

Floristic and ethnic perspective on wild forest plant species of Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India

VIPIN PARKASH*

Department ¹Forest Pathology Discipline, Forest Protection Division, Forest Research Institute, Dehradun-248006, Uttarakhand, India
*email: bhardwajpv@rediffmail.com.

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Abstract. Parkash V. 2021. Floristic and ethnic perspective on wild forest plant species of Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India. *Asian J Ethnobiol* 4: 93-105. This paper elucidates the indigenous traditional knowledge of wild plants usage by Khasi people (ethnic group) of Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India. About 117 different wild forest plant species belonging to 63 families were collected and enumerated for their traditional usage. Most of the plant parts utilized were of herbs (44) followed by trees (32) and shrubs (28). The climbers (7) and scrubs (6) have been utilized least in traditional usage by Khasi people in Nongkhylllem Reserve Forest. It is interesting to mention that due to overexploitation, some plant species, i.e., *Abroma augusta* L., *Phlogacanthus thyrsoiflorus* (Roxb.), *Puereria tuberosa* L., *Eryngium foetidum* L., Nees, *Smilax aspera* L. and *Houttuynia cordata* Thunb. were utilized in colossal quantity, and these plant species are nearing their threshold and hence, are under threat. Only two plants of *A. augusta* L. were found around forest edge areas of reserve forest, so there is a need of the hour to conserve this plant species in situ and ex-situ conditions. This study emphasizes research potentials and the need to document traditional knowledge about wild forest plant species utilization to benefit society and humankind through scientific intervention.

Keywords: Indigenous traditional knowledge, Khasi ethnic group, Nongkhylllem Reserve Forest, wild plants

INTRODUCTION

The northeast Himalayan region in India has vibrant forest flora. It has tremendous potential for cultivating and utilizing plant resources in its diverse agro-climatic zones. Meghalaya is one of the smallest states in this North-eastern part of India, (25°5'-26°10' N latitude, 89°47'-92°47' E longitude), covering an area of 22,429 km² and occupies the plateau and rolling hills between Assam state (India) and Bangladesh (Myer et al. 2000.). The word 'Meghalaya' means the abode of clouds, and it is the home of ethnic groups (tribals) influenced by the Hindu culture. The ethnic groups who inhabited Meghalaya are the Khasis, Jaintias, Garo, Mikirs, and the Kacharis. Meghalaya is a hilly strip in the eastern part of the country and is covered with lush forest areas and rich orchid plantations. Meghalaya has a forest cover of 9,496 km² square, which is 42.34 % of the total geographical location of the state (Samati 2004; 2007). The Meghalayan subtropical forests have been considered among the richest botanical habitats of Asia (Nayar 1996). These forests receive abundant rainfall and support a wide variety of floral and faunal biodiversity. A small portion of the forest area in Meghalaya is under what is known as "sacred groves." These are small pockets of an ancient forest that have been preserved by the communities for hundreds of years due to religious, cultural, and spiritual beliefs and held in great reverence. These forests represent the ancient ecosystem of the world—these 'sacred groves' harbor many rare floral and faunal species. Meghalaya has three Wildlife Sanctuaries, i.e., the Nongkhylllem Wildlife Sanctuary, the Siju Sanctuary, and the Bhagmara Sanctuary, which is also

the home of the insectivorous 'pitcher plant,' *Nepenthes khasiana*.

Nongkhylllem Reserve Forest (NRF) is located near Nongpoh, the district- headquarters of the Ri-Bhoi District of Meghalaya, situated on Gauhati-Shillong National Highway (NH-40). Nongkhylllem Reserve Forest, Nongpoh, has an area of 96 km² excluding the 29 km² area of Nongkhylllem Wildlife Sanctuary (Figures 1 and 2). Due to the diverse climatic and topographic conditions, Nongkhylllem Reserve Forest supports a vast floral diversity, including many epiphytes, succulent plants, and shrubs. The various trees like *Terminalia bellirica*, *T. chebula*, *Albizia lebeck*, *Adina cordiaefolia*, *Schima wallichii*, *Shorea robusta*, *Shorea assamica*, *Tectona grandis*, *Aesculus assamica*, *Aporosa wallichii*, *Bridelia retusa*, *Cryptocarya andersonii*, *Talauma hodgsonii*, *Lagerstroemia parviflora*, *Gmelina arborea*, etc. are some of the most important trees of economic importance. The main components of shrubby species are *Capparis zeylanica*, *Garcinia lancifolia*, *Bauhinia acuminata*, *Mimosa himalayana*, *Acacia concinna*, *Mussaenda roxburghii*, *Eupatorium modiflorum*, *Solanum kurzii*, and *Phlogacanthus tubiflorus*, etc. Numerous lianas intertwine the trees in a few areas, e.g., *Dysolobium grande*, *Mucuna bracteata*, *Fissistigma wallichii*, *Paederia scanders*, *Solena heterophylla*, and *Aristolochia saccate*, are prominent (Kumar et al. 1987).

Natural resources are being exploited on a large scale by the human race. So due to the over-exploitation of natural forest wealth, some forest plant species are on the verge of extinction. Therefore, it is a need of the hours to collect the primary data on botanical knowledge of the

ethnic groups and biodiversity conservation. It is also possible to discover new plants not documented earlier to cure diseases and other ailments. Ethnic perspective on wild forest plant species will help evaluate the natural forest wealth for traditional medicinal plants for further phytochemical studies and economic upliftment of the folk, conservation of biodiversity, and eventually for the welfare of society. So this study was taken in the form of a project on "Utilization of Vesicular Arbuscular Mycorrhizal diversity for conservation of some useful wild forest plant species of Nongkhylllem Reserve Forest Nongpoh, Meghalaya" during 2009-13 funded by ICFRE (Indian Council of Forestry Research and Education), Dehradun. Some notes on wild medicinal plants of Umtasoar Range under Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India, and their traditional usage by the Khasi tribe. Its have already been published (Parkash et al. 2013). The rest of the beneficial wild forest plant species with the traditional use of this reserve forest, including the forest ranges, i.e., the Nongpoh forest range and Umtasoar forest range, have been discussed in this paper.

MATERIALS AND METHODS

An extensive survey was conducted with the help of the Global Positioning System (GPS) (see Table 1 and Figure 1) and forest area map during (2009-2013) in Umtasoar and Nongpoh Range (Figure 2) and collected the wild functional plant species samples and data for enumeration. About 117 valuable and medicinal plants were collected from 11 compartments during the field survey. According to Forest Department, Meghalaya of Umtasoar Forest Range classification, i.e., Umsaw, Khakuoi, Benpoint, Khirdemkulai, Satroh-Khadnio. From the Nongpoh Forest Range, i.e., Diphu-Sydang, Leprosy Colony, Morok, Umsiling, and Tower Point. These plants were preserved in herbarium sheets and then deposited at the regional herbarium of Rain Forest Research Institute (Indian Council of Forest Research and Education) at Jorhat, Assam, India. The unidentified collected plants were

identified to B. S. I. (Botanical Survey of India) Northeast Circle, Shillong, Meghalaya, India, and also by consulting the available literature and flora (Kanjilal et al. 1934-40; Joseph 1982; Haridasan and Rao 1985, 1987) available in the Institute. The botanical names were neutralized, verified, and updated with the help of 'The Plant List' (www.theplantlist.org).

During different seasons, frequent visits were carried out to Nongkhylllem Reserve Forest, Nongpoh, and Meghalaya. The plants were collected from various sites of the area as cited above, identified by their local names recorded with the help of villagers/tribals/local village man. The data on ethnobotanical/medicinal usage of wild plants were collected through general conversation and questionnaires provided to the people of the fringe area of the reserve forest. The photographs of these wild forest plant species were taken during the field visits. Accurate datum regarding each plant species was collected by assigning botanical and local names along with habit, habitat, general description, and distribution of each plant species in the area. Collected plant specimens were maintained through herbarium preparation, as described earlier. The standard methods of ethnobotanical studies and identification of the collected plant specimens were done by using traditional methods and floral documentation written by different researcher's (Martin 1995; Gupta 1995; Jain 1995; Joshi 1995; Mudgil 1995; Rao and Hajra 1995; Parkash and Aggarwal 2010; Verma et al. 2012; Parkash et al. 2013) and available at the laboratory and library of Rain Forest Research Institute, at Jorhat, Assam.

In addition to this methodology, two broad approaches of ethnobotanical studies were considered. The indirect method, the extensive and intensive fieldwork in the rustic villages, was made. This is usually carried out by direct contacts with ethnic groups/ villagers, and first-hand information was collected from all the study sites. In an indirect approach, information was obtained in different ways, i.e., through ancient literature, personal diaries of foresters, traditional local doctors/hermits, plant collectors, etc.

Table 1. GPS data with different compartments of Umtasoar and Nongpoh Range under Nongkhylllem Reserve Forest, Meghalaya, India

Forest range	Compartments	GPS location		Elevation (m) (asl.)*
		Latitude	Longitude	
Umtasoar (UM)	Ben Point (BP)	25° 49' 05.1" N	91° 46' 17.9" E	567
	Kyrdemkulia (KK)	25° 48' 30.1" N	91° 46' 12.5" E	434
	Mowdkhar (MK)	25° 49' 40.6" N	91° 50' 07.9" E	628
	Pen-Point (PP)	25° 49' 09.9" N	91° 46' 19.9" E	570
	Umsaw (US)	25° 49' 50.8" N	91° 48' 21.0" E	576
	Zero-Point (ZP)	25° 49' 36.0" N	91° 50' 17.8" E	616
Nongpoh (NP)	Diphu-Sydang (DS)	25°48' 28.1"N	91°46' 10.5" E	432
	Leprosy Colony (LC)	25°55' 22.1"N	91°52' 15.9" E	536
	Morok (MO)	25°49' 23.8"N	91°51' 26.9"E	540
	Umsiling (UMSL)	25°48' 45.0"N	91°46' 10.6"E	418
	Tower point (TP)	25°55' 6.9"N	91°51' 47.9"E	569

Note: asl.: above sea level

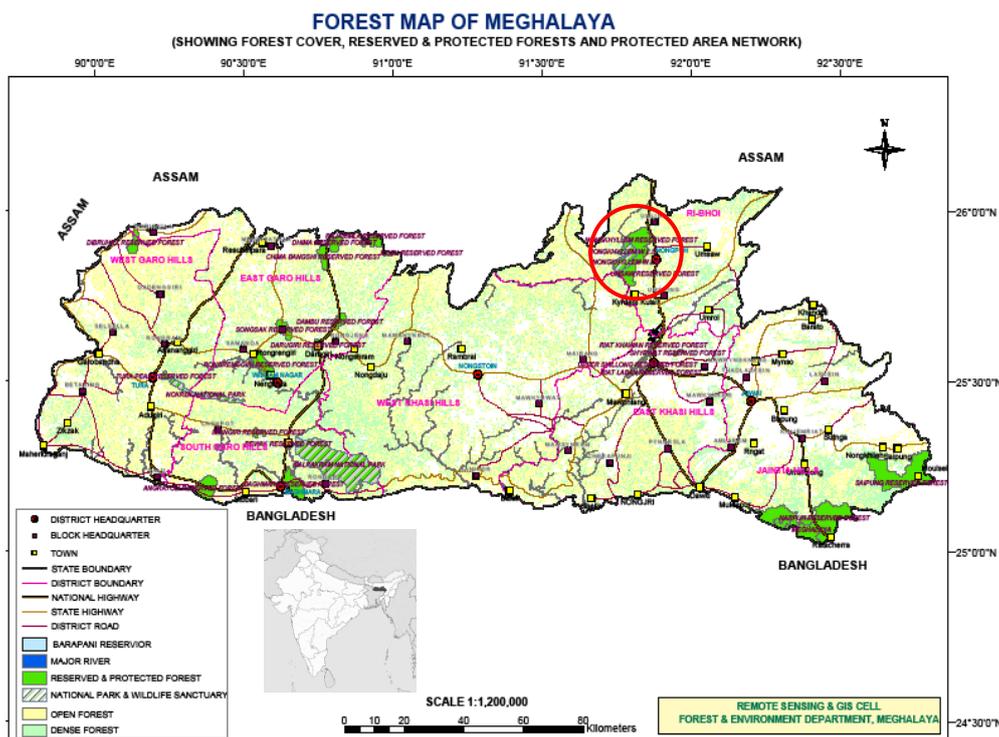


Figure 1. The study site of Nongkhylllem Reserve Forest (red circle), Nongpoh, Meghalaya, India



Figure 2. A-F: Different study places/locations along with *Khasi* people at Nongkhylllem Reserve Forest, Nongpoh, Meghalaya

In the present investigation, both direct and indirect approaches were employed to understand the traditional uses of plants properly. Information about the plants was recorded regarding their vernacular names, plant part used, the preparation of medicine either individually or in combination with other plant parts, and mode of application and dosage for the treatment.

RESULTS AND DISCUSSION

Nine survey tours were conducted to visit two forest ranges, *i.e.*, Umtasor (Ben-point, Kyrdemkulia, Mawdkhar, Pen-point, Umsaw, Zero-point) and Nongpoh (Leprosy Colony, Morok, Dipu-Sydgang, Tower point, and Umsling) for the collection of useful wild plants (see above Figures of the study site (Figure 1) and of study locations (Figure 2)).

A total of 117 plant samples of these two ranges, namely Umtasor and Nongpoh, were collected. Some of the valuable plant species of the Nongkhylllem Reserve Forest (NRF) are shown in Table 2. Enormous plant diversity exists in the Nongkhylllem Reserve forest, but only those plants specimens/samples were collected, which are being utilized by the local people directly from the wild. The locals utilize all the plants being used managed in their day-to-day life. Some of the essential plants are quoted along with their various usages (Table 2). The flowers of the *Trevesia* species of family Araliaceae found in the Mokdhor (MK) compartment are eaten by Khasi people in the Khasi hills and used to lower fever. The Juice of the root of *Holmskioldia sanguinea* Retz., a shrub in nature that belongs to the family Verbenaceae found in the compartment; the local people use Umsaw to get relief from fever. The shrub, *Solanum khasianum* of Solanaceae family, copiously found in compartment Mokdhor, is used as a vegetable, and mainly, the fruits and roots are cooked. *Costus speciosus* of family Costaceae, a shrub found in compartment Pen Point, is beneficial in urinary and earache problems. *Schima wallichii*, a common tree found in compartment Umsaw of family Theaceae, is used by the native people to cure cuts and wounds, kill intestinal worms in cattle, and kill leeches for which mainly the leaf and bark parts are used. During the survey, it was observed that as per the status of different plant parts used, stem and leaves form integral parts of most formulations while plant fibers are used in lesser quantities by local inhabitants.

The dominant top ten plant families of Nongkhylllem Reserve Forest have been shown in Figure 3. 63 families have been reported with 116 genera and 117 species. The studied families are clustered into six groups. The fimiraceae and Euphorbiaceae are in the Ist group, represented by 6 genera and 6 species each. Rubiaceae are placed in the IInd group and are characterized by 5 genera and 5 species. In group IIIrd, Acanthaceae, Fagaceae, Lauraceae, Verbenaceae, and Labiatae (Lamiaceae) are represented by 4 genera and 4 species except for 1 family, i.e., Acanthaceae is represented by 3 genera only. Five families, namely Ceasalpineaceae, Moraceae, Poaceae, Smilacaceae, and Urticaceae, are placed in group IV, eachesenting 3 genera and 3 species each. The rest 52 families are placed in Vth and VIth groups. 2 genera and 2 species represent the Vth group families except for the Magnoliaceae family with 1 genus only; all the families in the VIth group are represented by 1genus and 1 species each, respectively (see Table 3 and Figure 3).

The distribution of some collected wild useful plants of Nongkhylllem Reserve Forest is shown in Figure 4. Dicots are represented by 54 families, 101 genera, and 102 species. Monocots are represented by 5 families, 10 genera, 9 species, and the Pteridophytes with 4 families, 5 genera, and 5 species (Figure 4). Habit-wise distribution of wild valuable plant species of Nongkhylllem Reserve Forest is also shown in Figure 5. Trees are represented by 22 families, 31 genera, 32 species. Scrubs belong to 5 families, 6 genera, and 6 species, and the climbers with 5 families, 5 genera, and 7 species. Shrubs are represented by 21 families, 26 genera, and 28 species. Herbs are

represented by 27 families, 43 genera, and 44 species (Figure 5).

Enormous plant diversity exists in the Nongkhylllem Reserve forest. Still, only those plants specimens were collected, which are being utilized by the local people (*Khasi* ethnic group) directly from the wild (not domesticated) (Figures 6). Interestingly, some wild plant species like *Houttuynia cordata* Thunb., *Abroma augusta* L., *Eryngium foetidum* L., *Phlogacanthus thyriflorus* (Roxb.) Nees, *Pueraria tuberosa* L., and *Stachyterpheta jamaicensis* L. were utilized by the local *Khasi* ethnic group people inhabiting this range for their day-to-day remedies. In the course of the survey work, *H. cordata* is reported to be used by the *Khasi* community in measles, dysentery, gonorrhoea, eye troubles, skin diseases, hemorrhoids, certain gynecological disorders (Parkash and Dhungana 2011). This plant is a well-known, traditionally used medicinal material in China and Japan and is listed in the Chinese Pharmacopoeia. Recently, during the SARS outbreak, *H. cordata* was one of the ingredients in the SARS prevention formulae recognized by the Ministry of Public Health and the State Administrative Bureau of Traditional Chinese Medicine [TCM-2003] (Parkash and Dhungana 2011). Similarly, *Stachytarpheta jamaicensis*, which is cideder a weed in some other places, is used to prepare tea by the local *Khasi* community and *Thea Chinensis*. *A. augusta* L. is only found in fewer numbers around forest edge areas, so there is an urgent need to conserve this plant species in *in-situ* and *ex-situ* conditions.

It has been shown through numerous examples that the ethnic groups of Meghalaya make wide use of a large variety of wild medicinal plants available to them. The demand in the local market has increased, causing a threat to these wild plant species. Also, the genetic diversity in medicinal plants has diminished due to shifting cultivation and large-scale destruction of their natural location. The overexploitation of medicinal resources in an unscientific manner by unskilled laborers and poor natural or artificial regeneration has resulted in the virtual extinction of certain vital plant species (Kayang et al., 2005).

The data on wild medicinal plants will serve as a valuable tool to prepare development and action plan for the herbal drug industry for improving and uplifting the life and economy of the state. *In situ* and *ex-situ* conservation of endangered or likely to be endangered (rare) plant species should immediately be started in the appropriate districts of the state. Spontaneous and wild-collected plants must be limited as far as possible and should be replaced by sustainable cultivation. Rural people should be encouraged to raise their ethnomedicinal gardens or herbal gardens in their vicinity to conserve the depleting biodiversity in wild medicinal plants. Local people should be trained how to propagate, preserve and collect the medicinal plants as a part of extension and sustenance. They should be educated and provided with the proper guidelines so that there is a continuous regeneration of wild flora. Again, it is noteworthy that we should not disturb the local forest flora, which is generally susceptible to environmental changes that may lead to the extinction of natural and essential plant species.

Table 2. Some valuable wild forest plant species of Nongkhyllem Reserve Forest, Nongpoh, Meghalaya, India

Accession/ Collection No.	Botanical names	Family	Habit	Local name	Ethnic and r usage (if any)
NRF/UM/MK/01	<i>Castanopsis indica</i> (Roxb.) DC.	Fagaceae	Tree	<i>Khasi badam</i>	Fruits are edible and eaten raw by the <i>Khasi</i> people
NRF/UM/MK/02	<i>Sterculia villosa</i> Roxb.	Sterculiaceae	Tree	<i>Dieng-star</i>	Fiber and timber yielding plant species, Seeds are edible
NRF/UM/AM/03	<i>Melastoma malabathricum</i> Linn.	Melastomaceae	Shrub	<i>Dieng-soh-khing</i>	Fruits are edible, and it is speculated if this plant species are growing in any place that place is suitable for tea cultivation
NRF/UM/MK/04	<i>Curcuma pseudomontana</i> Graham	Zingiberaceae	Herb	*	Porcupines and boar eat tubers. The small almond-shaped tubers are boiled and eaten by the locals
NRF/UM/MK/05	<i>Aquilaria agallocha</i> Roxb.	Thymelaeaceae	Tree	<i>Makhi sal</i>	Used for production of agarwood
NRF/UM/MK/06	<i>Artocarpus chaplasha</i> Roxb.	Artocarpaceae	Tree	<i>Dieng-soh-ram</i>	Yields good logs and wood; seeds are edible; fruits are used as a vegetable
NRF/UM/MK/07	<i>Mussaenda frondosa</i> Sensu G. Forst., non L.	Rubiaceae	Shrub	*	Local medicinal formulations of leaves in stomach pains
NRF/UM/MK/08	<i>Garcinia Cova</i> Linn.	Clusiaceae	Tree	<i>Dieng-soh-longkor</i>	The acidic fruits are locally used to cure dysentery and stomach trouble, usually dried and preserved. Wild elephants also relish the fruits.
NRF/UM/MK/09	<i>Shorea asamica</i> C.F. Gaertn.	Dipterocarpaceae	Tree	<i>Dieng-blei (K), Borsal, Borsal (G)</i>	Timber-yielding and resin yielding plant species
NRF/UM/MK/10	<i>Smilax hispida</i> Muhl.	Smilacaceae	Shrub	*	Shoot pounded, fermented, extracted, and sun-dried for off-season use by <i>Khasi</i> and <i>Jaintia</i> ethnic group
NRF/UM/MK/11	<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Tree	<i>Dieng-sohmylleng (K)</i>	Fruits are edible, medicinal uses in the powder used in stomach pain and constipation.
NRF/UM/MK/12	<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	Tree	<i>Dieng-lang-sing (K)</i>	Timber yielding, used by locals as gum and fiber yielding plant species
NRF/UM/MK/13	<i>Solanum khasianum</i> C.B. Clarke	Solanaceae	Shrub	*	Fruits/berries are used as vegetables. Roots are also used for curing fungal infections on the skin.
NRF/UM/MK/14	<i>Sida cordifolia</i> Linn.	Malvaceae	Shrub	*	The plant is used in curing asthma by applying a paste made with the whole plant, pepper, and garlic over the body
NRF/UM/MK/15	<i>Solanum torvum</i> Sw.	Solanaceae	Shrub	<i>Katahi Bengelrgetable</i>	Fruits are edible raw, green fruits as a local vegetable; dried fruits yield powder (<i>churana</i>) used for digestion
NRF/UM/MK/16	<i>Asplenium nidus</i> Linn.	Aspleniaceae	Herb	*	The sprouts are eaten as a vegetable. Used as food plants by the larvae of some insect /butterfly species
NRF/UM/MK/17	<i>Mesua ferrea</i> Linn.	Clusiaceae	Tree	<i>Dieng-ngai (K), Khimdi (G)</i>	Fresh flowers are used medically mainly in itching, nausea, piles, excessive thirst, and sweating by the locals
NRF/UM/MK/18	<i>Spilanthes paniculata</i> Linn.	Asteraceae	Herb	*	Flowers and seeds are used in the toothache of children.
NRF/UM/MK/19	<i>Eryngium foetidum</i> Linn.	Apiaceae	Herb	<i>Dhania-khlaw</i>	Leaves used as a spice, it is also known as wild coriander and utilized in local vegetable preparation
NRF/UM/MK/20	<i>Polystichium braunii</i> Spenner	Dryopteridaceae	Herb	*	Young shoots are used as a v by the <i>Khasi</i> people
NRF/UM/MK/21	<i>Polypodium vulgare</i> Linn.	Polypodiaceae	Herb	*	Young shoots are used as a vegetable by the <i>Khasi</i> people
NRF/UM/MK/22	<i>Pteridium aquilinum</i> (L.) Kuhn.	Dennstaedtiaceae	Herb	*	Tender fronds are cooked in oil, sold in the local market by the <i>Khasi</i> people
NRF/UM/MK/23	<i>Alpinia allughas</i> (Retz.) Rose	Zingiberaceae	Shrub	<i>Tara</i>	The inner portion of the aerial parts (pith) is cooked as a vegetable and curry for flavoring. The rhizome is used and cooked, has been traditionally acclaimed as a remedy for intestinal infections

NRF/UM/US/24	<i>Callicarpa arborea</i> Roxb.	Verbenaceae	Tree	<i>Lakhiat</i>	Leaf, stem, and bark medicinal; leaf juice in fever, gastric diseases, giddiness, headache; bark in skin diseases and scorpion sting, carminative and used in cutaneous diseases
NRF/UM/US/25	<i>Thysanoleana maxima</i> (Roxb.) O. Ktze	Poaceae	Shrub	<i>Jhadu</i>	Inflorescence/Terminal twig is used in local broom-making /purpose
NRF/UM/US/26	<i>Manihot esculanta</i> Herm.	Euphorbiaceae	Scrub	*	The tapioca plant, extensively cultivated in in <i>Jhum</i> lands in <i>Khasi</i> hills for root tuber harvesting for local vegetable and staple food
NRF/UM/US/27	<i>Ficus glomerata</i> Linn.	Moraceae	Tree	<i>Tejmuri (Assamese)</i>	Fruits are edible and are eaten raw
NRF/UM/US/28	<i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC.	Papilionaceae	Climber	*	Root/tubers are of medicinal value and used against bodily debility; root paste is applied on joint pains
NRF/UM/US/29	<i>Pteris cretica</i> Linn.	Adiantaceae	Herb	*	The leaves are used in skin inflammation and irritation. Also, in Phytoremediation and as an ornamental plant
NRF/UM/US/30	<i>Cocculus hirsutus</i> Linn.	Menispermaceae	Climber	*	An infusion of the leaves is used to treat stomachache. Root and stem are used in the treatment of fever
NRF/UM/US/31	<i>Nephrodium hirsutum</i> C.Presl.	Dryopteridaceae	Herb	*	Extract of leaves is used for the treatment of fungal infections
NRF/UM/US/32	<i>Adiantum tenerum</i> Sw.	Pteridaceae	Herb	*	The fronds are used as a garnish on dishes and dried fronds in local tea preparation
NRF/UM/ZP/33	<i>Bridelia retusa</i> Spreng.	Euphorbiaceae	Scrub	<i>Jati</i>	Used as biological control of pests by attracting predators in <i>Jhum</i> lands
NRF/UM/ZP/34	<i>Mimosa himalayensis</i> Gamble	Mimosaceae	Shrub	<i>Sohshih</i>	The bark is used for fish poisoning by the local people during fishing
NRF/UM/ZP/35	<i>Crotolaria alata</i> Buch.-Ham. ex D.Don	Fabaceae	Herb	<i>Turin</i>	Fodder plant for grazing animals and milk yielding
NRF/UM/ZP/36	<i>Castonopsis concinna</i> (Champ. ex Benth.) A.DC.	Fagaceae	Tree	<i>Sohot</i>	Timber yielding plant species, the fruits/nuts are edible and eaten raw by the local people
NRF/UM/ZP/37	<i>Boechmeria macrophylla</i> Hornem	Urticaceae	Shrub	<i>Sohbyrthid</i>	Fiber yielding plant species and leaves extract used in skin allergy and irritation
NRF/UM/ZP/38	<i>Uncaria rhynchophylla</i> Schreb.	Rubiaceae	Climber	<i>Jermi</i>	The dried roots are used in local remedies of epilepsy, head pain, and dizziness. Used as a herbal medicine
NRF/UM/ZP/39	<i>Festuca pratensis</i> Huds.	Poaceae	Herb	*	Used as fodder grass species in more milk yield and also as an avenue grass species along riversides
NRF/UM/ZP/40	<i>Leea indica</i> (Burm.) Merr.	Lauraceae	Shrub	<i>Pharun-barne</i>	Fiber-yielding plant species. The plant is used as a remedy for ailments such as diarrhea, dysentery, diabetes, body ache, and wound treatment by the local people
NRF/UM/ZP/41	<i>Duabanga grandiflora</i> Roxb. ex DC.	Sonneratiaceae	Tree	<i>Dieng-bai</i>	Timber yielding plant species, especially for plywood manufacturing
NRF/UM/ZP/42	<i>Boechmeria nivea</i> Hk. Et Arn.	Urticaceae	Shrub	*	Fiber yielding plant species and leaves extract used in skin allergy and irritation
NRF/UM/ZP/43	<i>Begonia crenata</i> Linn.	Begoniaceae	Herb	<i>Jajew</i>	Wholevegetable plant is used in urination problems/disorders
NRF/UM/KK/44	<i>Dioscorea bulbifera</i> Linn.	Dioscoreaceae	Climber	<i>Sohksiew</i>	Species of Dioscorea are used as local vegetable preparation
NRF/UM/PP/45	<i>Costos speciosa</i> (Koenig) Smith	Costaceae	Shrub	*	Used in urinary problem and ear-ache by the local/ ethnic group people
NRF/UM/MK/46	<i>Crotolaria juncia</i> Linn.	Leguminosae	Shrub	*	Fodder plant for grazing animals for yielding more milk
NRF/UM/US/47	<i>Elephantopus scaber</i> Linn.	Asteraceae	Herb	*	The aqueous extract is consumed orally to induce abortion and treat urinary disorders. Used as a contraceptive by the ethnic group women
NRF/UM/US/48	<i>Richardia scabra</i> Linn.	Rubiaceae	Herb	*	Roots are used in lowering body temperature and amoebic dysentery
NRF/UM/US/49	<i>Zanthoxylum armatum</i> DC	Rutaceae	Scrub	<i>Dieng-sohkhlam (K), Dieng-jaiur (J)</i>	Young branches used as tooth-brush, stomach pains, young twig sprouts are used in making local <i>chutney</i>

NRF/UM/US/50	<i>Abrus fruticulosus</i> W.& A.	Fabaceae	Shrub	*	The seeds are used in the treatment of bodily infirmity. Used in piles also, the seed powder is used with milk early in the morning for the more vibrant condition of the body
NRF/UM/US/51	<i>Holmskioldia sanguinea</i> Retz	Verbenaceae	Shrub	*	Juice of roots is taken to relieve fever and bodily ebb
NRF/UM/US/52	<i>Semecarpus anacardium</i> Linn. f.	Anacardiaceae	Tree	*	Pseudocarp eaten raw or roasted, nut used medicinally as a source of Vitamin K, the nuts are used as body vitalizer
NRF/UM/US/53	<i>Hyptis suaveolens</i> (Linn.) Poit.	Lamiaceae	Herb	<i>Bontulsi</i>	Young twigs and leaves are used against skin diseases
NRF/UM/US/54	<i>Schima wallichii</i> (DC.) Korth.	Theaceae	Tree	<i>Dieng-nganbuit</i>	Bark, leaf medicinal; leaf paste on cuts and wounds; leaf decoction to cure flatulence; powdered bark to cattle to kill intestinal worms and leaches
NRF/UM/BP/55	<i>Leucas cephalotes</i> (Roth) Spreng.	Lamiaceae	Herb	*	The whole plant is used as an edible vegetable and herbal remedy for skin eruption
NRF/UM/BP/56	<i>Bidens pilosa</i> Linn.	Asteraceae	Herb	*	The whole plant is applied to a fresh wound and cut for healing
NRF/UM/BP/57	<i>Phyllanthus glaucus</i> Wall. Ex Mull.Arg.	Phyllanthaceae	Shrub	*	Plant extract is used to relieve stomach indigestion
NRF/UM/BP/58	<i>Dicliptera paniculata</i> Forssk.	Acanthaceae	Herb	*	The plant is used as a good forage for cattle for yielding more milk; the whole plant is used as a green manure
NRF/UM/BP/59	<i>Lepidagathis hyaline</i> Nees	Acanthaceae	Herb	*	The leaves decoction are used for reducing fever, and the flowering ash mixed with coconut oil is used for external application for inflammation, wound healing by <i>Khasi</i> people
NRF/UM/BP/60	<i>Achyranthes aspera</i> Linn.	Amaranthaceae	Herb	*	Leaves are used for curing cuts and wounds by sickles and axes
NRF/UM/BP/61	<i>Urena picta</i> Linn.	Malvaceae	Herb	*	Paste of fresh leaves is applied for swelling, bone fracture, and joint pains
NRF/UM/BP/62	<i>Selaginella exalta</i> (Kunze) Spring.	Selaginellaceae	Herb	*	The whole plant is used in the treatment of seasonal sneezing, colds, and coughs
NRF/UM/US/63	<i>Carissa spinarum</i> Linn.	Apocynaceae	Shrub	*	Fruits are either eaten raw or prepared of pickle and jam
NRF/UM/US/64	<i>Pteris umbrosa</i> R.Br.	Adiantaceae	Herb	*	Local people use the plants in their household yards for soil stabilization and also as ornamental plant species
NRF/UM/US/65	<i>Crepis japonica</i> (L.) Benth.	Asteraceae	Herb	*	Extract of fresh leaves is used as traditional ear drop (2-3 drops 3 to 4 times a day as per local hermit).
NRF/UM/US/66	<i>Hypoestes aristata</i> (Vahl) Sol. ex R.Br.	Labiatae	Herb	*	Leaf juice is orally administered in Jaundice by the ethnic group people
NRF/UM/US/67	<i>Salix psilostigma</i> Andersson	Salicaceae	Tree	*	Timber yielding plant and used for firewood. The decoction of the leaves or bark has also been used as an antihelmintic and vermifuge traditional remedy
NRF/UM/US/68	<i>Uncaria sessilifructus</i> Wall. ex Roxb.	Rubiaceae	Climber	*	The leaves extract is used as an emetic tonic if consumed overdosed
NRF/UM/US/69	<i>Macaranga denticulata</i> Muell.Arg.	Euphorbiaceae	Tree	<i>Dieng-lakhor</i>	Stem juice is helpful in skin diseases, cuts, and wounds. Also considered a religious/venerated tree and planted in temple yards
NRF/UM/US/70	<i>Phlogacanthus thyrsoiflorus</i> (Roxb.) Nees	Acanthaceae	Shrub	<i>Tadang-kakseu,</i> <i>Dieng-soh-kajut</i>	Local people use leaves and flowers. The flowers are used in the treatment of diabetes.
NRF/UM/US/71	<i>Ficus elastica</i> Roxb. ex Hornem	Moraceae	Tree	<i>Dieng-jri (K),</i> <i>Phrap-ramkhet (G)</i>	The bark of the tree is used in the treatment of muscle and joint pain administered by village medicine-man
NRF/NP/LC/72	<i>Salix daphnoides</i> Vill.	Salicaceae	Tree	<i>Padem-dieng</i>	Timber yielding plant and used for firewood
NRF/NP/LC/73	<i>Elaeocarpus floribundus</i> Bl.	Elaeocarpaceae	Shrub	<i>Lamsuvegetable</i>	Fruits are edible, usually pickled and cooked. The seeds are used in the preparation of beaded necklaces/jewelry/rosary
NRF/NP/LC/74	<i>Alangium platanifolium</i> Linn.	Alangiaceae	Scrub	<i>Lobong-kakseu</i>	The leaves and the bark of the root are used as an insecticide in seed keeping in containers

NRF/NP/LC/75	<i>Toona ciliata</i> Roem.	Meliaceae	Tree	<i>Dieng-Sali</i>	Timber yielding plant and the bark is used for tanning leather and has been traditionally used in joint pains
NRF/NP/LC/76	<i>Litsea glutinosa</i> C.B. Roxb.	Lauraceae	Scrub	*	Used as firewood, fruits are edible for their pulp, the bark is wrapped on bone fractures with the help of a bandage for healing
NRF/NP/LC/77	<i>Paspalidium flavidum</i> Stapf.	Poaceae	Herb	<i>Tuilaasu bon</i>	The grass species is planted alongside ravines for controlling erosion; seeds are eaten raw.
NRF/NP/LC/78	<i>Dendrocalamus hamiltonii</i> Nees & Arn. ex Murno	Poaceae	Herb	<i>Dieng-Seij-lai</i>	The shoot is used for making soup by the locals
NRF/NP/LC/79	<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees & Nees	Lauraceae	Tree	<i>Dieng-syiem</i>	Leaves are used as a local spice; the leave is put in local tea in the making of local tea <i>Kadah</i>
NRF/NP/LC/80	<i>Eheretia laevis</i> Roxb.	Boraginaceae	Shrub	*	Yield good timber for construction. Leaves provide fodder for yielding more milk
NRF/NP/LC/81	<i>Cyperus involvulatus</i> Linn.	Cyperaceae	Herb	*	Used for making house plants, beds, and borders, containers, pools and ponds, flower arrangements, roots are used in high fever and poor digestion
NRF/NP/LC/82	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Tree	<i>Dieng-sohkhloru (K)</i>	Local people eat seeds to cure gastric problems and stomach disorders. The fruits are used in piles, dropsy, leprosy, and headache
NRF/NP/LC/83	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	Tree	*	The bark is used medicinally for curing gastric problems and stomach disorders; the bark for blood pressure.
NRF/NP/LC/84	<i>Smilax aspera</i> Linn.	Smilacaceae	Climber	*	Planted in front of the house to protect from evil sight. The twig is used as a vegetable
NRF/NP/LC/85	<i>Michelia champaca</i> Linn.	Magnoliaceae	Tree	<i>Shap (K)</i>	Wood is durable, used in furniture and building works, the flowers are used in temples and for fragrance
NRF/NP/LC/86	<i>Tectona grandis</i> Linn.	Verbenaceae	Tree	<i>Dieng-rang</i>	Timber yielding plant species, flowers are acrid, bitter, and valuable in bronchitis, biliousness, urinary discharges
NRF/NP/LC/87	<i>Chlorophytum comosum</i> Thunb.	Liliaceae	Herb	*	Twigs cooked as a vegetable, the tuberous roots are used in bodily debility
NRF/NP/LC/88	<i>Amorphophallus</i> species Blume ex Decne.	Araceae	Herb	*	Corms are cooked as local vegetable/ preparation
NRF/NP/LC/89	<i>Impatiens balsamina</i> Linn.	Balsaminaceae	Herb	*	Leaves are used for yielding dye and are pasted on hands during the rainy season for hand and feet inflammation
NRF/NP/LC/90	<i>Boechmeria platyphylla</i> Buch.-Ham. ex D.Don	Urticaceae	Herb	*	Fiber yielding plant species and used in skin allergy and irritation
NRF/NP/LC/91	<i>Peperomia pellucida</i> (Linn.) Kunth	Piperaceae	Herb	*	Leaves used in stomach pain and as a local vegetable/preparation
NRF/NP/LC/92	<i>Centella asiatica</i> (Linn.) Urban	Apiaceae	Herb	<i>Badmaina</i>	Useful in stomach disorder, used as a brain tonic and act against conjunctivitis and eye irritation
NRF/UM/US/93	<i>Abroma augusta</i> (Linn.) Linn. f.	Sterculiaceae	Scrub	<i>Dieng-tyrkhum</i>	The root bark is used as an emmenagogue and uterine tonic. The powdered root is an abortifacient and anti-fertility agent. Used in intra-uterine diseases and other gynecological disorders
NRF/UM/US/ 94	<i>Houttuynia cordata</i> Thunb.	Saururaceae	Herb	<i>Ja-myrdoh</i>	Leaves are used as spice and roots, and leaves are used for <i>chutney</i> preparation.
NRF/NP/TP/95	<i>Bauhinia purpurea</i> Linn.	Cesalpiniaceae	Shrub	<i>Dieng-long (K) Bol -Megong(G)</i>	Stem warts are edible; Leaves are used as fodder for milk yield
NRF/NP/TP/96	<i>Ficus palmata</i> Linn.	Moraceae	Tree	*	Fruits are edible raw, the closed flowers/fruits are dried and moistened with water and taken for stomach pain early in the morning
NRF/NP/TP/97	<i>Phyllanthus fatraenus</i> Linn.	Phyllanthaceae	Herb	*	Plant extract is used to relieve stomach indigestion

NRF/NP/TP/98	<i>Clerodendrum serratum</i> Linn.	Verbenaceae	Shrub	*	Flowers are of medicinal value and taken during fever and as a local vegetable/preparation
NRF/NP/TP/99	<i>Cassia obtusifolia</i> (L.) Irwin & Barneby	Caesalpinaceae	Shrub	<i>Amoora</i>	Leaves used as fodder; pulp as purgative and is much relished by deer and goats
NRF/NP/TP/100	<i>Roylea cineria</i> (D. Don) Baillon	Labiatae	Shrub	*	Medicinally used for the treatment of jaundice, skin diseases, malaria, diabetes, febrifuge, and contusions
NRF/NP/TP/101	<i>Grewia abutifolia</i> Linn.	Tiliaceae	Shrub	*	Fruits and roots are used in diarrhea, dysentery, wounds. The bark is astringent, expectorant, and used in cough, skin diseases, clearing hair by local women
NRF/NP/TP/102	<i>Cassia occidentalis</i> Linn.	Caesalpinaceae	Shrub	*	Used in local remedies for skin and hand eruption/disease
NRF/NP/TP/103	<i>Selaginella velutina</i> Ces.	Selaginellaceae	Herb	*	Plants were placed on the head as a headache remedy, or were boiled in water and then strained, cooled liquid used as a medicinal eyewash
NRF/NP/MO/104	<i>Trevesia palmata</i> Roxb.	Araliaceae	Tree	<i>Phunlut</i> , Dieng-Soh-khyntur	The flowers are eaten in Garo hills and are used for fever
NRF/NP/MO/105	<i>Phoebe attenuata</i> Nees	Lauraceae	Tree	<i>Bonsum</i>	Yields straight boiled, good quality timber, which is a substitute for Teak wood in the local area
NRF/NP/MO/106	<i>Celtis orientalis</i> Linn.	Ulmaceae	Tree	*	Fodder plant and used for more milk yield by cattle, the fruits are fermented to get local vinegar (<i>Sirka</i>)
NRF/NP/MO/107	<i>Caryota urens</i> Linn.	Arecaceae	Tree	<i>Dieng-klai</i>	Stem pith boiled, mixed with rice, and cooked for getting a local drink (liquor)
NRF/NP/MO/108	<i>Smilax zeylanica</i> Linn.	Smilacaceae	Climber	*	Leaves are used during labor pain and fever in children
NRF/NP/MO/109	<i>Dicliptera cuneata</i> Juss.	Acanthaceae	Herb	*	The plant species is a good forage and used to have more milk
NRF/NP/MO/110	<i>Celastrus paniculatus</i> Willd.	Celastraceae	Herb	*	The seeds are crushed to get oil which issued in joint pains and leg and temple pain
NRF/NP/MO/111	<i>Albizia chinensis</i> (Osborne) Merr.	Leguminosae	Tree	*	Wood is used for house construction purposes, furniture, and firewood; a gum of low quality is extracted from the bark mixed with other gums and used as an extender and termite repellent
NRF/NP/MO/112	<i>Rubia cordifolia</i> Linn.	Rubiaceae	Shrub	*	Extract from plant roots are used in skin disease, irritation, and also in high fever
NRF/NP/MO/113	<i>Commelina erecta</i> Linn.	Commelinaceae	Herb	*	Leaves cooked as a v by local people for stomach pains
NRF/NP/MO/114	<i>Michelia excelsa</i> Wall.	Magnoliaceae	Tree	*	Wood is durable, used in furniture and building works, plant species are used in shifting cultivation
NRF/NP/MO/115	<i>Indigofera hebeptala</i> (Benth)	Fabaceae	Shrub	*	Flowers are used for yielding dye by local people
NRF/NP/DS/116	<i>Rubus indicus</i> Thunb.	Rosaceae	Shrub	<i>Soh-piro</i>	Ripe fruits are eaten raw
NRF/NP/DS/117	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	Asteraceae	Herb	*	Leaf paste is applied on cuts and wounds for healing

Table 3. List of dominant Plant families of Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India

Family	Genera	Species	Group	
Asteraceae	6	6	I	
Euphorbiaceae	6	6		
Rubiaceae	5	5	II	
Acanthaceae	3	4		
Fagaceae	4	4	III	
Lauraceae	4	4		
Verbenaceae	4	4	IV	
Labiatae (Lamiaceae)	4	4		
Cesalpiniaceae	3	3		
Moraceae	3	3		
Poaceae	3	3		
Smilacaceae	3	3		
Urticaceae	3	3		
Adiantaceae	2	2		V
Apiaceae	2	2		
Araceae	2	2		
Clusiaceae	2	2		
Combretaceae	2	2		
Cyperaceae	2	2		
Dryopteridaceae	2	2		
Leguminosae	2	2		
Magnoliaceae	1	2		
Malvaceae	2	2		
Polygonaceae	2	2		
Salicaceae	2	2		
Selaginellaceae	2	2		
Solanaceae	2	2		
Sterculiaceae	2	2		
Zingiberaceae	2	2		
Alangiaceae	1	1		
Amaranthaceae	1	1		
Anacardiaceae	1	1		
Apocynaceae	1	1		
Araliaceae	1	1		
Artocarpaceae	1	1		
Aspleniaceae	1	1		
Balsaminaceae	1	1		
Boraginaceae	1	1		
Celastraceae	1	1		
Commelinaceae	1	1		
Costaceae	1	1		
Dennstaedtiaceae	1	1		
Dioscoriaceaevegetable	1	1		
Dipterocarpaceae	1	1		
Elaeocarpaceae	1	1		
Liliaceae	1	1		
Lythraceae	1	1		
Melastomaceae	1	1		
Meliaceae	1	1		
Menispermaceae	1	1		
Mimosaceae	1	1		
Papilionaceae	1	1		
Piperaceae	1	1		
Polypodiaceae	1	1		
Pteridaceae	1	1		
Rosaceae	1	1		
Rutaceae	1	1		
Saururaceae	1	1		
Sonneratiaceae	1	1		
Theaceae	1	1		
Thymelaeaceae	1	1		
Tiliaceae	1	1		
Ulmaceae	1	1		
Total	116	117	6	

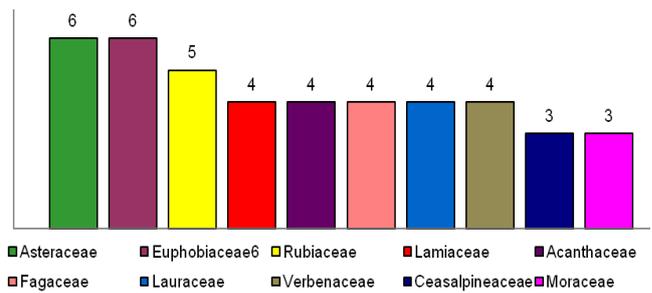


Figure 3. Top ten dominating plant families in Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India

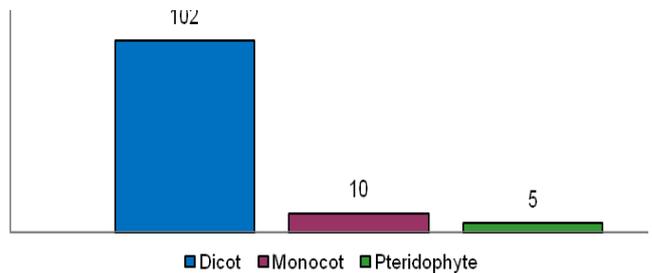


Figure 4. Distribution of some valuable wild plant species in Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India

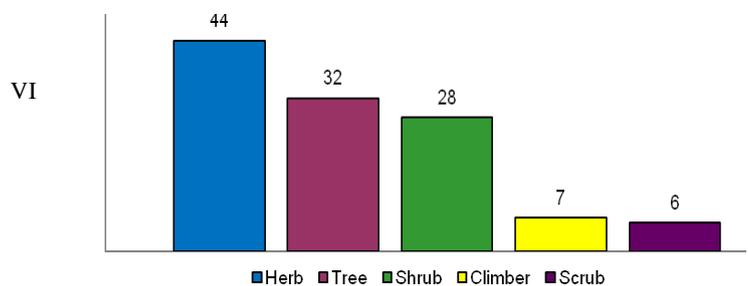


Figure 5. Habit wise distribution of some beneficial wild plant species in Nongkhylllem Reserve Forest, Nongpoh, Meghalaya, India

Considering the importance of natural forest plant species, the present investigation was carried out to see the endomycorrhizal association and diversity from the rhizospheres of the wild forest plant species and exploit them for better quality stock production *vis-a-vis* their conservation. The endomycorrhizal association and diversity from the rhizospheres of the wild forest plant species have been published (Parkash 2020). Hence, only the ethnic perspective on wild forest plant species of Nongkhylllem Reserve has been published, and also Forest, Nongpoh, has been discussed in this manuscript.

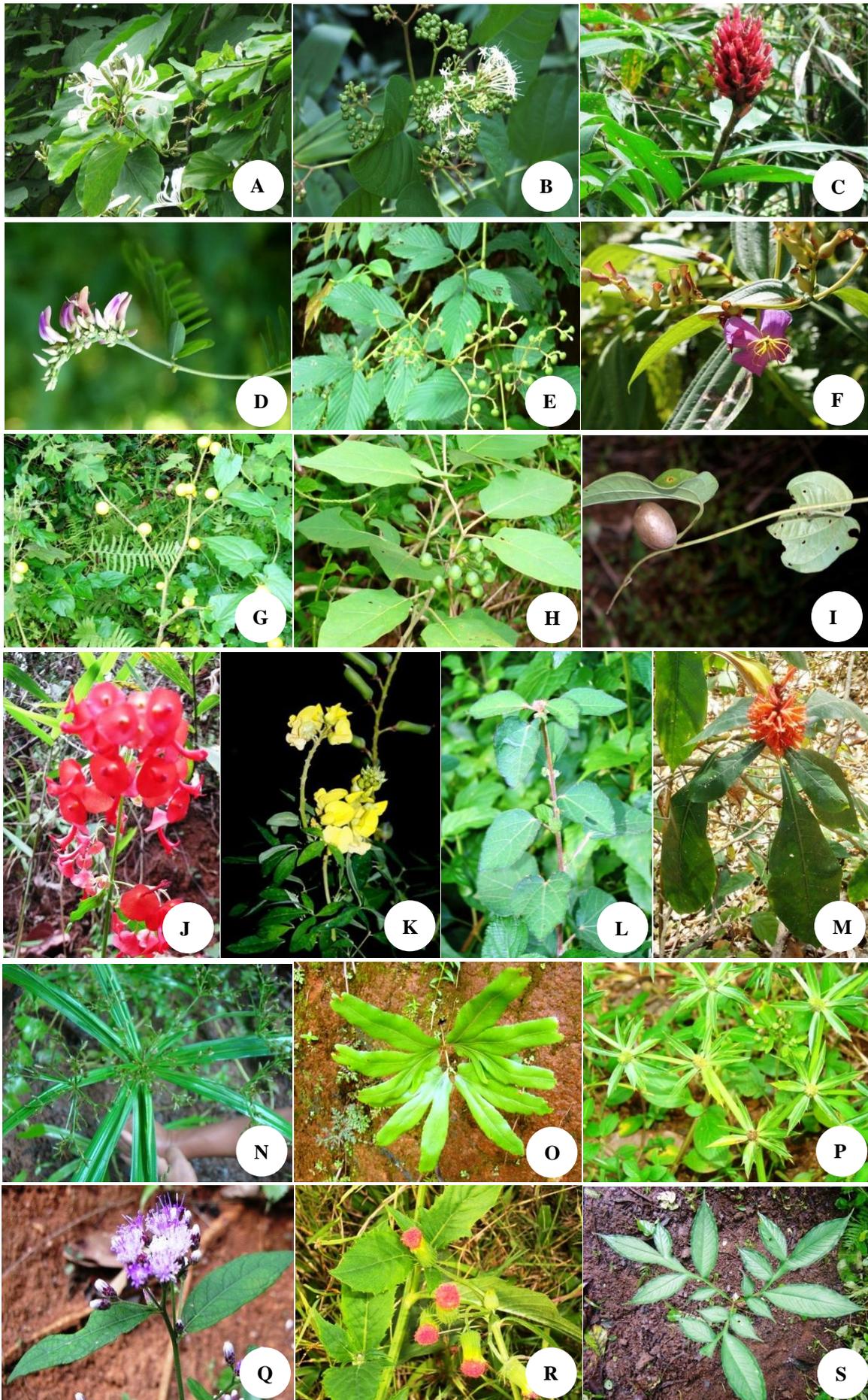




Figure 6. A. *Bauhinia purpurea*, B. *Clerodendrum coelebrioides*, C. *Costos speciosa*, D. *Indigofera hebeptala*, E. *Leea sambuciana*, F. *Melastoma malabathricum*, G. *Solanum khasianum*, H. *Solanum turbum* I. *Dioscorea bulbifera*, J. *Holmskioldia sanguinea*, K. *Croton juncea*, L. *Sida cordifolia*, M. *Phlogacanthus thyrsoiflorus*, N. *Cyperus involcuratus*, dwarf umbrella sedge, O. *Pteris cretica* (Ribbon fern), P. *Eryngium foetidum*, Q. *Hypoestis* species, R. *Crassocephalus crepidioides*, S. *Amorphophallus Blume ex Decne*, T. *Impatiens balsamina*, U. *Leucas cephalotus*, V. *Peperomia pellucida*, W. *Nephrodium* species, X. *Polypodium* sp., Y. *Selaginella exalta*, Z. *Adiantum tenerum*, AA. *Elephantopus scaber*, AB. *Polystichium* species

In conclusion, the baseline information generated from this study on wild forest plant species usage by the *Khasi* ethnic group needs a thorough scientific and additional phytochemical investigation. The ethnic groups have good knowledge of medicinal plants and their traditional conservation of plant species. Therefore, the knowledge on depleting wild and natural plant resources could help create mass awareness regarding the need to preserve plants and promote ethno-medico-botany expertise within the region. Traditional knowledge contributes to protecting and conserving those wild economically important plant species that are nearing their threshold. We must conserve our floral and faunal diversity before they are lost irrevocably.

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