridasan et al., (1990) also give an account of about 90 wild edible plants along with their distribution zone from Arunachal Pradesh. Chakraborty et al., (2003) reported ethnobotanical information on 35 species of wild edible plants sold in the daily
markets of Arunachal Pradesh. Das and Tag (2006) also documented about 45 medicinal plants used by the Khamti tribe in Lohit district of Arunachal Pradesh. About 150 wild plant species are recorded to be used by the Adi tribes in Dehang Debang Biosphere Reserve in Arunachal Pradesh, of which 85 plant species were used as edible (Gajurel et al., 2006). Further, 75 traditional medicinal plants belonging to 37 families used by the Bangnis tribe of the East Kameng district of Arunachal Pradesh was reported by Gupta and Vishal (2006). Khongsai et al., (2011) also study the ethnomedicinal plants used by different tribal communities and reported that 28 species of medicinal plants used by Apatani, Mongpa, Sinpho and Tongsa tribes and 56 species by Padam, Ngishi and I-Idu tribes. The study also focus on the potentials of ethnobotanical research, needs for conservation and documentation of traditional medicinal knowledge. Similar studies on Nishi, Nocte and Apatani tribes of the state were carried out by (Shanker et al., 1998; Bhuyan, 2003; Angami et al., 2006). The nutritive values of 27 most commonly consumed wild edible plants in the Sikkim Himalaya were analyzed and observed that the nutritional contents of these wild edible plants are well comparable with various commercial fruits (Sundriyal and Sundriyal, 2001). In 2004, they presents data on marketing, value addition and management concerns of the wild edible plants of the Sikkim Himalaya and recorded a total of 44 wild edible species that are sold in the local markets. Also a total of 190 wild plant species have been reported from the Sikkim Himalaya, derived from 143 genera and 78 families and accounting for nearly 15% of total edible plants resources of India (Sundriyal et al., 2004). Pradhan and Badola (2008) also reported a total of 118 species belonging from 71 botanical families and 108 genera used as ethnomedicinal by the Lepchas tribe from Dzungo valley in north Sikkim for curing 66 different ailments.
In recent time, a number of published works on ethnobotany mainly the tribal communities in Assam are available in the literature. Devi (2003) reported 156 species including 3 species of fern and 1 species of gymnosperm of wild plants of Sonitpur district of Assam used for food by local inhabitants which includes both tribals and non-tribals of the area. An account of 61 species of plant traditionally used as folk medicine to treat different ailments by the inhabitants of Dibru-Saikhowa biosphere reserve of Assam in Northeast India by Purkayastha et al., (2007). Barua et al., (2007) reported 38 species of wild edible plants belonging to 25 families from Majuli Island and Darrang district of Assam. A survey was conducted by Das et al., (2008) in different areas of Barak valley in different seasons of the year to identify the non-conventional edible plants and documented 70 edible plants belonging to 45 families of the flowering plants. Out of which some of the plants are used as edible green vegetables, edible fruits and other purposes. They also reported 107 species of medicinal plants used by different tribal communities from Cachar district of Assam against diseases such as jaundice, diarrhoea, dysentery, cough, malarial fever, skin diseases, etc. Gogoi and Islam (2010) conducted an ethnomedicinal plant survey in upper Brahmaputra valley of Assam and recorded 49 species belonging to 44 genera and 34 families. An updated estimate of wild edible, medicinal and threatened plant species of Assam was conducted by Sarma et al., (2010) using the information derived through meta-analysis and observed that out of the total 3895 plant species recorded from the state, 7.34% were reported to be used as wild edible vegetables, fruits and ethnomedicines. Overall, a total of 286 edible wild plant species belonging to 93 families and 192 genera hitherto unknown or less known to the world are recorded. The estimate also revealed as many as 150 species used in traditional system of medicine. About 27 species were listed in the red data
book CITIES and IUCN red list threat categories due to over exploitations and therefore require a strong conservation and protection management. Other important contributors on the ethnobotanical studies of the state include (Biossyya and Majumdar, 1980; Hajra and Baishya, 1981; Baruah and Sharma, 1984; Singh et al., 1996; Saikia et al., 2006; Acharyya and Sharma, 2004; Patiri and Borah, 2007; Kar and Borthakur, 2008).

Quite a good number of ethnobotanical accounts have been documented from the state of Meghalaya. One of the first ethnobotanical works in the state was conducted by Joseph and Kharkongor (1981) and reported over one hundred plants of ethnobotanical importance used by the Khasi and Jaintia tribes for medicine, subsidiary food, making implements, musical instruments and religious ceremonies. In the same year they also enumerated about 100 species of folklore medicinal plants which are commonly used by the rural communities of the Khasi and Jaintia Hills people. Kumar et al., (1987) also reported 74 species of ethnobotanical plant used by the “War Jaintia” of Jaintia Hills district. Ahmed and Borthakur (2005) documented a total of 577 species of plant belonging to 375 genera under 146 families used by the Hynniewtreps of Meghalaya as edibles, plant masticatories and ethnoiatrical plants. A total of 249 wild edible plants belonging to 153 genera and 82 families were reported from Meghalaya (Sawian et al., 2007). Also about 110 edible wild plants used by different tribal communities of Meghalaya state was reported by Kayang (2007). Further, Hynniewta and Kumar (2008) also reported about 54 species of medicinal plant belonging to 53 genera and 38 families used as herbal remedies by the traditional healers and village folks in Meghalaya for treating various ailments.
Few works on the ethnobotanical studies of the tribes like Ao, Angami and Rengma of Nagaland was conducted by (Megoneitso and Rao, 1983; Rao and Jamir, 1990; Jamir et al., 1999). Other workers from the state includes Kemp (2003) recorded 9 different species of most commonly used ethnomedicinal plants by the Rengma tribe in Dimapur district, Nagaland. Jamir et al., (2008; 2010) presents an account of the traditional knowledge of Konyak and Lotha-Naga tribes in Mon and Wokha district, Nagaland and documented 53 and 55 species of medicinal plants respectively. An account of 75 species of economic plants belonging to 59 genera and 41 families related to Angami Naga tribe of Nagaland was documented by Barua et al., (2008). These include 31 species of edible food, 19 species of natural dyes, 11 species of fodder, 6 species of timber, 4 species of fish poison, 2 species as fiber and 2 species as gum and oil yielding that are found as weed in the cultivated or open fields.

2.3.2. Manipur: In Manipur state, till date there exist some publications pertaining to ethnobotanical studies. Singh and Singh (1985) reported 30 wild edible plants belonging to 24 families from the markets of Manipur valley. This is one of the first reports on ethnobotanical work from the state. However, Sinha (1987) was the pioneer in the field of ethnobotanical study of Manipur and has reported 667 plant species including eight varieties, 442 genera and 117 families of flowering plants. Elangbam et al., (1989) conducted an ethnobotanical survey of Tangkhul Naga tribe of Ukhrul district in Manipur and reported the uses of 36 plant species in their daily life such as medicines, food, fibres and shelter. Kumar et al., (1990) conducted a preliminary screening test to study the presence of phytoconstituents of about 30 plants of Manipur. Out of 30 plants studied, 27 indicated presence of alkaloids, 18 saponins, 14 flavanoids and 9 tannins. Mao (1993) listed 71 wild species of plant
having wide ethnobotanical application of the Mao Naga tribe. This formed the first ethnobotanical report on the Mao tribe. Sinha (1996) reported about 1200 species of medicinal plant in his book ‘Medicinal Plants of Manipur’ of which 430 plant species are found in Manipur and are used by the different ethnic communities in the state. Majumder and Bharroli (1997) reported about 85 species of medicinal plant in the forest areas from the three hill districts of Manipur namely Ukhrul, Chandel and Churachanpur. The paper also described the uses of these plants in the Ayurvedic formulation of the Indian traditional system of medicine. Singh et al., (2003) published a book entitled “Herbal medicines of Manipur” A colour encyclopaedia where the ethnomedicinal uses of 361 plant species were reported. Chakraborty (2003) also reported about 47 wild species of edible plants sold in the local markets in and around Imphal, Manipur. Ethnobotanical studies in the four sacred groves located in the two valley districts of Manipur were reported by Ashalata et al., (2005). The study revealed the therapeutic applications of 120 plant species representing 106 genera and 57 families. This work formed the first ethnobotanical studies in the sacred grove of Manipur. Khan and Yadava (2010) recorded 44 plant species belonging to 24 families from Thoubal district of Manipur used by the herbal practitioners of Meitei, Meitei-Pangal and Loi communites for curing asthma. A total of about 20 species of ferns and ferns-allies belonging to 15 families were documented and categorized into food (4), medicine (5), abrasives (2), manure (3), decoration (7) and ritual ceremonies (2) based on their mode of uses were reported from Manipur by Yumkham and Singh (2011). Jain et al., (2011) also recorded 51 edible wetland species used by indigenous Meitei people for food and medicinal purposes.
Thus it has been observed that most of the ethnobotanical reports from the region involve just listing or documentation of the various plants used by different tribes or indigenous communities. However, to make ethnobotanical work more meaningful and of practical use for human welfare, some new approaches such as critical analysis for new data, prioritization of species, prospect of socio-economic benefits such as through cooperative societies value addition of marketable products and cottage industry (Jain, 2010). Further, many of the known medicinally uses of plants have not been studied empirically in detailed for the phytochemical constituents and pharmacological properties. Therefore selective screening of some locally used ethnomedicinal plants for active principle(s) will be an effective and rational approach in the search for novel plant derived compounds particularly antimicrobial drugs since microbial resistance to many conventional drugs is increasing exponentially over the years. Also such studies will validate the traditional or folklore medicine used in the treatment of various diseases or ailments. Further analysis of the nutritional values of some locally used important edible wild plants will help to identified and prioritized species for bringing into agro-forestry system for sustainable used and management of the resources which at present are highly undervalued.