

REVIEW ARTICLE

A review on diversity of floristic elements in the Indian state of Arunachal Pradesh

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Abstract

The present review deals with the floristic accounts, diversity elements and statistics of the flora of Arunachal Pradesh from earlier period of 1820 to 2023. This study revealed the richness and representativeness of the rare and endemic flora of the state which accounts for nearly 32.86% of the total flora of the state. The study also highlighted vital statistics of angiosperm, gymnosperm, fern and fern allies, botanically curious plants, phytogeographical affinities, medicinal and economic plants, and also suggested need for accelerating focused exploratory research and conservation efforts, as many species have been identified under threat category due to habitat loss triggered by anthropogenic activities. The results of this review provide deep insight into the floristic diversity of Arunachal Pradesh which will aid in accelerating further exploratory and applied research for the improvement of effective conservation policies to upscale ecosystem resilience and sustainable economic utilization of plant bioresources.

Keywords: Floristic Diversity; Arunachal Pradesh; Endemism; Data; Floristic Elements; Conservation

1. Introduction

The Indian state of Arunachal Pradesh is located in the East Himalayan Hotspot and it has been recognized as one of the top 12 global biodiversity hotspot region primarily on the basis of rich biological resources with exceptional concentration of rare, threatened and endemic taxa found in diverse ecological habitats (Myers et al., 2000). It has been reported to have high degree of endemism and a disproportionately higher prevalence of endangered and rare taxa. The state has exceptionally rich, diverse and luxuriant growth of flora, as well as a gene pool of both wild and cultivated plant species. The prevalence of primitive plant taxa and wild relatives of cultivated plants truly justify the designation assigned by Takhtajan (1969) as "cradle of flowering plants" and "biogeographical gateway" of biological resources. Arunachal Pradesh has been regarded as one of the important biogeographic states in India due to its unusual abundance of diverse floristic elements found in a diverse ecological habitats (Jain, 1990). Arunachal Pradesh has a rich and intriguing vegetation pattern because of its unique phytogeographical position, undulating terrain, steep mountainous ranges, and deep valleys, along with a broad range of climate and soil types. These factors have all contributed to the establishment of diverse ecological habitats which defines the endemism range of floristic elements in the region.

In the early 19th century, a number of European explorers and botanists had made sporadic trips to the North East Frontier region of Assam which include present Arunachal Pradesh (Buchanan-Hamilton, 1820; Roxburgh, 1820–24; Griffith, 1847; Hooker, 1854, 1872–1897; Hooker and Thomson, 1855; Clarke, 1889; Burkill, 1924–1925, 1965; Kingdom Ward, 1929, 1960). Mishmi Hills were visited by Lieutenant R. Wilcox (1828) and Captain Bedford as part of their study of Assam and the surrounding nations in response to geographic discoveries in the N.E. Frontier (1825–1828) (Figure 1), but it was William Griffith (1847) who first conducted botanical expedition and documented floristic elements of the region. His work was based on the specimens he gathered between October and December of 1836 by roughly following Wilcox and Bedford's

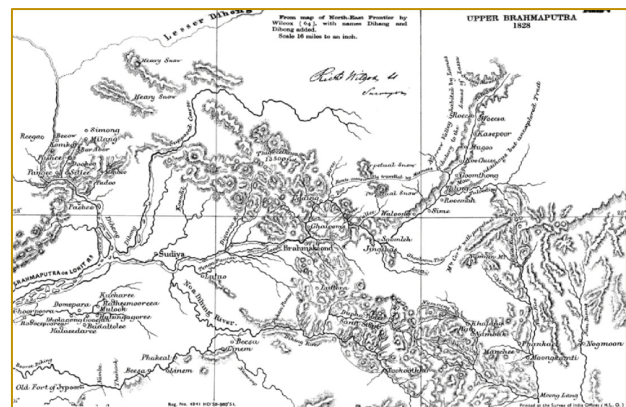


Figure 1. Map prepared by Lt. Richard Wilcox for the Upper Brahmaputra - India's North East Frontier in 1828 (adopted from R.H. Phillimore (eds.) *Historical Records of the Survey of India*, Vol. 3: 1815–1830 (1954); Survey of India, Dehra Dun).

path. Earlier, Thomas J. Booth (1840–1850) conducted horticultural plant expeditions from Biswanath in Assam to the "Daphlas" (Nyishi Hill region) in the southeast of Bhutan, and he reported few *Rhododendron* species from the region (Nuttall, 1853). Robinson (1841), however, he provided the first floristic description of the area in 1841. Additionally, Hooker (1854 and 1906) provided a fairly thorough assessment of the region's floristic elements. The plant explorations in Arunachal region had gained it momentum in the 20th century, leading to the publication of some significant floristic accounts of the region, including *The Flora of Aka Hills* by Biswas (1941), based on the collections of N. L. Bor (1938) and *The Botany of Abor Expedition* by I.H. Burkill (1924–25), as well as *Botanical Expedition in the Mishmi Hills* by British Botanist Francis Kingdom-Ward (1929) and *A Sketch of the Vegetation of Aka*, and publication of the *Flora of Assam* (Vol. 1-

5), which provides a first-hand account of the flora and vegetation of Assam by Kanjilal et al (1934 and 1940). Although the *Flora of Assam* focuses more on woody dicotyledonous plants, it is nonetheless recognised as a significant floristic account of the North East India to date.

Following the reorganisation of the Botanical Survey of India and the establishment of the Eastern Circle of BSI at Shillong in December 1955, and the subsequent establishment of BSI Arunachal Field Station at Itanagar in July 1977, extensive exploration activities were carried out by several botanists in different district of Arunachal Pradesh and the North East India. Several tour reports and floristic accounts were published by Panigrahi and Naik (1961, 1965, 1966), Rao and Panigrahi (1961), Rao and Joseph (1965), Panigrahi and Joseph (1966), Sastry (1966), Panigrahi and Kar (1967), Joseph (1975, 1981), Rao and Ahuja (1969), Sahni (1969), Rao (1972), Rao and Deori (1980), Rao and Hajra (1973, 1976), Rao and Murti (1990), Rao (1994) etc. *A Contribution to the Flora of Namdapha, Arunachal Pradesh (Chauhan et al., 1996); Materials for the Flora of Arunachal Pradesh, Vol. 1-3 (ed. Hajra et al., 1996); Orchidaceae of Arunachal Pradesh (Check list) (Chowdhury and Pal, 1997) and Orchid Flora of Arunachal Pradesh (Chowdhury, 1998); Flora of Lower Subansiri District (Pal, 2013); Flora of Kurung Kumey District (Dash and Singh, 2017)* are among the major contributions made by the botanists of the BSI Arunachal Pradesh Regional Centre besides numerous reports of new species and new records for India. The State Forest Research Institute of Arunachal Pradesh and the Forest Research Institute in Dehradun have also made substantial contributions which aids to the understanding of the diversity of floristics elements, in addition to these regional and local flora.

2. Materials and methods used in present review

Present review used botanical expedition reports, flora, monographs, manual, journal articles and tour memoirs of the European Botanists archived in both online and hard copies which dating back from early period of 1820 during colonial era to some key publications of the Botanical Survey of India from 1955 - 2023. Apart from consulting BSI literatures, we also consulted the regional flora, monographs, manuals and journal articles published by various workers of India who have made significant contribution in understanding general flora, ethno and economic botany of Arunachal Himalayan region. Accepted name of the plant species were verified in POWO (<https://powo.science.kew.org/>). Statistical data were compiled using Microsoft excel and key observation and findings are presented in graphs and tabulated form and the future research prospects are also discussed.

3. Vegetation

The diverse climatic conditions along different altitudinal gradient have considerable influence on the growth and proliferation of plant diversity in the state of Arunachal Pradesh. The state is renowned for its lush rainforest and diverse vegetation, having an ecology that spans from a tropical zone to snow-capped alpine highlands. Approximately 80% of the state's total land area is covered by forests. Despite of being threatened by several biotic and abiotic forces, the majority of the region is still under primary

forest coverage. The distinctive three-storeyed vegetation structure, particularly in the tropical and subtropical belts, is one of its most notable features, with shrubs and small trees forming the ground cover, medium-sized trees forming the middle storey, and lofty trees with dense canopy forming the upper storey. Champion and Seth (1968), Rao and Panigrahi (1961), Sahni (1981), Rao and Hajra (1986) were pioneer researchers who examined the forests types and floristic composition of Arunachal Himalayan region. The vegetation of Arunachal Pradesh was described by Rao (1972) as an evergreen type in general and was divided into 5 types: tropical, subtropical, temperate, subalpine, and alpine based on altitudinal considerations. Rao (1974) did the same while discussing the vegetation and phytogeography of Assam. The precise forest types that exist in the state of Arunachal Pradesh, however, cannot be determined from these observations and classifications since these are considered to be too general. No significant efforts were made to accelerate the vegetation type research activities in the state in earlier decades until Kaul and Haridasan (1987) took extra miles to recognised 6 primary forest types within the 4 climatic categories and compared them to the traditional classification system of Champion and Seth (1968). This categorization, which Kaul and Haridasan (1987) developed after 20 years of extensive field research, have been found to be more useful for identifying different forest types of Arunachal Pradesh. Tropical, subtropical, temperate, sub-alpine, and alpine vegetation, secondary and degraded forest, and riparian vegetation are among the basic categories under which the vegetation is divided; each has subgroups mostly depending on the altitude and climate type (Figure 2; Table 1).

4. Statistics of floristic diversity

More than 23.52% of India's flowering plants are reported to be found in Arunachal Pradesh that represent 2.54% of the India's total land area. The region is reported to be one of the richest botanical treasure houses of India because of its diverse topography and physiography while 76.93% of Indian plant families are reported to be found in the state of Arunachal Pradesh. Mao and Dash (2020) reported 5192 species of angiosperms from the state which belonging to 1437 genera and 174 families, as compare to the roughly 21,984 species of angiosperm belonging to 2774 genera and 268 families reported in India. About 1353 of them are reported to be monocots which belonging to 397 genera and 25 families, whereas 3839 species belonging to 1040 genera and 149 families have been reported as dicotyledons (Table 2).

Monotypic dicot herbaceous families like Balsaminaceae are reported to be represented by 64 species of *Impatiens* while Begoniaceae is reported to be represented by 35 species of *Begonia*. Dioscoreaceae and Smilacaceae, monotypic monocot families were reported to be represented by 29 and 16 species of *Dioscorea* and *Smilax*, respectively (Camfield and Hughes, 2021; Sukhramani and Choudhary, 2023).

It is accepted that the state has also harbours high diversity of non-flowering plants. The richness of the vegetation of Arunachal Pradesh is significantly contributed by ferns and their allies. About 655 species out of about 1200 fern species reported in India have been identified from Arunachal Himalayan region (Jenkins and Baishya, 2020). This region also harbours great diversity of fern allies like *Selaginella* and *Lycopodium* which dominate the ground flora in subtropical and temperate region. A total of 14 species of

Table 1. Vegetation types of Arunachal Pradesh with its components.

SN	Major Type of vegetation	Subtype	Division
1.	Tropical vegetation - restricted to up to 900 m above sea level and spread throughout the foothill areas and outer valleys	Tropical evergreen forests	Tropical semievergreen forests Low hills and plains semievergreen forests Riverine semievergreen Forests
2.	Subtropical vegetation - occur at the elevation from 900-1800 m and are basically of evergreen and dense in nature	Broad Leaved Forests	
3.	Temperate vegetation - These forests occur in the form of a continuous belt between 1800-3500 m altitude. The forests are open and lax storeyed	Pine Forests (occur between 1200 - 1800 m.) Broad Leaved Forest - occur in between 1800-2800 m	
4.	Subalpine and Alpine Forest - These forests occupy the highest altitude, 3500-5500 m and generally lack of tree species.	Conifer Forest - confined to 2800-3500 m altitude and experience regular snowfall during winter months	
5.	Secondary Forest - Various adverse factors, both biotic and abiotic, greatly influence the forests and modify the forest. pes occurring upto an altitude of 3000 m		
6.	Aquatic Vegetation - Some common hydrophytes growing in the marshes, roadside pools, nallas and paddy fields. Besides the water bodies are rich in algal flora.		

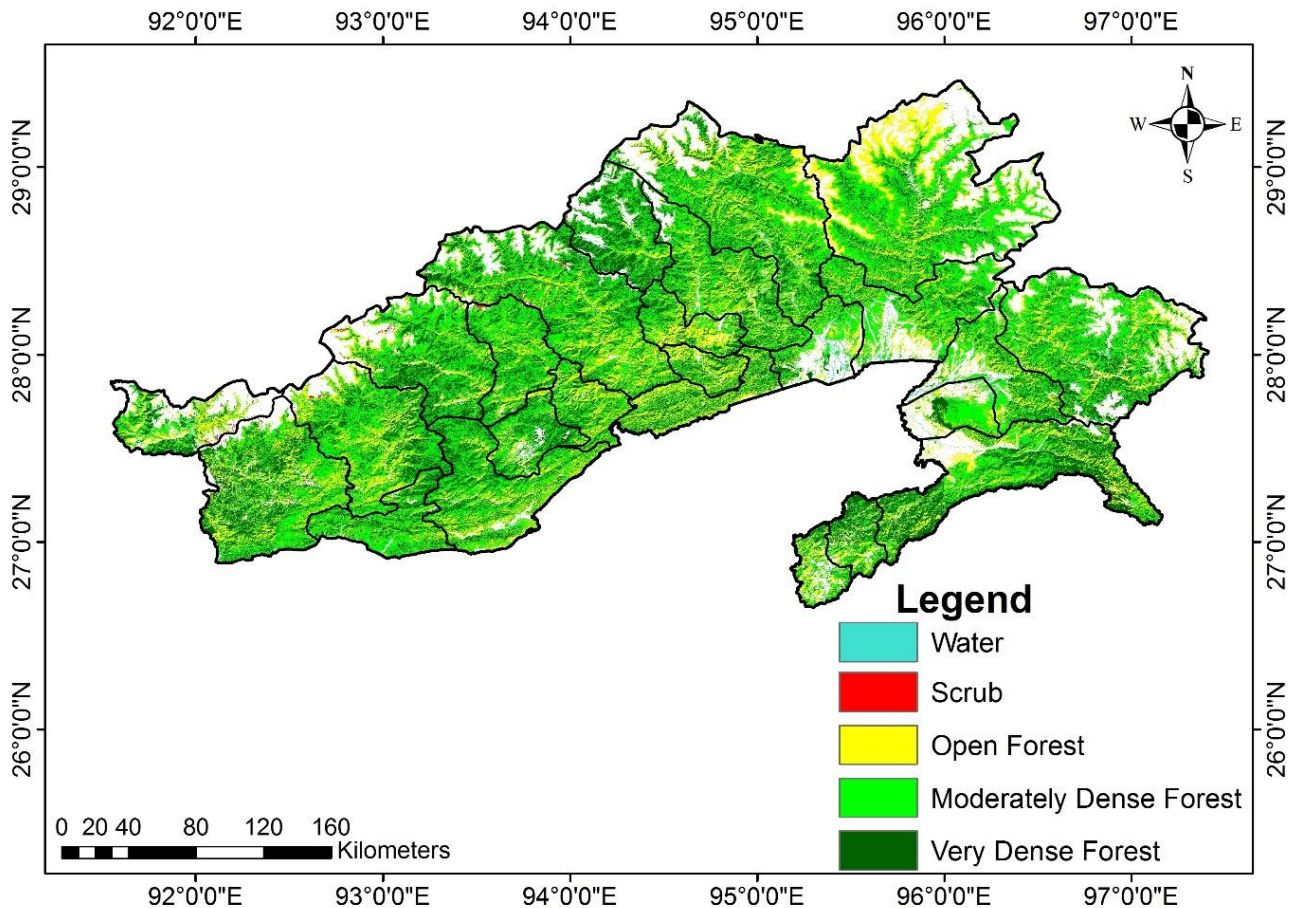


Figure 2. Map showing Major Forest Types of Arunachal Pradesh

Lycopodium sensu lato, a fern allies have been reported from the state which is much higher when compared with Western Himalaya which is represented by only 3 species (Jenkins et al., 2016, 2018, 2020).

4.1. Dominant plant families

Families with strong representation in the dominant flora includes Orchidaceae (658 spp.), Leguminosae (196 spp.), Ericaceae (191 spp.), Poaceae (153 spp.), Asteraceae (152 spp.), Rosaceae (137 spp.), Urticaceae (129 spp.) Cyperaceae (120 spp.), Rubiaceae (117 spp.), Euphorbiaceae (104 spp.), Acanthaceae (83 spp.), Lamiaceae (78 spp.), Balsaminaceae (64 spp.), and Lauraceae (61 spp.) which is presented in Figure 3. Among the monocot group, Orchidaceae is represented by highest number of species (658 spp.) which is followed by Poaceae (153 spp.), Cyperaceae (121 spp.), Liliaceae (64 spp.), Zingiberaceae (55 spp.) while Smilacaceae is represented by least number of species (16 spp.) (Giri et al., 2008; Chowdhary et al., 2009; Nyorak, 2023) which is presented in Figure 4. When compared with Orchid flora of India, State of Arunachal Pradesh represents 52.71% of the total Orchid species of India and represents 2.35% of the global orchid flora (Table 3). Leguminosae has been reported to be the second most dominant plant family in Arunachal Pradesh which accounts for 15.17% of the total Leguminosae flora of India. This is followed by Ericaceae which accounts for 77.01% of Indian Ericaceae flora while Poaceae represents 9.43% of the total Poaceae flora of India (Chowdhary et al., 2009; Mao and Dash, 2020).

The top 10 angiosperm genera, namely *Agapetes*, *Bulbophyllum*, *Carex*, *Dendrobium*, *Impatiens*, *Eria*, *Ficus*, *Rhododendron*, *Rubus*, and *Strobilanthes*, each with more than 25 species, have been reported with strong representation in the state of Arunachal

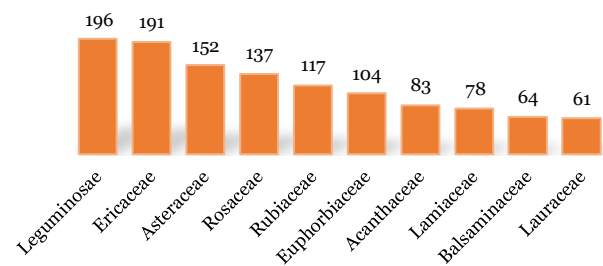


Figure 3. Dominant Dicot families in Arunachal Pradesh.

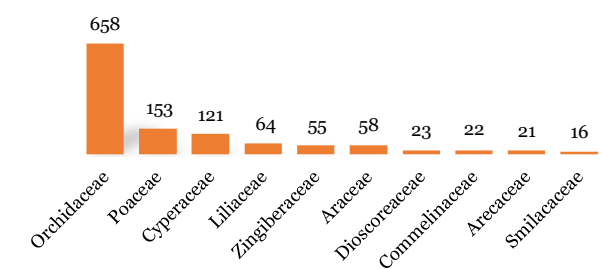


Figure 4. Dominant Monocot families in Arunachal Pradesh.

Pradesh (Table 4). A comparison of the genera shows that the herbaceous plants, such as *Impatiens*, *Carex*, and *Strobilanthes*, are replaced by tree species of *Rhododendron* and *Ficus* in Arunachal Pradesh. Orchidaceae is represented by two genera, while *Bulbophyllum* and *Dendrobium* are among the top five dominant genera reported in the state (Table 4). The horseshoe-shaped bending of the Himalaya provides a ideal meeting point for Chinese, Sino-Tibetan, Indo-Burmese, and Malaysian floristic elements, which undergo mutation and natural hybridization have contributed to the uniqueness, richness and representativeness of the species diversity in Arunachal Pradesh (Chaudhary et al., 2012).

5. Notable floristic elements in Arunachal Pradesh

Rhododendron (Ericaceae) have been reported with 74 species, 21 subspecies, 24 variety (total 119 taxa), of which 12 taxa are endemic to the state of Arunachal Pradesh (Mao et al., 2017). This genus is considered the largest single genus of flowering plants, in contrast to six species in the western Himalayas. Aside from numbers, this genus exhibits highest diversity of life forms, from small herbs to tall trees. In the upper temperate region, they often form vast patches found along Bumla, Zimitang and Nagula in Tawang district (Mao, 2010; Paul et al., 2010; Gogoi et al., 2022). List of endemic species of *Rhododendron* reported from Arunachal Pradesh is presented in Table 5.

Impatiens (Balsaminaceae) commonly known as Balsam is one of the most significant genera with high species diversity which shows 80% endemism for Indian sub-continent (Gogoi et al., 2018). *Impatiens* is represented in North East India with 80 species, of which 64 species have been reported from Arunachal Pradesh and 28 species have reported as endemic to the state (BSI eFlora of India, 2023; Gogoi et al., 2018). One of the most striking features of *Impatiens* is their unique flowers, which are often brightly colored and shaped like a horn or trumpet. These flowers attract a variety of pollinators, including bees, butterflies, and hummingbirds. Unfortunately, many species of *Impatiens* in Arunachal Pradesh are under threat due to habitat loss triggered by anthropogenic factors. Conservation efforts are needed to protect these plants and their habitats, and to promote restoration of wildness in the ecosystem (Gogoi et al., 2018; Tiwari, 2023). Few endemic species of *Impatiens* found in Arunachal Pradesh are presented in Table 6.

Begonias (Begoniaceae) are one of the most diverse plant groups in the world which are popular cultivated as ornamental plants due to their attractive foliage and flowers. They comprise about 1,500 species and numerous hybrids and Arunachal Pradesh has been reported as home to several species of *Begonias* (43 spp.) of which 31 are endemic to state (Camfield and Hughes, 2021; BSI eFlora of India, 2023). These species are found in different altitudinal gradient ranging from 300 meters to 3,500 meters above sea level (Table 7).

Orchidaceae is one of the most intriguing and highly developed monocot angiosperm plant families, with 1256 species belonging to 155 genera reported in India (Singh et al., 2019) while 622 species belonging to 123 genera have been recorded from Arunachal Pradesh of which 65 species have been reported as endemic (Singh et al., 2019). However, many additional surprises from the state have recently been described by diverse botanists working in the region. *Bulbophyllum*, *Calanthe*, *Cymbidium*, *Dendrobium*, and *Eria* are among the most diverse genera in terms of species diversity. *Paphiopedilum wardii*, long known from the upper slopes of Lohit Valley, is thought to have disappeared from its native environment, whereas 12 species are listed as endangered. There are 16 species that are vulnerable while 31 species have been reported as threatened (Hegde, 2020; De et al., 2016). Apart from horticultural importance, orchids have medicinal and commercial importance and has high demand in pharmaceutical and cosmetic industries raw materials. About 112 species are reported to be used

Table 2. Statistical representation of floristic diversity of Arunachal Pradesh (AP) in comparison with India.

SN	Plant Groups	Families		Genera		Species	
		AP	India	State	India	State	India
1	Angiosperms	174	268	1437	2774	5192	16773
2	Dicotyledons	149	222	1040	2143	3839	12449
3	Monocotyledons	25	46	397	631	1353	4324
4	Gymnosperms	5	12	13	46	25	147
5	Pteridophytes	32	41	99	168	656	1385

in traditional medicine by different tribes of the Arunachal Pradesh (Tsering et al., 2017, 2020).

Bananas (*Musa*) are monocotyledonous plants belonging to the family Musaceae placed under the order Zingiberales. These plants are reported to be originated from South East Asia and subsequently introduced in other continents (Daniells et al., 2001). Wild bananas are represented in Arunachal Pradesh by 22 species (Ranibala et al., 2018) which is presented in Table 8. Musaceae is one among the economically most significant plant families represented by large number of wild species in Arunachal Pradesh. *Musa balbisiana*, known as *Kullu/Kullung* among the Nyishi tribe is among the most dominant species found in the tropical and subtropical wet-evergreen forest which hold immense significance as fibre source for crafting of traditional carpet and wall panelling of traditional huts.

Zingiberaceae family is another group of ornamental plants and economically important plant group which are abundantly found in variety of habitats with high moisture contents. There are about 57 species reported Arunachal Pradesh (BSI eFlora of India, 2023) which is presented in Table 9. However, this group of plant is still considered to be largely unexplored and difficult to identify due to delicate and shortlived flowers. Further studies are needed to resolve the taxonomic puzzle remain in this family (Ashokan and Gowda, 2017, 2019; Sanoj, 2011; Singh and Srivastava, 2020; Sabu and Hareesh, 2020).

Araceae is one such family still largely remain unexplored in the state of Arunachal Pradesh. Nangkar (2018, 2019) has recorded 58 species of Araceae from the state of Arunachal Pradesh and reported 3 species new to the science and some of them were new record for the flora of India and flora of Arunachal Pradesh. However, Araceae continue to be the most untouchable plant group among the botanists in the Eastern Himalaya and India due to its delicate morphology which is difficult to maintain quality herbarium and with high concentration of calcium oxalate crystal presence in the leaves, petiole and corm that causes skin irritation. Further exploration is needed to discover more species in this group.

Table 3. Comparison of the top 10 major Angiosperm families of Arunachal Pradesh, India, and the rest of the world

Name of the family	Arunachal Pradesh		India		World	
	Genera	Species	Genera	Species	Genera	Species
Orchidaceae	123	658	155	1270	763	28000
Leguminosae	67	196	176	1292	740	19400
Ericaceae	10	191	11	248	126	4000
Poaceae	76	153	278	1622	800	10000
Asteraceae	68	152	193	1171	1620	23600
Rosaceae	20	137	38	516	90	2500
Urticaceae	25	129	26	114	54	2625
Cyperaceae	22	120	32	609	115	5000
Rubiaceae	45	117	101	635	611	13150
Euphorbiaceae	35	104	70	468	227	6745

Table 4. A comparison of the ten major genera of Arunachal Pradesh and India

SN	Genera in Arunachal Pradesh	Species	Genera in India	Species
1	<i>Rhododendron</i>	105	<i>Impatiens</i>	279
2	<i>Bulbophyllum</i>	72	<i>Carex</i>	208
3	<i>Impatiens</i>	64	<i>Strobilanthes</i>	156
4	<i>Dendrobium</i>	54	<i>Primula</i>	143
5	<i>Agapetes</i>	52	<i>Bulbophyllum</i>	139
6	<i>Ficus</i>	45	<i>Fimbristylis</i>	128
7	<i>Carex</i>	45	<i>Crotalaria</i>	127
8	<i>Strobilanthes</i>	42	<i>Rhododendron</i>	125
9	<i>Primula</i>	40	<i>Eriocaulon</i>	118
10	<i>Eria</i>	37	<i>Dendrobium</i>	116

Table 5. List endemic species of *Rhododendron* of Arunachal Pradesh

SN	Name of Plant	Phenology	Districts
1	<i>R. arunachalense</i> Chamberlain & Rae	May – June	Lower Subansiri, West Siang & Kurum-Kumey
2	<i>R. benianum</i> Cowan	May – September	Upper Siang
3	<i>R. concinoides</i> Hutchinson & Kingdon Ward	September – December	Delei Valley, Anjaw & West Siang
4	<i>R. coxianum</i> Davidian	March – September	Lower Subansiri
5	<i>R. formosum</i> Wallich var. <i>inaequale</i> (Hutchinson) Cullen	Feb. – May	West Siang
6	<i>R. hookerii</i> Nuttall	April – September	Kurum-Kumey
7	<i>R. mechukae</i> A.A. Mao & A. Paul	Feb. - March	West Siang
8	<i>R. nayarai</i> G.D. Pal		Lower Subansiri
9	<i>R. pangeanum</i> A.A. Mao & M. Bhaumik	May - June	Lower Subansiri
10	<i>R. santapau</i> A.R.K. Sastry, S.K. Katak, P.A. & E.P. Cox	May – September	Lower Subansiri, West Siang
11	<i>R. subansiriense</i> Chamberlain & Cox	March – September	Lower Subansiri
12	<i>R. titapuriense</i> A. A. Mao, K.N. Cox D.F. Chamberlein	April – May	West Siang

Table 6. List of few *Impatiens* species endemic to Arunachal Pradesh

SN	Name of Plant	Phenology	Districts
1	<i>I. adamowskiana</i> Gogoi & Borah	July - September	Lower Dibang Valley
2	<i>I. albopetala</i> Gogoi & Borah	July - September	Lower Dibang Valley
3	<i>I. anjawensis</i> Borah, Kandwal, Chhetri & Gogoi	August - September	Anjaw
4	<i>I. arunachalensis</i> Hareesh, A. Joe, M. Sabu & Gogoi	May – August	Upper Siang
5	<i>I. ashiohi</i> Gogoi & Borah	July-September	Lower Dibang Valley
6	<i>I. bracteolata</i> Hook.f.	June to December	West Kameng
7	<i>I. dalaiensis</i> Gogoi & Borah	July - September	Anjaw
8	<i>I. dibangensis</i> Gogoi & Borah	July - September	Lower Dibang Valley
9	<i>I. gammiei</i> Hook.f.	July - November	West Kameng
10	<i>I. haridasanii</i> Hareesh & M. Sabu	May - June	Longding

Table 7. List of endemic *Begonia* species of Arunachal Pradesh

SN	Name of Plant
1	<i>Begonia aborensis</i> Dunn
2	<i>B. acetosella</i> Craib
3	<i>B. beddomei</i> Hook.f.
4	<i>B. burkillii</i> Dunn
5	<i>B. dux</i> C.B. Clarke
6	<i>B. griffithiana</i> (A.DC.) Warb.
7	<i>B. iridescens</i> Dunn
8	<i>B. limprichtii</i> Irmsch.
9	<i>B. longifolia</i> Blume
10	<i>B. sandalifolia</i> C.B. Clarke
11	<i>B. scintillans</i> Dunn
12	<i>B. shilendrae</i> Rekha Morris & P.D.McMillan.
13	<i>B. taliensis</i> Gagnep.
14	<i>B. tessaricarpa</i> C.B. Clarke
15	<i>B. markiana</i> Taram, Wahlsteen & D.Borah
16	<i>B. arunachalensis</i> D.Borah & Wahlsteen
17	<i>B. pasighatensis</i> D.Borah, Taram & Wahlsteen
18	<i>B. dicressine</i> Wahlsteen
19	<i>B. kekarmonyingensis</i> Taram, D.Borah & M.Hughes
20	<i>B. oyunia</i> M.Taram & N.Krishna

Gesneriaceae is one of the most diverse species found in the variety of ecological habitats and along different altitudinal gradient of Arunachal Pradesh. Taram (2023) has reported more than 70 species of Gesneriaceae from the state of Arunachal Pradesh and reported 8 species which new to the science and published several new records for the flora of Arunachal Pradesh and flora of India. Further studies at morphology and molecular aspects could offer more insights into its phylogeny and evolution.

It is suggested that state of Arunachal Pradesh has the germplasm of several such beautiful and wild plants. There is a need for upscaling research infrastructure facilities to accelerate taxonomic studies of wild plant groups belonging to different plant families at morphological, biochemical and molecular levels. Rhizomatous herbs such as *Arisaema* (21 sp.) and climbers such as *Piper* (26

spp.) are among the unique flora reported from the state with high ornamental and medicinal values (BSI eFlora of India, 2023).

Many species of palm (Arecaceae) such as *Arenga obtusifolia*, *Calamus erectus*, *Caryota urens*, *Didymosperma luma*, *Livistona jenkinsiana*, *Phoenix rupicola*, *Pinanga gracilis*, *Wallichia densiflora*, *Wallichia triandra*, and *Zalacca secunda* can be found in abundance in both tropical and subtropical forest of Arunachal Pradesh along different altitudinal gradient which are reported to be closely linked with local food and cultural practices (Kumar et al., 2021; Mehmod and Roy, 2021).

Bamboo is another dominant group of plants in the state with high economic significance to its 28 tribal communities. Bamboo in Arunachal Pradesh is represented by more than 70 species

Table 8. List of Wild Bananas of Arunachal Pradesh

SN	Name of Plant
1	<i>Ensete glaucum</i> (Roxb.) Cheesm.
2	<i>Musa argentii</i> Gogoi & Borah
3	<i>Musa arunachalensis</i> A. Joe, Sreejith & M. Sabu
4	<i>Musa aurantiaca</i> G. Mann ex Baker
5	<i>Musa aurantiaca</i> var. <i>homenborgohaimiana</i> Gogoi
6	<i>Musa aurantiaca</i> var. <i>jengingensis</i> Gogoi
7	<i>Musa cheesmannii</i> Simm.
8	<i>Musa chunii</i> Häkkinen
9	<i>Musa flaviflora</i> Cheesman
10	<i>Musa kamengensis</i> Gogoi & Häkkinen
11	<i>Musa mannii</i> var. <i>mannii</i>
12	<i>Musa mannii</i> var. <i>namdangensis</i> Gogoi & Borah
13	<i>Musa markkui</i> Gogoi & Borah
14	<i>Musa nagensium</i> Prain
15	<i>Musa puspanjalae</i> Gogoi & Häkkinen
16	<i>Musa sikkimensis</i> var. <i>sikkimensis</i>
17	<i>Musa velutina</i> ssp. <i>velutina</i>
18	<i>Musa markkuana</i> (M.Sabu, A.Joe & Sreejith) Hareesh, A.Joe & M.Sabu
19	<i>Musa balbisiana</i> Colla
20	<i>Musa itinerans</i> Cheesman
21	<i>Musa rubinea</i> Häkkinen & C.H.Teo

Table 9. List of Zingiberaceae genera and species of Arunachal Pradesh.

SN	Name	Endemism Range
1	<i>Alpinia galanga</i> (L.) Willd.	
2	<i>Alpinia malaccensis</i> (Burm.f.) Roscoe.	
3	<i>Alpinia ovoidocarpa</i> H. Dong & G. J. Xu	
4	<i>Alpinia zerumbet</i> (Pers.) B.L. Burtt & R.M. Sm.	
5	<i>Amomum arunachalense</i> Hareesh & M. Sabu	
6	<i>Amomum nimkeyense</i> M. Sabu, Hareesh, Tatum & A.K. Das	Endemic to AP
7	<i>Amomum riwatchesii</i> M. Sabu & Hareesh	Endemic to AP
8	<i>Amomum subulatum</i> Roxb.	
9	<i>Boesenbergia kingii</i> Mood & L.M. Prince	
10	<i>Caulokaempferia arunachalensis</i> (Bhaumik, S. Dey & Langhu) Sushil K. Singh	Endemic to AP
11	<i>Cautleya gracilis</i> var. <i>gracilis</i>	
12	<i>Curcuma amada</i> Roxb.	
13	<i>Curcuma aromatica</i> Salisb.	
14	<i>Curcuma caesia</i> Roxb.	
15	<i>Curcuma involucrata</i> (King ex Baker) Škornick.	
16	<i>Curcuma longa</i> L.	
17	<i>Curcuma zedoaria</i> (Christm.) Roscoe	
18	<i>Etingera linguiformis</i> (Roxb.) R.M. Sm.	
19	<i>Globba clarkei</i> Baker	
20	<i>Globba multiflora</i> Wall. ex Baker in Hook.f.	
21	<i>Hedychium calcaratum</i> A.S. Rao & D.M. Verma	Endemic to India: Arunachal Pradesh, Meghalaya.
22	<i>Hedychium coccineum</i> Buch.Ham. ex Sm.	
23	<i>Hedychium coronarium</i> J. Koenig	
24	<i>Hedychium densiflorum</i> Wall.	
25	<i>Hedychium ellipticum</i> Buch.Ham. ex J.E. Sm	
26	<i>Hedychium gardnerianum</i> Sheppard ex Ker Gawl.	
27	<i>Hedychium gomezianum</i> Wall.	
28	<i>Hedychium gracile</i> Roxb.	
29	<i>Hedychium gracillimum</i> A.S. Rao & Verma	Endemic to India: Arunachal Pradesh, Assam, Meghalaya
30	<i>Hedychium greenii</i> W.W.Sm.	
31	<i>Hedychium griffithianum</i> Wall.	
32	<i>Hedychium longipedunculatum</i> Sastry & D.M. Verma	
33	<i>Hedychium radiatum</i> A.S. Rao & Hazra	
34	<i>Hedychium robustum</i> A.S. Rao & Hajra	
35	<i>Hedychium speciosum</i> Wall. in Roxb.	
36	<i>Hedychium spicatum</i> Sm.	
37	<i>Hedychium stenopetalum</i> Lodd.	
38	<i>Hedychium thyriforme</i> Buch.Ham. ex J.E. Sm.	
39	<i>Hedychium villosum</i> var. <i>villosum</i>	
40	<i>Hedychium villosum</i> var. <i>tenuiflorum</i> Wall. ex Baker	
41	<i>Hedychium wardii</i> C.E.C. Fisch.	
42	<i>Hedychium ziroense</i> V. Gowda & Ashokan	Endemic to India: Arunachal Pradesh
43	<i>Hedychium mechukanum</i> M.Sabu & Hareesh	
44	<i>Hornstedtia arunachalensis</i> S. Tripathi & V. Prakash	Endemic to India: Arunachal Pradesh
45	<i>Larsenianthus arunachalensis</i> M. Sabu, Sanoj & Rajesh Kumar	Endemic to India: Arunachal Pradesh
46	<i>Larsenianthus careyanus</i> (Benth. & Hook.f.) W.J. Kress & Mood	
47	<i>Meistera fulviceps</i> (Thwaites) Skornick. & M.F.Newman	Endemic to India: Arunachal Pradesh, Assam, Meghalaya
48	<i>Parakaempferia synantha</i> A.S. Rao & D.M. Verma	Endemic to India: Arunachal Pradesh, Assam, Mizoram
49	<i>Roscoea megalantha</i> Tosh. Yoshida & Yangzom	
50	<i>Roscoea wardii</i> Cowley	
51	<i>Wurfbainia aromatica</i> (Roxb.) Skornick. & A.D. Poulsen	
52	<i>Zingiber arunachalensis</i> A.Joe, T.Jayakr., Hareesh & M. Sabu	Endemic to India: Arunachal Pradesh
53	<i>Zingiber intermedium</i> Baker in Hook.f.	Endemic to India: Arunachal Pradesh, Assam, Meghalaya, Nagaland
54	<i>Zingiber neotruncatum</i> T.L.Wu, K. Larsen & Turland	
55	<i>Zingiber squarrosum</i> Roxb.	
56	<i>Zingiber cornigerum</i> T.Jayakr., A.Joe, Hareesh, & M.Sabu	
57	<i>Zingiber campanulatum</i> T.Jayakr., A.Joe, Hareesh & M.Sabu	
58	<i>Zingiber sianginensis</i> Tatem & A.K. Das	

distributed along tropical, subtropical and temperate forest of which include both native and introduced species (Upreti and Sundriyal, 2001). However, majority of the species have been reported from tropical region of the state. Bamboo taxonomy is one of the most challenging for the taxonomists which requires both skills and long-term training and exposure. So far, 34 genera and 144 species of Bamboo have been reported from India (BTSG-KFRI, 2023), of which 47 species belonging to 19 genera are found in Arunachal Pradesh (BSI eFlora of India, 2023). Bamboo being the economically significant plant groups in North East India need thorough taxonomic investigation to correctly identify the species for the conservation and economic utilization and (Table 10).

6. Primitive angiosperms

The state of Arunachal Pradesh is abundantly represented by unique flowering plants with significant presence of primitive species of Annonaceae, Piperaceae, and Lauraceae which are unique to the state which cannot be seen in other part of India, with the possible exceptions of the Northeastern area, Eastern Himalayas, Assam, and Burma (Myanmar). This implies that

Takhtajan's theory of Arunachal Himalayan region as "cradle of flowering plants" seems to be true and verifiable. The checklist of some important primitive angiosperm plants reported from Arunachal Pradesh reported by Takhtajan (1969), Rao (1974), Shankar (2020), Balkrishna et al (2021) is presented in Table 11. These primitive angiosperms not only hold taxonomic significance but also reported as ethnobotanical, economic and cultural significance to the local tribal communities of Arunachal Pradesh. Some of these primitive angiosperms such as *Arenga obtusifolia*, *Phoenix rupicola* and *Plectocomia himalayana* are palm species reported as food and cultural importance but also rare in their natural habitat which need conservation attention for the sustainable utilization.

7. Gymnosperm flora

Gymnosperms thrive well in the subtropical and temperate climatic zone in Arunachal Pradesh, where they grow, blossom, and bear fruit. The subtropical and temperate region of the state offer the best environment for their reproduction and population expansion. A total of 48 native species belonging to 15 genera and

Table 10. Some *Bambusa* genera and species reported from Arunachal Pradesh (AR = Arunachal Region).

SN	Genera	Species	Endemism
1	<i>Ampelocalamus</i>	<i>patellaris</i> (Gamble) Stapleton	
2	<i>Bambusa</i>	<i>balcooa</i> Roxb.	
3	<i>Bambusa</i>	<i>burmanica</i> Gamble	
4	<i>Bambusa</i>	<i>jaintiana</i> R.B. Majumdar	
5	<i>Bambusa</i>	<i>pallida</i> Munro	
6	<i>Bambusa</i>	<i>polymorpha</i> Munro	
7	<i>Bambusa</i>	<i>teres</i> Buch. -Ham. ex-Munro	
8	<i>Bambusa</i>	<i>tulda</i> Roxb	
9	<i>Bambusa</i>	<i>vulgaris</i> Schrad. Ex J.C. Wendl	
10	<i>Cephalostachyum</i>	<i>capitatum</i> Munro	Endemic to AR
11	<i>Cephalostachyum</i>	<i>latifolium</i> Munro	
12	<i>Cephalostachyum</i>	<i>mishimieanum</i> H.B. Naithani	
13	<i>Cephalostachyum</i>	<i>pallidum</i> Munro	
14	<i>Chimonobambusa</i>	<i>callosa</i> (Munro) Nakai	
15	<i>Chimonobambusa</i>	<i>arunachalensis</i> T.P. Sharma & Borthakur	Endemic to AR
16	<i>Chimonobambusa</i>	<i>griffithianus</i> (Munro) J.R. Xue & T.P. Yi	
17	<i>Chimonobambusa</i>	<i>longiusculus</i> Hsueh & T.P. Yi	
18	<i>Dendrocalamus</i>	<i>giganteus</i> Munro	Endemic to AR
19	<i>Dendrocalamus</i>	<i>hookeri</i> Munro	
20	<i>Dendrocalamus</i>	<i>parishii</i> Munro	
21	<i>Dendrocalamus</i>	<i>sahnii</i> H.B. Naithani & Bahadur	
22	<i>Dendrocalamus</i>	<i>sikkimensis</i> Gamble ex Oliver	
23	<i>Dendrocalamus</i>	<i>strictus</i> (Roxb.) Nees	Endemic to AR
24	<i>Dinochloa</i>	<i>macllellandii</i> (Munro) Kurz	
25	<i>Drepanostachyum</i>	<i>intermedium</i> (Munro) Keng f.	
26	<i>Drepanostachyum</i>	<i>khasianum</i> (Munro) Keng f.	
27	<i>Gigantochloa</i>	<i>albociliata</i> (Munro) Kurz	
28	<i>Himalayacalamus</i>	<i>hookerianus</i> (Munro) Stapleton	
29	<i>Phyllostachys</i>	<i>mannii</i> Gamble	
30	<i>Phyllostachys</i>	<i>nigra</i> (Lodd. ex Lindl.) Munro	
31	<i>Pseudostachyum</i>	<i>polymorphum</i> Munro	Endemic to AR
32	<i>Sarocalamus</i>	<i>faberi</i> (Rendle) Stapleton	Endemic to AR
33	<i>Sarocalamus</i>	<i>racemosus</i> (Munro) Stapleton	Endemic to AR
34	<i>Schizostachyum</i>	<i>pergracile</i> (Munro) R.B. Majumdar	
35	<i>Schizostachyum</i>	<i>griffithii</i> (Munro) R.B. Majumdar	
36	<i>Schizostachyum</i>	<i>helferi</i> (Munro) R.B. Majumdar	
37	<i>Stapletonia</i>	<i>arunachalensis</i> (H.B. Naithani) P. Singh, S.S. Dash & P. Kumari	
38	<i>Stapletonia</i>	<i>seshagiriiana</i> (R.B. Majumdar) H.B. Naithani	
39	<i>Thamnocalamus</i>	<i>arunachalensis</i> H.B. Naithani	Endemic to AR
40	<i>Thamnocalamus</i>	<i>spathiflorus</i> (Trin.) Munro	
41	<i>Thyrsostachys</i>	<i>oliveri</i> Gamble	
42	<i>Yushania</i>	<i>elegans</i> (Kurz) R.B. Majumdar	
43	<i>Yushania</i>	<i>hirsuta</i> (Munro) R.B. Majumdar	
44	<i>Yushania</i>	<i>longispiculatus</i> (R.B. Majumdar) Kottaim.	Endemic to AR
45	<i>Yushania</i>	<i>maling</i> (Gamble) R.B. Majumdar & Karthik.	
46	<i>Yushania</i>	<i>pantlingii</i> (Gamble) R.B. Majumdar	

8 families have been reported from India while 24 species belonging to 13 genera have been reported from Arunachal Pradesh (Khuraijam and Singh, 2015; Singh et al., 2018). *Araucaria columnaris*, *Cycas pectinata*, *Cryptomeria japonica*, *Taxodium distichum*, and *Thuja orientalis* are five exotic species that are grown for their ornamental values. At least 29 genera and 8 families have been reported to have strong representation in Arunachal Pradesh (Table 12). Arunachal Pradesh is home to the endemic gymnosperm species, namely, *Amentotaxus assamica* which has been reported as critically endangered by IUCN. The economically significant species prioritized are *Abies delavayi*, *Pinus wallichiana*, *Pinus roxburghii* and *Tsuga Dumosa*. These species are on the top list as major source of timber and oleoresins production while *Taxus wallichiana* has been reported to be a major source of anti-cancer drug taxol and *Gnetum* species are reported to be edible. Majority of the gymnosperms are found in the temperate and subalpine region. Habitat preference is specific which need conservation attention for sustainable utilization (Singh et al., 2018; Seal, 2023).

Gymnosperm distribution in the state of Arunachal Pradesh have been reported to be an altitude dependent. In the Kameng and Siang region, *Pinus roxburghii* and *Pinus wallichiana* are among the dominant conifers reported from the state which thrives mostly in tropical and subtropical forest. A Burmese pine known as *Pinus merkusii* is found in the Kulung and Lati valleys of the Tirap and Lohit districts. *Agathis robusta* is also found growing in the mountain slopes of the Tirap, Changlang, and Lohit districts. *Larix griffithii* occurs in Tawang and West Kameng district of Arunachal Pradesh. A temperate species found primarily in the state is *Abies*, *Cedrus*, *Tsuga*, *Juniperus*, *Larix*, and *Picea* while *Gnetum* species are found in the lower elevation of evergreen tropical rainforest (Haridasan et al., 2001).

Out of the 7 species of *Pinus* reported from India, 5 species and a variety are found documented from Arunachal Pradesh. This

comparison of generic diversity in Arunachal Pradesh and India is presented in Table 13. The *Amentotaxus*, *Larix*, *Taxus*, and *Tsuga* are represented by a single species each. With the exception of *Juniperus*, Arunachal Pradesh has a greater representation of all the genera of Gymnosperms.

8. Fern and fern allies

The ferns and fern allies of Arunachal Pradesh thrives in the region due to favorable climatic conditions, which is characterized by high humidity and rainfall with moderate temperatures (Table 14). These fern species of Palaeozoic era are well-adapted to the diverse habitats, including dense forests, riverbanks, and rocky slopes in different elevation gradient in Arunachal Himalayan region. The fern and fern allies in Arunachal Pradesh are reported to be represented by 33 families, 99 genera 656 species and 61 subspecies including varieties (Jenkins et al., 2016, 2018, 2020). The family Dryopteridaceae has been reported with highest number of species (129) which is followed by Polypodiaceae (107), Pteridaceae (81), Woodsiaceae (68), Thelypteridaceae (49), Aspleniaceae (35) while rest of the families such as Dennstaedtiaceae, Lycopodiaceae, Hymnophyllaceae and Davalliaceae are represented by less than 20 species (Table 14). Some of the fern species, namely, *Diplazium esculentum* is reported to be edible while other species are reported as medicinal, ornamental and cultural importance to the local tribal communities of Arunachal Pradesh. Further taxonomic studies are required to unearth those undescribed taxa in the region (Seal, 2023).

9. Endemism

High endemism in a comparatively younger mountain range of Arunachal Himalayan region is mainly contributed by synergistic effect of environment factors together with geophysical conditions such as geographic location, physiography, and geological history.

The presence of endemic species, which is influenced by biogeographic provinces, distinctive ecosystems, and topographical and climatological interfaces, is indicative of a region's rich biogeography which serves as centre of speciation, extinction, and adaptive evolution of the constituent biota. Current state of endemism of angiosperm flora in Arunachal Pradesh and India (Gopalan and Henry, 2000; Singh et al., 2015) is presented in Table 15. Currently, about 221 species of angiosperms are reported to be endemic to Arunachal Pradesh which accounts for 5.13% of the total 4303 species of endemic angiosperm reported from India (BSI Envis, 2023). Endemism of Dicotyledon is represented by highest number of species in Arunachal Pradesh (170 species) which is followed by monocotyledon (51 species) (Table 15).

10. Phytogeographical affinities

The flora of Arunachal Pradesh has been recognized as distinctive and included in the Eastern India province of Mishmi Hills by Hooker and Thomson (1855). It is also acknowledged as a Province (Hooker, 1906) or Sub-Subarea (Clarke 1898) or area (Chatterjee, 1962) within the Eastern Himalaya. Assam has been included under the broader definition of Gangetic plain by Hooker (1906) or as a part of Sub-Subareas Assam along with north and northeast Burma by Clarke (1898) or as a separate phytogeographical area by Chatterjee (1962). According to Hooker's definition, most of the north-eastern mountainous states of India are included under the province of Burma. This sub-province northern Burma encompasses the area from the great land of Brahmaputra to the Chinese portion of Yunnan and continuous with the mountains of Nagaland, Mizoram, and Manipur. The vegetation of this region was recognized as similar to that of Eastern Himalaya but differ by absence of an alpine flora in a broader perspective. It is important to note that the recognition of the Arunachal flora as distinctive and its inclusion in various provinces and sub-areas is based on extensive research and analysis. As such, it is recommended that these classifications are recommended to be used as a guide for further study and conservation efforts. In a broader context, Takhtajan (1969) recommended Indian region to be included in the Indo-Chinese territory of the Indo-Malaysian subkingdom. Mani (1974) claimed that Arunachal Pradesh falls under the Indo-Chinese Amphitheatre. He concluded that the flora of Arunachal Himalayan region is considerably more recent, in particular, the humid tropical forests are entirely descended from Asiatic (Yunnan-Burma) tertiary flora. Although Rao and Joseph (1965) disagree and maintain that it possesses a unique flora while Burkill (1925) theorized that Abor Hills provides a phytogeographical nexus for the mixing of Chinese, Malaysian, and Himalayan Flora which was supported by Sahni (1969). Rao (1974) discovered close connections between the flora of Myanmar and Arunachal Pradesh and saw it as a component of Assam. In biogeography context, Assam and North Myanmar has been reported to be a high-transitional zone where there is a significant mixing of the Asiatic and Indian Peninsular elements. Numerous species, including *Aspidopterys indica*, *Elaeocarpus aristatus*, *Elaeocarpus rugosus*, *Schima wallichii*, *Dalrymplea pomifera*, etc., exhibits disjunct distribution, supporting the idea that this area serves as a biogeographical 'gateway' for Indo-Malayan elements to peninsular India or Western India, or vice versa. Only 10-15 of the 545 species of orchids in the state have a common ancestor with the Western Himalayas, 66 shares a common ancestor with Myanmar, and 30 species shares a common ancestor with Malaysia. Again only 12 out of the 61 *Rhododendron* species found in Arunachal Pradesh are Himalayan origin, while 7 are Indo-Chinese. However, of the 46 species reported in the Rosaceae family, half of them are found in Burma, and the Himalayas. Member of the Malvaceae, Bombacaceae, Annonaceae, Polygalaceae, etc., also suggest a strong relationship affinities with Indo-China, Burmese and Malaysian elements. These discussions most likely continued after the closure of Tethys Sea and the Tertiary Mountains were formed which is now known as Himalayas (Lakhanpal, 1970). Arunachal Pradesh was identified by Takhtajan (1986) as a Boreal subkingdom in the Eastern Himalaya Province of Eastern Asia, together with portions of Eastern Nepal in the west up to the Kali River valley, Darjeeling, Sikkim, Bhutan, some portions of the Assam Himalaya, and southern portions of Tibet. In addition to its rich endemism, the majority of the phytogeographical accounts of the Indian subcontinent and its various regions shares affinities with flora of Arunachal Pradesh, Indo-Chinese and Indo-Malaysian elements (Mao and Dash, 2020; Mishra et al., 2004).

The Indo-Chinese elements, such as *Betula alnoides*, *Callicarpa rubella*, and *Cinnamomum bejolghota* var *bejolghota* are found predominant in Arunachal Pradesh. The presence of floristic elements, namely, *Callerya cinerea*, *Dalbergia millettii* var *mimosoides*, *Harashuteria hirsuta*, *Litsea kingii*, *Lonicera webbiana*, *Magnolia campbellii*, *Meconopsis napaulensis*, *Neilia thibetica* var *thibetica*, *Osmanthus suavis*, *Panax pseudoginseng*, *Potentilla griffithii*, *Rhododendron leptocarpum*, *R. neriiflorum*, *Waldsteinia fragarioides* shows Indo-Burma elements. The presence of species, namely, *Ampelocissus barbata*, *Antidesma acidum*, *Brassaiopsis glomerulata*, *Carallia brachiata*, *Debregeasia longifolia*, *Engelhardia spicata*, *Mycaranthes floribunda*, *Exbuclandia populnea*, *Hodgsonia macrocarpa*, *Lithocarpus elegans*, *Maxillaria aggregata*, *Magnolia champaca*, *Magnolia hodgsonii*, *Oroxylum indicum*, *Procris crenata*, *Tetrameles nudiflora*, *Tecoma sureni* etc. in Arunachal Pradesh shows Indo-Malaysian affinity (Jain, 1990; Mao and Dash, 2020).

Table 11. List of Primitive Species of Arunachal Pradesh (Takhtajan 1969; Rao 1974; Shankar, 2020; Balkrishna et al., 2021)

SN	Name of species	Family
1	<i>Alnus nepalensis</i>	Betulaceae
2	<i>Altingia excelsa</i>	Hamamelidaceae
3	<i>Aphanamixis polystachya</i>	Meliaceae
4	<i>Aspidocarya uvifera</i>	Menispermaceae
5	<i>Betula alnoides</i>	Betulaceae
7	<i>Decaisnea insignis</i>	Lardizabalaceae
8	<i>Euptelea pleiosperma</i>	Eupteleaceae
9	<i>Exbucklandia populnea</i>	Hamamelidaceae
10	<i>Haematocarpus validus</i>	Menispermaceae
11	<i>Stauntonia latifolia</i>	Lardizabalaceae
12	<i>Houttuynia cordata</i>	Piperaceae
13	<i>Illinium cambodianum</i> var. <i>cambodianum</i>	Illiciaceae
14	<i>I. griffithii</i>	Illiciaceae
15	<i>I. simonsii</i>	Illiciaceae
16	<i>Magnolia baillonii</i>	Magnoliaceae
17	<i>M. campbellii</i>	Magnoliaceae
18	<i>M. caveana</i>	Magnoliaceae
19	<i>M. champaca</i>	Magnoliaceae
20	<i>M. doltsoa</i>	Magnoliaceae
21	<i>M. globosa</i>	Magnoliaceae
22	<i>M. griffithii</i>	Magnoliaceae
23	<i>M. gustavi</i>	Magnoliaceae
24	<i>M. hodgsonii</i>	Magnoliaceae
25	<i>M. hookeri</i>	Magnoliaceae
26	<i>M. insignis</i>	Magnoliaceae
27	<i>M. kingii</i>	Magnoliaceae
28	<i>M. kisopa</i>	Magnoliaceae
29	<i>M. lanuginosa</i>	Magnoliaceae
30	<i>Myrica esculenta</i>	Myricaceae
31	<i>Phoenix rupicola</i>	Arecaceae
32	<i>Plectocomia himalayana</i>	Arecaceae
33	<i>Pycnarrhena pleniflora</i>	Menispermaceae
6	<i>Sarcandra glabra</i> subsp. <i>brachystachys</i>	Chloranthaceae
34	<i>Tacca integrifolia</i>	Taccaceae
35	<i>Tetracentron sinense</i>	Tetracentraceae
36	<i>Wallichia oblongifolia</i>	Arecaceae

11. Curious plants

The state of Arunachal Pradesh is a home to various unusual and botanically curious plants that have drawn attention due to plant explorers due to their unique morphological characteristics and life support systems which greatly increase the floristic diversity in the state (Table 16). The tropical, subtropical and temperate forest of Mehao Wildlife sanctuary, Namdapha National Park, Eagle Nest Wildlife Sanctuary, Tale Wildlife Sanctuary, Pakke Tiger Reserve, Kamlang Wildlife Sanctuary, and Dihing Dibang Biosphere Reserve have been reported to be the home to a large number of botanically curious plant species such as *Cyclocodon phalloides*, *Sapria himalayana*, and *Balanophora dioica* (Baishya et al., 2001). In the aforementioned locations, the nonchlorophyllous species *Monotropa uniflora* of brilliant white colour grows on thick humus. Some plants, like *Saussurea obvallata*, *Rheum nobile*, and *Cirsium erioporoides* and others, have blooms that serve as insulating enclosures because they are surrounded by broad, translucent, leafy bracts. The bracts, which provide warmth for insects throughout the winter and aid in pollination (Baishya et al., 2001).

Table 12. Checklist of Gymnosperms species reported from Arunachal Pradesh.

No.	Name of species	Family
1	<i>Abies delavayi</i> Franch	Pinaceae
2	<i>Abies densa</i> Griffith	Pinaceae
3	<i>Abies spectabilis</i> (D. Don) Spach	Pinaceae
4	<i>Amentotaxus assamica</i> D.K Ferguson	Taxaceae
5	<i>Cedrus deodara</i> (Roxb. ex D. Don) J.G. Don	Pinaceae
6	<i>Cephalotaxus mannii</i> Hook.f. in Hook	Taxaceae
7	<i>Cupressus torulosa</i> D. Don	Cupressaceae
8	<i>Gnetum gnemon</i> var. <i>gnemon</i>	Gnetaceae
9	<i>Gnetum gnemon</i> var. <i>brunonianum</i> (Griffith) Markgraf	Gnetaceae
10	<i>Gnetum montanum</i> Markgra	Gnetaceae
11	<i>Juniperus indica</i> Bertoloni	Cupressaceae
12	<i>Juniperus recurva</i> Buchanan-Hamilton ex D. Don	Cupressaceae
13	<i>Juniperus indica</i> var. <i>indica</i>	Cupressaceae
14	<i>Larix griffithii</i> Hooker f	Pinaceae
15	<i>Picea brachytyla</i> (Franchet) E. Pritzel	Pinaceae
16	<i>Picea spinulosa</i> (Griffith) A. Henry	Pinaceae
17	<i>Pinus armandii</i> Franchet	Pinaceae
18	<i>Pinus bhutanica</i> A.J.C. Grierson, D.G. Long & C.N. Page	Pinaceae
19	<i>Pinus merkusii</i> Jungh et de Vries	Pinaceae
20	<i>Pinus roxburghii</i> Sargent	Pinaceae
21	<i>Pinus wallichiana</i> A.B. Jackson	Pinaceae
22	<i>Pinus arunachalensis</i> R.C. Srivast.	Pinaceae
23	<i>Podocarpus nerifolius</i> D. Don	Podocarpaceae
24	<i>Taxus wallichiana</i> Zuccarini	Taxaceae
25	<i>Tsuga dumosa</i> (D. Don) Eichler	Pinaceae

Table 13. Comparison in Distribution of Gymnosperms in India & Arunachal Pradesh

Genera	No. of species in Arunachal Pradesh	No. of species in India	Percentage (%)
<i>Pinus</i>	6	29	20
<i>Abies</i>	3	4	75
<i>Cupressus</i>	1	8	13
<i>Gnetum</i>	2	6	33
<i>Juniperus</i>	3	10	30
<i>Picea</i>	2	3	67
<i>Larix</i>	1	1	100
<i>Podocarpus</i>	1	3	33
<i>Taxus</i>	1	1	100
<i>Tsuga</i>	1	1	100
<i>Cephalotaxus</i>	1	2	50
<i>Cedrus</i>	1	1	100
<i>Amentotaxus</i>	1	1	100

Table 14. Top Ten Dominant Genera and species of Ferns & Fern Allies of Arunachal Pradesh

SN	Families	Genera	Species
1	Dryopteridaceae	14	129
2	Polypodiaceae	14	107
3	Pteridaceae	10	81
4	Woodsiaceae	7	68
5	Thelypteridaceae	1	49
6	Aspleniaceae	1	35
7	Dennstaedtiaceae	6	21
8	Lycopodiaceae	4	18
9	Hymnophyllaceae	2	17
10	Davalliaceae	5	13

12. Wild counterparts of domesticated plants

It is well known that agricultural crop plants are naturally selected from wild races through mutation over a certain period of time. More than 270 of these wild relatives of agricultural plants are reported to be found in the Himalayan region alone, and 79 species have been identified from the state of Arunachal Pradesh (Angami et al., 2006; Gajurel et al., 2023). According to Vavilov (1926, 1951), one of the main centres of origin for many agricultural crop plants is the Arunachal Himalayan region, which is also known as the "Hindustan Center for Origin of Cultivated Plants". These crop plants have become resistant to pests and diseases while living in

the wild habitat, which severely damages the nearby cultivated crops. As a result, it is possible to generate more resistant, and high yielding cultivars by incorporating resistant genes from wild counterpart (Table 17).

Citrus and *Musa* germplasm have been reported to be abundant in the Arunachal Himalayan Region. Additionally, a large number of related species of *Thea*, which are used as tea substitutes, have been identified from the state. In Arunachal Pradesh, elevation between 1800 and 2700 metres above sea level, many primitive and indigenous rice cultivars have been documented from the tribal communities (Rao, 1994). State is a treasure-trove of Barley, Maize, Buckwheat, Finger millet, Foxtail millet, and Amaranth, Irene bean, Soyabean, Cowpea, Black gramme, Pea, Scarlet bean, Pumpkin, Cucumber, Allium, Ginger, Tree tomato, Brassica, Pome, and Stone fruits crop germplasm (Hazarika et al., 2022; Paroda and Arora, 1991).

13. Timber yielding plants

Arunachal Pradesh is a home to a variety of important timber species which play key role in economy and livelihood of the local population, and has high demand at national market. In the recent decades, these facilities were widely used by Indian Railways, Plywood industries, etc., aside from being utilised to make furniture and other household items. Some of the commercially viable timber species reported from Arunachal Pradesh are *Altingia excelsa*, *Anthoshorea assamica*, *Canarium strictum*, *Castonopsis indica*, *Chukrasia tabularis*, *Duabanga grandiflora*, *Dipterocarpus retusus*, *Dysoxylum alliarium*, *Gmelina arborea*, *Pinus wallichiana*, *Magnolia pterocarpa*, *Magnolia champaca*, *Magnolia doltsopa*, *Morus macroura*, *Picea spinulosa*, *Tetrameles nudiflora*, *Tona ciliata*, *Terminalia chebula*, and *Terminalia myriocarpa* and *Quercus griffithii*. These timber species are reported to be found in the tropical, subtropical and temperate forest with elevation ranging from 100 – 2800 m from mean sea level (Kumar, 1999) (Table 18). Some of the high valued timber species such as *Pinus wallichiana* and *Magnolia champaca* are commonly cultivated in the community forest land for traditional house construction, crafting of furniture items for the commercial purposes.

14. Ornamental plants

Several species of orchids, including *Rhododendron*, *Hedychium*, *Begonia*, *Calanthe*, *Coelogyne*, *Cymbidium*, *Dendrobium*, *Phaius*, *Phalaenopsis* etc. reported to be occurring in the state of Arunachal Pradesh have the immense potential to be used in the horticulture. One of the rarest Lady's slipper orchids, *Paphiopedilum fairieanum*, which was formerly considered to be "lost," has a restricted distribution in the West Kameng district of Arunachal Pradesh. Other beautiful but endangered species are *Cymbidium elagans* var. *elagans*, *C. macrorrhizon*, and *C. goeringii* etc. One of the most intriguing blooming plants, *Rhododendron* are also reported to be significant in horticulture and several species have been brought under cultivation in the temperate region for ornamental and landscaping species (Hegde, 2020; Kumar, 1999).

The majority of decorative plants (both foliage and blooming plants) that have been reported to be harvested from the wild sources, and their climatic and disease resistance quality have been enhanced through selection and breeding methods. Numerous hybrid orchid species and varieties have been developed at the Orchid Research Centre Tippi, near Balukpong in West Kameng district of Arunachal Pradesh. Their adoption and introduction as attractive plants would not only enhance our collection but also enhancing the economic condition of people in the region through entrepreneurship activities. Apart from orchids, many wild species of Aroids such as *Aglonema hookerianum*, *Arisaema nepenthoides*, *Arisaema concinnum*, *Ariopsis peltata*, *Alocasia fallax*, and *Raphidophora decursiva* has the potential to be introduced as ornamental species in the market after hybridization (Hegde, 2020; Nangkar, 2018, 2019) (Table 19).

15. Dye yielding plants

Fibers and dyes both are derived from plants using by human society. Natural dyes have been reported to be used for colouring textile, drugs, cosmetics etc. Because of its non-toxic nature, it is also used for colouring various food products. Due to lack of availability of precise technical knowledge on the extraction and dyeing technique, it has not been successful commercially as compare to synthetic dyes. Arunachal Pradesh has 28 tribes

Table 15. Representation of Endemism of Vascular Plants of Arunachal Pradesh (Singh et al., 2015; Envis, 2023)

No.	Plant Groups	Families		Genera		Species	
		State	India	State	India	State	India
1	Angiosperms	63	154	154	977	221	4303
2	Dicotyledons	56	127	119	723	170	3170
3	Monocotyledons	7	27	35	254	51	1133

broadly belonging to the Indo-Mongoloid racial stock, with linguistic and cultural diversity. The constitutionally recognized tribes such as Monpa, Sherdukpen, Sajolang, Bugun, Aka, Sartang, Brokpa, Nyishi, Solung, Nah, Tagin, Galo, Adi, Momba, Kamba, Idu, Taraon, Mishmi-Kaman, Tai Khamti, Singpho, Tangsa, Yobin, Nocte, and Wancho possess unique knowledge of dye yielding plant species (Census, 2011; Mahanta and Tiwari, 2005; Behra, 2010). The state of Arunachal Pradesh has more than 500 species of dye yielding plant which are primarily employed in preparation of natural dyes, colorants with several applications in textiles, inks, cosmetics, and other products among the indigenous tribal communities (Das and Kalita, 2016; Kumar, 1999). Most commonly used dye yielding plant species reported from Arunachal Pradesh are listed in Table 20.

16. Medicinal and aromatic plants

According to Haridasan et al (2003), Arunachal Pradesh could be considered as nature's reservoir of therapeutic plants. With their native expertise and intimate ties with plant resources, the tribal communities of Arunachal Pradesh have the rich traditional knowledge on identification and sustainable utilization of medicinal plants available in their biocultural landscape. The pharmaceutical industries could be benefitted from harnessing these traditional ethnomedicinal knowledge of therapeutic plants as key raw materials after conducting thorough validation study at phytochemical, pharmacological and molecular level (Das and Tag, 2006; Tag et al., 2007; Jambey et al., 2017). Some of these wild medicinal plant species could undergo extinction due to illegal and unscientific harvesting of the middlemen as agent of some pharmaceutical industries, and habitat destruction due to anthropogenic activities. Some of the critically endangered medicinal plant species identified from Arunachal Pradesh are *Aconitum ferox*, *Coptis teeta*, *Rheum nobile*, *Suertia chirayita*, *Paris polyphylla*, *Panax pseudoginseng*, *Panax bipinnatifidus* and *Taxus wallichiana*, which need conservation attention for their sustainable utilization. Initially, around 500 species of medicinal plants have recorded from Arunachal Pradesh (Haridasan et al., 1995; Bhuyan, 2000; Angami et al., 2006) and current working list is estimated to be more than 2000 species which is evident from various ethnobotanical literatures, and they are found to be distributed along different altitudinal gradient in Arunachal Himalayas which need further ethnobotanical exploration and identification (Perme, 2015; Jambey et al., 2017; Tag et al., 2012; Hage et al., 2021). Checklist of some selected 100 species of important medicinal plants reported from Arunachal Pradesh are provided in Table 21.

17. Conservation measures

Similar to other regions of India, Arunachal Pradesh too have the places where different development activities are taking place that pose the greatest harm to the flora and other biodiversity components of its fragile ecosystem. Increased human population with rapid expansion of township area, haphazard and unscientific way of developmental activities without using traditional wisdom of the tribal communities have triggered loss of forest coverage and genetic diversity including wild relatives of diverse agricultural plants in the last two decades. In an endeavour to conserve ecosystem and biodiversity of Arunachal Pradesh, Ministry of Environment and Forest, Govt of India has established 9 wildlife sanctuaries, 2 national parks, 1 biosphere reserve, and 1 orchid sanctuary in the state of Arunachal Pradesh and reserve forest accounts for 9815 sq. km area which harbours rare, endemic and economically significant flora. The state protects 6677.75 sq km area of wildlife habitat, 2468.23 sq km of national park, 5111.5 sq km of biosphere reserve, and 100 sq km of orchid sanctuary (FSAP, 2008). Despite of remarkable floristic diversity seen in Arunachal Pradesh, population of rare and endangered species have been reported to be diminished due to habitat destruction. The majority of widespread alien and invasive plant species and anthropogenic activities have been observed to have negative impact on plant species diversity of ecological, evolutionary, economic and cultural importance to the region.

Table 16. Curious Plants of State (eFlora of India, 2023)

SN	Type of Plants	Name of Plants
Root parasite		
1		<i>Aeginetia indica</i> (Orobanchaceae)
2		<i>Aeginetia acaulis</i> (Orobanchaceae)
3		<i>Balanophora abbreviata</i> (Balanophoraceae)
4		<i>Balanophora dioica</i> (Balanophoraceae)
5		<i>Balanophora involucreta</i> (Balanophoraceae)
6		<i>Balanophora polyandra</i> (Balanophoraceae)
7		<i>Orobanche cernua</i> (Orobanchaceae)
8		<i>Rhopalocnemis phalloides</i> (Balanophoraceae)
9		<i>Sapria himalayana</i> (Rafflesiaceae)
10		<i>Xylanche himalaica</i> (Orobanchaceae)
Saprophytes		
1		<i>Cyrtosia falconeri</i> (Orchidaceae)
2		<i>Drosera peltata</i> (Droseraceae)
3		<i>Epipogium roseum</i> (Orchidaceae)
4		<i>Monotropa uniflora</i> (Monotropaceae)
Insectivorous		
1		<i>Utricularia aurea</i> (Lentibulariaceae)
2		<i>Utricularia bifida</i> (Lentibulariaceae)
3		<i>Utricularia brachiata</i> (Lentibulariaceae)
4		<i>Utricularia gibba</i> (Lentibulariaceae)
5		<i>Utricularia recta</i> (Lentibulariaceae)
6		<i>Utricularia striatula</i> (Lentibulariaceae)

18. Conclusion and future directions

Present review unveiled brief history of botanical research in Arunachal Pradesh and diversity of floristic elements found in a diverse forest types and ecological habitats found along different altitudinal gradients ranging from tropical to snow-clad alpine mountainous region. Floristics statistics revealed immense diversity of angiosperm and gymnosperm flora, fern and fern allies, botanically curious plants, endemism and phytogeographical affinities of Arunachal Flora with other regions of Asia, medicinal and ornamental species, dye and timber yield species found in Arunachal Himalayan region. This study also highlighted expansion of population and anthropogenic activities as major factors which contributing towards possible loss of habitat and species diversity. Although government has established several national parks and wildlife sanctuaries to protect forest and its floristic elements and other bioresources, however, majority of the floristic diversity of the government and community protected areas still need to be botanized on high priority basis. There is an urgent need for accelerating focused exploratory and value-added research activities on various plant families at morphological, biochemical and molecular level. This would aid deeper insights into diversity at ground level which could significantly contributing towards improving forest coverage and species diversity, setting conservation policies for halting species loss, sustainable management and utilization, and need to upscale resilience in the ecosystem to further strengthening rural and urban food and livelihood security. Documentation of traditional conservation knowledge and wisdom, and active engagement with local communities have been felt essential to prevent species extinction and habitat loss triggered by anthropogenic and developmental activities.

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Authors' contribution

Suman Halder: Conceptualization, original draft of manuscript.
Hui Tag: Concept guidance and scientific approach, data contribution and compilation, manuscript draft, review and final editing
V.K. Rawat: Data contribution and writing.
Akshat Shenoy: data collection, compilation, review.
Arijit Ghosh: data collection, compilation and review.
S.S. Dash and A.A. Mao: Concept guidance, data contribution and review.

Conflict of interest

Authors have no conflict of interests.

Table 17. Wild Relatives of Cultivated Plants in Arunachal Pradesh

SN	Category of plants	Name of the species
1	Cereals and millets	<i>Coix lacryma-jobi</i> , <i>Polytoca</i> (Poaceae).
2	Legumes	<i>Cajanus goensis</i> , <i>Cajanus scarabaeoides</i> , <i>Vigna umbellata</i> (Fabaceae).
3	Fruits	<i>Abelmoschus manihot</i> (Malvaceae); <i>Artocarpus chama</i> (Urticaceae); <i>Cirtus assamensis</i> , <i>Citrus x aurantium</i> , <i>Citrus indica</i> , <i>Citrus x taitensis</i> , <i>Citrus medica</i> (Rutaceae); <i>Mangifera sylvatica</i> (Anacardiaceae); <i>Ensete glaucum</i> , <i>Musa acuminata</i> , <i>M. balbisiana</i> , <i>Musa balbisiana</i> var <i>balbisiana</i> , <i>M. glauca</i> , <i>M. nagensium</i> , <i>M. velutina</i> (Musaceae); <i>Myrica esculentum</i> (Myricaceae); <i>Prunus ceracoides</i> , <i>Prunus cornista</i> , <i>Prunus nepaulensis</i> , <i>Prunus persica</i> , <i>Pyrus Pashia</i> , <i>Ribes glaciale</i> , <i>Rubus ellipticus</i> , <i>Rubus dasycoctus</i> , <i>Rubus lineatus</i> , <i>Rubus moluccasus</i> .
4	Vegetables	<i>Alocasia macorrhizos</i> , <i>Amorphophalus bulbifera</i> (Araceae); <i>Momodica cochinchinensis</i> , <i>M. dioica</i> , <i>Trichosanthes cucumerina</i> , <i>T. dioica</i> , <i>T. truncata</i> (Cucurbitaceae); <i>Solanum violaceum</i> (Solanaceae); <i>Dioscorea alata</i> (Dioscoreaceae).
5	Oil seeds	<i>Brassica rapa</i> (Brassicaceae).
6	Fibres	<i>Gossypium arboreum</i> (Malvaceae).
7	Spices	<i>Allium tuberosum</i> (Amaryllidaceae); <i>Amomum subulatum</i> , <i>Curcuma amada</i> , <i>Curcuma zedoaria</i> , <i>Wurfbainia aromatica</i> (Zingiberaceae); <i>Piper longum</i> , <i>Piper peepuloides</i> , <i>P. mullesua</i> (Piperaceae).
8	Miscellaneous	<i>Camellia caudata</i> (Theaceae); <i>Miscanthus nepalensis</i> , <i>Saccharum longisetosum</i> (Poaceae).

Table 18. List of commercially viable Timber Yielding Plants reported from Arunachal Pradesh

SN	Same of the Species	Family	Local name
1	<i>Actinodaphne obovata</i>	Lauraceae	Pajihuta
2	<i>Albizia lucida</i>	Mimosaceae	Moz.
3	<i>Alstonia scholaris</i>	Apocyanaceae	Satiana
4	<i>Anthoshorea assamica</i>	Dipterocarpaceae	Mekai
5	<i>Artocarpus chama</i>	Moraceae	Dewa chali
6	<i>Bauhinia variegata</i>	Fabaceae	Kanchon
7	<i>Beilschmiedia roxburghiana</i>	Lauraceae	Bonhingalo
8	<i>Betula alnoides</i>	Betulaceae	Birch
9	<i>Bischofia javanica</i>	Euphorbiaceae	Urium
10	<i>Bombax ceiba</i>	Bombacaceae	Simul
11	<i>Breonia chinensis</i>	Rubiaceae	Kadam
12	<i>Canarium strictum</i>	Burseraceae	Dhuna
13	<i>Camarium bengalense</i>	Burseraceae	Dhuna
14	<i>Castonopsis indica</i>	Fagaceae	Hingori
15	<i>Dipterocarpus retusus</i>	Dipterocarpaceae	Hollong
16	<i>Duabanga grandiflora</i>	Lythraceae	Khokon
17	<i>Didymocheton alliaceus</i>	Meliaceae	Gondhaki-poma
18	<i>Garcinia cowa</i>	Clusiaceae	Tekra
19	<i>Gmelina arborea</i>	Lamiaceae	Gomari
20	<i>Gynocardia odorata</i>	Achariaceae	Chahnugra
21	<i>Juglans regia</i>	Juglandaceae	Walnut
22	<i>Kydia calycina</i>	Malvaceae	Pichola
23	<i>Liquidambar excelsa</i>	Altingiaceae	Jutuli
24	<i>Macaranga denticulata</i>	Euphorbiaceae	Morali
25	<i>Magnolia hodgsonii</i>	Magnoliaceae	Boramthuri
26	<i>Magnolia pterocarpa</i>	Magnoliaceae	Baramphthuri-sopa
27	<i>Magnolia champaca</i>	Magnoliaceae	Teeta Champa
28	<i>Magnolia doltsopa</i>	Magnoliaceae	Sopa
29	<i>Mesua ferrea</i>	Clusiaceae	Nahar
30	<i>Morus macroura</i>	Moraceae	Bola
31	<i>Prasoxylon excelsum</i>	Meliaceae	Lali
32	<i>Phoebe bootanica</i>	Lauraceae	Bonsum
33	<i>Phoebe cathia</i>	Lauraceae	Mekahi
34	<i>Picea spinulosa</i>	Pinaceae	Spruce
35	<i>Pinus roxburghii</i>	Pinaceae	Chirpine
36	<i>Pinus wallichiana</i>	Pinaceae	Blue pine
37	<i>Quercus griffithii</i>	Fagaceae	Oak
38	<i>Sterculia villosa</i>	Sterculiaceae	Pahari
39	<i>Syzygium cumini</i>	Myrtaceae	Jamuk
40	<i>Terminalia bellirica</i>	Combretaceae	Bohera
41	<i>Terminalia chebula</i>	Combretaceae	Hilika
42	<i>Terminalia myriocarpa</i>	Combretaceae	Hollock
43	<i>Tetrameles nudiflora</i>	Tetramelaceae	Bhelu
44	<i>Toona ciliata</i>	Meliaceae	Poma

Table 19. List of Ornamental Plants in Arunachal Pradesh

SN	Name of Plants	Family	Habit	Parts used
1	<i>Aglonema hookerianum</i>	Araceae	Herb	Foliage
2	<i>Alocasia fallax</i>	Araceae	Herb	Foliage
3	<i>Ariopsis peltata</i>	Araceae	Herb	Foliage
4	<i>Arisaema concinnum</i>	Araceae	Herb	Foliage
5	<i>Arisaema decipiens</i>	Araceae	Herb	Foliage and spathes
6	<i>Arisaema flavum</i>	Araceae	Herb	Foliage and spathes
7	<i>Arisaema jacquemontii</i>	Araceae	Herb	Foliage and spathes
8	<i>Arisaema nepenthoides</i>	Araceae	Herb	Foliage and spathes
9	<i>Arisaema speciosum</i>	Araceae	Herb	Foliage and spathes
10	<i>Arisaema propinquum</i>	Araceae	Herb	Foliage and spathes
11	<i>Aristolochia acuminata</i>	Aristolochiaceae	Climber	Flowers
12	<i>Aristolochia saccata</i>	Aristolochiaceae	Climber	Flowers
41	<i>Aster himalaicus</i>	Asteriaceae	Herb	Flowers and foliage
42	<i>Aster sikkimensis</i>	Asteriaceae	Herb	Flowers and foliage
11	<i>Pothos scandens</i>	Araceae	Climber	Foliage
12	<i>Rhaphidophora decursiva</i>	Araceae	Climber	Foliage
13	<i>Scindapsus officinalis</i>	Araceae	Climber	Foliage
14	<i>Paris polyphlla</i>	Liliaceae	Herb	Foliage
15	<i>Ophiopogon dracaenoides</i>	Liliaceae	Herb	Whole Plant
16	<i>Tacca integrifolia</i>	Taccaceae	Herb	Foliar bracts
17	<i>Stemona tuberosa</i>	Stemonaceae	Climber	Foliage and flowers
18	<i>Asparagus racemosus</i>	Liliaceae	Climber	Whole plant
19	<i>Arenga pinnata</i>	Arecaeae	Tree	Whole plant
20	<i>Calamus erectus</i>	Arecaeae	Shrub	Whole plant
21	<i>Pinanga gracilis</i>	Arecaeae	Shrub	Whole plant
22	<i>Caryota urens</i>	Arecaeae	Trees	Whole plant
23	<i>Livistona jenkinsiana</i>	Arecaeae	Trees	Whole plant
24	<i>Phoenix rupicola</i>	Arecaeae	Trees	Whole plant
25	<i>Hypericum griffithii</i>	Hypericaceae	Shrub	Flowers
26	<i>Hypericum hookerianum</i>	Hypericaceae	Shrub	Flowers
27	<i>Impatiens brachycentra</i>	Balsaminaceae	Herb	Flowers
28	<i>Impatiens acuminata</i>	Balsaminaceae	Herb	Flowers
29	<i>Impatiens bicomuta</i>	Balsaminaceae	Herb	Flowers
30	<i>Impatiens racemosa</i>	Balsaminaceae	Herb	Flowers
31	<i>Begonia nepalensis</i>	Begoniaceae	Herb	Whole plant
32	<i>Begonia palmata</i>	Begoniaceae	Herb	Whole plant
33	<i>Begonia cathcartii</i>	Begoniaceae	Herb	Whole plant
34	<i>Begonia griffithiana</i>	Begoniaceae	Herb	Whole plant
35	<i>Begonia roxburghii</i>	Begoniaceae	Herb	Whole plant
36	<i>Ixora acuminata</i>	Rubiaceae	Shrub	Flowers
37	<i>Ixora cuneifolia</i>	Rubiaceae	Shrub	Flowers and foliage
38	<i>Clerodendrum colebrookaenum</i>	Verbenacae	Shrub	Flowers and foliage
39	<i>Osbeckia nutans</i>	Melastromiaceae	Shrub	Flowers and foliage
40	<i>Melastoma malabathricum</i>	Melastomaceae	Shrub	Flowers and foliage
43	<i>Jacobaea raphanifolia</i>	Asteraceae	Herb	Flowers and foliage
44	<i>Jasminum elongatum</i>	Oleaceae	Shrub	Flowers and foliage
45	<i>Lobelia pyramidalis</i>	Lobeliaceae	Shrub	Flowers and foliage
46	<i>Thunbergia coccinea</i>	Acanthaceae	Climber	Flowers
47	<i>Thunbergia grandiflora</i>	Acanthaceae	Climber	Flowers

Table 20. List of Common dye yielding plants of Arunachal Pradesh

SN	Name	Family	Parts Used	Color	Distribution
1	<i>Aporosa octandra</i> var. <i>octandra</i>	Euphorbiaceae	Leaves	Black	Changlang, Lohit and Subansiri districts
2	<i>Baccaurea ramiflora</i> Lour.	Phyllanthaceae	Bark, leaves & fruit	Black	Throughout State
3	<i>Bischofia javanica</i> Blume	Euphorbiaceae	Bark & leaves	Black	Changlang and Lohit
4	<i>Bixa orellana</i> L.	Bixaceae	Seeds	Annatto (yellow- orange)	Lohit and Papum Pare
5	<i>Maclura cochinchinensis</i> (Lour.) Corner	Moraceae	Leaves & seed	Orange, yellow	Lohit
6	<i>Clitoria mariana</i> L.	Fabaceae	Flowers	Blue/violet	Changlang & Subansiri
7	<i>Colquhoulia coccinea</i> Wall.	Lamiaceae	Whole plant	Black	Changlang & Lohit
8	<i>Daphne papyracea</i> Wall.	Thymelaeaceae	Bark & fruit	Dark red	West Kameng
9	<i>Ototropis multiflora</i> (DC.) H.Ohashi & K.Ohashi	Fabaceae	Flower	Purple	Kameng, Subansiri and Siang district
10	<i>Engelhardia spicata</i> Leschebe ex. Blume	Juglandaceae	Bark	Dark brown	West Kameng
11	<i>Entada rheedei</i> subsp. <i>rheedei</i>	Mimosaceae	Young pods	Dark blue	Lohit, Siang & Subansiri districts
12	<i>Ficus altissima</i> Blume	Moraceae	Stem & root	Yellow	Kharsang area of Changlang
13	<i>Ficus nerifolia</i> Smith	Moraceae	Fruit & Root	Red (fruits), Yellow (roots)	Changlang, Lohit
14	<i>Flemingia macrophylla</i> (Willd.) Kuntze ex Merr.	Fabaceae	Leaves & Bark	Black	Changlang, Lohit, Siang Subansiri & Tirap
15	<i>Garuga floribunda</i> var. <i>gamblei</i> (King ex W.W.Sm.) Kalkman	Burseraceae	Bark	Brownish black	Changlang, Lohit, Siang Subansiri & Tirap
16	<i>Ilex embelioides</i> Hook.f.	Aquifoliaceae	Bark	Black	Changlang
17	<i>Illicium griffithii</i> Hook.f & Thomson	Illiciaceae	Seed, bark & leaves	Yellow dye	West Kameng & Tawang
18	<i>Indigofera tinctoria</i> L.	Fabaceae	Leaves & pods	Indigo	Throughout state
19	<i>Juglans regia</i> L.	Juglandaceae	Unripe fruits	Black	West Kameng
20	<i>Melastoma malabathricum</i> L.	Melastomataceae	Fruits	Purple black	Throughout state
21	<i>Magnolia montana</i> (Blume) Figlar	Magnoliaceae	Bark & flower	Yellow	Siang, Changlang & Subansiri
22	<i>Miliusa dioeca</i> (Roxb.) Chaowasku & Kessler	Annonaceae	Bark & ripe fruits	Red	Changlang & Kameng districts
23	<i>Nerium oleander</i> L.	Apocyanaceae	Roots & bark	Black	Changlang
24	<i>Phaius tankervilleae</i> (Banks) Blume	Orchidaceae	Leaves & flower	Indigo	Chongkham area of Lohit
25	<i>Pinus wallichiana</i> A. B. Jackson	Pinaceae	Bark	Black	West Kameng & Tawang
26	<i>Persicaria hydropiper</i> (L.) Delarbre	Polygonaceae	Whole plant	Blue black	Throughout state
27	<i>Punica granatum</i> L.	Punicaceae	Flower & fruit	Deep blue & black	West Kameng
28	<i>Pyrus pashia</i> Buch.-Ham. ex D. Don	Rosaceae	Fruits	Black	Subansiri
29	<i>Rubia cordifolia</i> L.	Rubiaceae	Whole plant	Red	West Kameng, Tawang & Lower Subansiri
30	<i>Rubia sikkimensis</i> Kurz.	Rubiaceae	Whole plant	Red	Changlang, Kameng, Lohit and Siang districts
31	<i>Balaka baccata</i> (Roxb.) Esser	Euphorbiaceae	Leaves	Blackish green	Namdapha National Park, Changlang
32	<i>Solanum lasiocarpum</i> Dunal	Solanaceae	Half ripe fruits	Black	Chongkham area of Lohit
33	<i>Symplocos paniculata</i> (Thumb.) Miq	Symplocaceae	Bark	Yellow	Throughout state
34	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Bark & fruits	Black	Changlang, Lohit & Tirap
35	<i>Tephrosia candida</i> D.C	Fabaceae	Leaves	Dark blue	Changlang, Subansiri & Tirap
36	<i>Terminalia chebula</i> Retz	Combretaceae	Root & bark	Dark blue	Throughout state
37	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Flowers	Reddish yellowish	Tenga Valley, West Kameng

Table 21. List of some potential medicinal plants of Arunachal Pradesh.

SN	Name of the plant	Family	Habit	Ethno-medicinal uses	Plant parts used
1	<i>Aemella paniculata</i>	Asteraceae	Herb	Antimalarial, antipyretic, analgesic, flowers are chewed during toothache	Flower bud, stem, roots, leaves
2	<i>Acorus calamus</i>	Acoraceae	Herb	Sedative, laxative, carminative, stroke, insecticidal activities, also in making perfume	Leaves, stems and roots
3	<i>Aconitum ferox</i>	Ranunculaceae	Herb	Underground roots and tubers are used in arrow poisoning by local hunters	Roots and tubers
4	<i>Aesculus assamica</i>	Hippocastanaceae	Tree	Skin infection, reduces backache, in the treatment of haemorrhoids.	Seed, roots and flowers
5	<i>Ageratum conyzoides</i>	Asteraceae	Herb	Wound healing, antihelminthic	Leaf, stem
6	<i>Alstonia scholaris</i>	Apocynaceae	Tree	Treatment of ulcer, swelling, latex is given during abdominal pain after delivery	Leaves, root, bark, latex
7	<i>Alnus nepalensis</i>	Betulaceae	Tree	Disinfectant, diuretic, reduce swelling, prevent excessive sweating, also used for carpentry	Branches, bark, leaves
8	<i>Alpinia nigra</i>	Zingiberaceae	Herb	Analgesic, appetizer, antifungal, jaundice, gastric ulcer, diuretic, expectorant, anti-inflammatory, flavouring agent, leaves are used in beer preparation	Rhizome, fruits and leaves
9	<i>Asplenium phyllitidis</i>	Aspleniaceae	Herb	Anti-oxidant, antimicrobial, locally used for decoration in local festival	Leaves, aerial parts of plant
10	<i>Aloe vera</i>	Asphodelaceae	Herb	Burns and cut, applied in face for smoother skin, anti-inflammatory, dermatitis	Leaf
11	<i>Amaranthus spinosus</i>	Amaranthaceae	Herb	Leprosy, skin infection, piles, expectorant, appetizer, dysentery, hallucinogenic	Whole plant
12	<i>Andrographis paniculata</i>	Acanthaceae	Herb	Malaria, jaundice, liver tonic, respiratory problems, stomach disorder, rheumatism, ulcerative colitis	Whole plant
13	<i>Artsamea consanguineum</i>	Araceae	Herb	Locally used for arrow poisoning for hunting	Rhizome
14	<i>Artemesia nilagirica</i>	Asteraceae	Shrub	In headache and stomach pain, used as vegetable, to get relief from asthma	Leaves
15	<i>Artemisia indica</i>	Asteraceae	Herb	For skin allergy, believe to be effective in breast cancer	Leaves, young seedlings
16	<i>Balakata baccata</i>	Euphorbiaceae	Tree	Analgesic, antimicrobial, skin irritant, locally used as fish poison	Leaves, stem
17	<i>Batispermum calycinum</i>	Euphorbiaceae	Shrub	Purgative, stimulant, antidote in snake bite, asthma, jaundice, gastric problem, gout and rheumatism, toothache	Whole plant
18	<i>Bambusa tulda</i>	Poaceae	Herb	Bamboo shoots are consumed as integral part of diet,	Stem, shoots
19	<i>Bauhinia variegata</i>	Fabaceae	Tree	Asthma, ulcer, digestive problem, antioxidant, locally also used as spies	Flowers, leaves, root and buds
20	<i>Berberis aristata</i>	Berberidaceae	Shrub	Eye lotion, anti-pyretic, anti-bacterial, fever, as a bitter tonic	Whole plant
21	<i>Bidens pilosa</i>	Asteraceae	Herb	Wound healing, ulcer, ear and eye problem, influenza, hepatitis, urinary tract infection, anti-malaria, anti-pathogenic	Whole plant
22	<i>Cannabis sativa</i>	Cannabaceae	Herb	Stomach disorder, hypnotic, sedative, anti-inflammatory, analgesic, nausea, vomiting, hallucinogenic	Stem, seed, leaves, flower
23	<i>Callicarpa arborea</i>	Verbenaceae	Tree	Insect repellent, skin diseases, scorpion sting, also used in toothache	Branch, bark and leaves
24	<i>Carica papaya</i>	Caricaceae	Tree	Anti-malarial, treatment of cuts, rashes, burns, stings, digestive problem, improve hearing capacity and improve lactation.	Whole plant
25	<i>Centella asiatica</i>	Apiaceae	Herb	Fresh plant juice with honey is given in stomach ulcer, leprosy	Whole plant
26	<i>Clerodendron glandulosum</i>	Lamiaceae	Shrub	For treatment of high blood pressure and bowel troubles, obesity	Fruits and leaves
27	<i>Colocasia esculenta</i>	Araceae	Herb	Fever and cough, petiole juice is used as styptic and stimulant	Leaves, stem and rhizome
28	<i>Curcuma longa</i>	Zingiberaceae	Herb	Used in bone fracture, anti-tumour, in cardiovascular disease, anti-bacterial	Leaf, rhizome
29	<i>Coptis teeta</i>	Ranunculaceae	Herb	Fever, headache, gastric trouble, dysentery, ulcer, insomnia, vomiting, stimulant to heart, antibacterial	Roots
30	<i>Chrysanthemum indicum</i>	Compositae	Herb	Chest pain, prostate cancer, anti-diabetic, stomach ache, fever, dysentery, cold, swelling	Whole plant
31	<i>Chenopodium album</i>	Chenopodiaceae	Herb	Locally used in preparing local wine and also eat as a vegetable	Leaves, seed, young shoots
32	<i>Chromolaena odoratum</i>	Asteraceae	Shrub	Wound healing, relieve pain, anti-gonorrhoeal, diuretic, skin disease	Leaf and root
33	<i>Citrus medica</i>	Rutaceae	Tree	Treatment of scurvy, intestinal ailments, antidote, anticancer, weak eyesight, vomiting, skin diseases, haemorrhoids	Leaves and fruit
34	<i>Crassocephalum crepidioides</i>	Asteraceae	Herb	Antimalarial, analgesic, epileptic, wound bleeding, headache	Whole plant
35	<i>Debregeasia longifolia</i>	Urticaceae	Shrub	Anti-tumours, rheumatism, juice is applied to the areas of the skin affected by scabies	Fruits, leaves
36	<i>Dillenia indica</i>	Dilleniaceae	Tree	Fruit decoction is applied to scalp for curing dandruff, wound healing, bone fracture, anti-diarrhoea	Fruit pulp and leaves
37	<i>Dioscorea floribunda</i>	Dioscoreaceae	Climber	Intestine diverticulis, gall bladder pain, for increasing energy, rheumatoid arthritis	Roots
38	<i>Drymaria diandra</i>	Caryophyllaceae	Herb	Anti-HIV, anti-tumours, malnutrition in infants, anti-malarial, edema, rheumatism	Whole plant
39	<i>Erigeron bonariensis</i>	Asteraceae	Herb	Vapour of leaves is inhaled in sinus problem	Leaves
40	<i>Eryngium foetidum</i>	Apiaceae	Herb	Anti-epileptic, headache, scorpion sting, anti-diabetic, anti-bacterial, analgesic, fever, arthritis	Leaves, seed
41	<i>Erythrina stricta</i>	Fabaceae	Tree	Scorpion sting, gout, anti-inflammatory, anxiolytic property	Flower, root, bark
42	<i>Elenisne coracana</i>	Poaceae	Herb	Cough, cold, congestion, antimicrobial, anti-inflammatory, food preservative	Whole plant
43	<i>Embelia ribes</i>	Myrsinaceae	Herb	Anti-diarrhoea, also used against intestinal worm infection	Leaves and fruits
44	<i>Euphorbia ligularis</i>	Euphorbiaceae	Tree	Bone fracture, arrow poisoning, anti-arthritis, purgative, antiasthmatic, expectorant	Stem, root, latex, leaves
45	<i>Fagopyrum esculantum</i>	Polygonaceae	Herb	To control high blood pressure, anti-diabetic, pain relief, anti-oxidant	Whole plant
46	<i>Gerbera piloselloides</i>	Compositae	Herb	Treat cold, fever, acute conjunctivitis, rheumatic pain	Leaves and rhizomes
47	<i>Gmelina arborea</i>	Lamiaceae	Tree	Purify blood, stomach trouble, leprosy, diarrhoea, anaemia, snake bite and scorpion sting, ulcers	Whole plant
48	<i>Gynocardia odorata</i>	Achariaceae	Tree	In treatment of leprosy, toothache, lupus, scrofula and many skin diseases	Seeds and fruits
49	<i>Hedyotis coccineum</i>	Zingiberaceae	Herb	Cure asthma and indigestion, antimicrobial, also used for local ornamental purposes	Whole plant

SN	Name of the plant	Family	Habit	Ethno-medicinal uses	Plant parts used
50	<i>Hedychium gracile</i>	Zingiberaceae	Herb	Mosquito repellent, antifungal, also used as spies	Leaves, rhizome
51	<i>Hellenia speciosa</i>	Costaceae	Herb	Respiratory problem, astringent, stimulant, anthelmintic, liver cirrhosis, aphrodisiac, urinary problem	Roots and stem
52	<i>Houttuynia cordata</i>	Saururaceae	Herb	Measles, gonorrhoea, skin troubles, anti-tumour, anti-cancer, pneumonia, bronchitis, stomach ulcer	Shoots, leaves, stem
53	<i>Laggera crispata</i>	Asteraceae	Herb	Anthelmintic, treatment in inflammation and swelling	Whole plant
54	<i>Litsea cubeba</i>	Lauraceae	Tree	Astringent, antiseptic, worm infection, blood dysentery, stimulant, anti-inflammatory, hypotensive, insecticide, in bone fracture, headache	Whole plant
55	<i>Litsea monopelata</i>	Lauraceae	Tree	Antidepressant, bruises, anti-infertility, cytotoxic, antifungal, insecticide, antiseptic,	Stem
56	<i>Macaranga denticulata</i>	Euphorbiaceae	Tree	Skin damage, anti-bacterial, antihistamine, fungal infection, wound healing, stomach pain	Whole plant
57	<i>Mentha arvensis</i>	Lamiaceae	Herb	Stomach disorder, influenza, appetite, gall bladder problems,	Leaves
58	<i>Mikania scandens</i>	Asteraceae	Climber	Blood clotting, insect bites and sting, anti-fungal, gastric ulcer, locally used as ornamental plant	Leaves, flower
59	<i>Mimosa pudica</i>	Mimosaceae	Herb	Anti-depressant, anti-convulsant, anti-fertility, sinus, dysentery, tumour, insomnia, antidote in snake poison	Whole plant
60	<i>Moringa oleifera</i>	Moringaceae	Tree	In liver disorder, water purification etc	Pods, leaves
61	<i>Musa x paradisiaca</i>	Musaceae	Herb	Boiled unripe fruits are given during dysentery, diabetes, in anaemia	Fruits and leaves
62	<i>Mucuna pruriens</i>	Fabaceae	Tree	Parkinson disease, antiepileptic, antidote in snake bite, in the treatment of itching	Seeds, dried leaves
63	<i>Murraya paniculata</i>	Rutaceae	Shrub	Analgesic, anti-diarrhoeal, anti-inflammatory	Whole plant
64	<i>Musa acuminata</i>	Musaceae	Herb	In anaemia, diarrhoea, constipation, ulcer, for menstrual cramps	Whole plant
65	<i>Mussaenda roxburghii</i>	Rubiaceae	Shrub	Detoxify mushroom poison, anti-pyretic, diuretic, treat blemsishes on tongue, acute gastroenteritis	Whole plant
66	<i>Myrcia longifolia</i>	Rubiaceae	Herb	Pain relief, ulcer, wound healing, inflammation, antinociceptive	Leaves
67	<i>Ocimum tenuiflorum</i>	Lamiaceae	Herb	Bronchitis, cough, in several heart disease, believe to promote longevity	Whole plant
68	<i>Oroxylum indicum</i>	Bignoniaceae	Tree	Cancer, anti-malarial, jaundice, anti-arthritis, diarrhoea, fever, ulcer, anti-inflammatory	Roots
69	<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Dyspepsia, bowel disorder, anaemia, scurvy, datura poisoning, cure opacity of cornea	Whole plant
70	<i>Oxyspora paniculata</i>	Melastomataceae	Shrub	Treatment of various liver disorder, stomachic, antidote against snake poisoning	Leaf, whole plant
71	<i>Paedaria foetida</i>	Rubiaceae	Herb	Rheumatism and gout, emetic, astringent, gastritis, body pain, for active digestion	Leaf root, bark, fruit
72	<i>Pertilla frutescens</i>	Lamiaceae	Herb	Locally used as spices or as a curry, in treatment of asthma, also used for nausea, sunstroke, reduce muscle spasms	Seeds, leaves
73	<i>Piper betle</i>	Piperaceae	Climber	Leaf after rubbing with mustard oil and warming over burning charcoal is applied to belly during stomach ache of children	Leaf
74	<i>Piper longum</i>	Piperaceae	Climber	Treat joints pain, gout, paralysis, improve immune and digestive system, arthritis	Leaves, stem
75	<i>Phlogacanthus thyriformis</i>	Acanthaceae	Shrub	Expectorant, asthma, stomach problems, fever	Leaves and fruit
76	<i>Phlogacanthus curviflorus</i>	Acanthaceae	Shrub	Boiled leaf juices are used to cure cough and fever	Leaves, roots
77	<i>Phrynum pubinerve</i>	Marantaceae	Herb	Anti-diabetic, analgesic, antihyperglycemic, locally used as wrapping and packaging materials	Leaves
78	<i>Physalis angulata</i>	Solanaceae	Herb	Gastric trouble, laxative, diuretic, anti-cancer, in hypertension, anti-inflammatory	Whole plant
79	<i>Phyllanthus emplica</i>	Euphorbiaceae	Herb	Liver tonic, anti-diabetic, asthma, peptic ulcer, analgesic, heart problems, jaundice	Fruits, seed
80	<i>Plantago asiatica</i> subsp <i>erosa</i>	Plantaginaceae	Herb	Constipation, improves digestion, astringent, demulcent, diuretic, expectorant, anti-inflammatory	Seeds, leaves
81	<i>Pseudognaphalium affine</i>	Asteraceae	Herb	Treatment of common cold, gout, antioxidant, antimicrobial, locally used as vegetable also	Flower, dried plant
82	<i>Rauwolfia serpentina</i>	Apocynaceae	Herb	Antihypertensive, sedative, hypnotic, liver ailments, constipation, epilepsy, schizoprenia	Roots and leaves
83	<i>Ricinus communis</i>	Euphorbiaceae	Shrub	Orthopaedic, intestinal worms, in piles, glandular tumours	Whole plant
84	<i>Rotheca serrata</i>	Lamiaceae	Herb	Diabetes, obesity, hypertension, locally it is also used as a vegetable	Whole plants
85	<i>Ruba manjith</i>	Rubiaceae	Climber	Used to cure headache, cough, cold, locally used as a textile dye	Roots, fruits and leaves
86	<i>Scoparia dulcis</i>	Plantaginaceae	Herb	Leaf juice is applied in eczema and itching	Leaves and roots
87	<i>Sema alata</i>	Fabaceae	Shrub	Jaundice, diabetes, antioxidant, diuretic, analgesic, anti-inflammatory	Seeds, berries and shoots
88	<i>Solanum aethiopicum</i>	Solanaceae	Shrub	Root decoction is used to treat malaria, antifertility property, anti-inflammatory	Whole plant
89	<i>Solanum nigrum</i>	Solanaceae	Herb	Vomiting, diarrhoea, also used to cure tuberculosis, reduce mild abdominal pain	Roots, leaves, all parts
90	<i>Solanum lasiocarpum</i>	Solanaceae	Herb	Ringworm, gout, asthma, diuretic, stimulant, expectorant, toothache	Leaves and roots
91	<i>Solanum violaceum</i>	Solanaceae	Herb	Appetizer, toothache, roughage, berry is given to patient of stone problem	Seeds, berries and roots
92	<i>Swerthia chirayita</i>	Gentianaceae	Herb	Plant decoction is taken in fever, anti-hepatitis B	Whole plant
93	<i>Syzgium cumini</i>	Myrtaceae	Tree	Astringent, carminative, anti-diabetic, stomach disorder, diarrhoea and dysentery	Berry
94	<i>Tacca integrifolia</i>	Dioscoraceae	Herb	Skin disease, leprosy, wound healing, stomach pain, dysentery	Whole plant
95	<i>Terminalia chebula</i>	Combretaceae	Tree	Dehydration, cure blindness, cardiotonic, constipation, tumours, anthelmintic	Fruit and bark
96	<i>Terminalia bellerica</i>	Combretaceae	Tree	Bark extract is given in chest pain and as cardiac stimulant	Rhizome s, tubers
97	<i>Thelypteris parasitica</i>	Aspleniaceae	Fern	Gout and rheumatism, anthelmintic, antifungal and antibacterial	Fruit
98	<i>Zanthoxylum armatum</i>	Rutaceae	Tree	Seed and bark are used as tonic during fever and cholera, stomach disorder	Fruit, leaves, bark
99	<i>Zanthoxylum rhetsa</i>	Rutaceae	Tree	Indigestion, stimulant	Leaves, rhizome
100	<i>Zingiber officinale</i>	Zingiberaceae	Herb	Stomach pain, carminative, stimulant, rhizome juice mixed with honey is used for cough	Rhizome

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