



PLANT DIVERSITY ASSESSMENT IN SUB TROPICAL MIXED FORESTS OF KANGCHUP HILLS, MANIPUR

Botany

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ABSTRACT

Study was carried out to assess plant diversity in sub-tropical mixed forest of Kangchup hills, Manipur. A total of 195 plant species belonging to 145 genera and 72 families were recorded from different forest sites. Among them there were 69 trees, 49 shrubs, 57 herbs, 12 lianas and 8 ferns. *Lithocarpus fenestrata*, *Schima wallichii*, *Castanopsis tribuloides*, *L. dealbata* and *Litsea thomsonii* were the dominant species in this forest.

KEYWORDS

Biodiversity, Lauraceae, North East India, Poaceae, Sub-tropical forests

INTRODUCTION

Tree species is one of the major components for the formation of forests communities. The Himalayan region is known for its rich biological diversity and has always been a botanists' paradise. Among the East Himalayan region, sub-tropical forests constitute the most diverse plant communities on earth. Rapid depletion of biodiversity in these forests, particularly due to wanton deforestation such as shifting cultivation, extraction of timber, fuel wood and other forests products. From the ecological view point, the maintenance of biological diversity is an assessment of the relative importance in terms of diversity of different areas, habitats or ecosystem. Especially, the north eastern region of India is significant for biodiversity conservation because of its floristic richness and high levels of endemism (Khan *et al.*, 1987 ; Upadhaya *et al.*, 2004 ; Mishra *et al.*, 2005). The forests of Manipur are also rich in diversity and endemism among the north eastern region, harbouring over 2162 species of flowering plants out of the 17,000 species described from India (Deb, 1961; Shukla and Baishya, 1979; Singh *et al.*, 1995; Singh and Yadava, 1996; Khan *et al.*, 2007). The north- eastern region of India has been recognized, as one of the earth's biologically wealthiest part. The conservation International (2005) now recognizes a total of 34 biodiversity hot spots (Roach, 2005) reflecting a severe threat to biodiversity. The Himalayan region is included as one of the nine newly identified biodiversity hotspots. The present study area also falls within the Indo-Burma hot spot region of biodiversity. However, limited information is available on plant diversity assessment in sub-tropical forests of North-east India (Rao *et al.*, 1990; Upadhaya *et al.*, 2004; Mishra *et al.*, 2005; Supriya and Yadava, 2006; Shalini 2009) and no detailed investigation has been undertaken on plant diversity assessment in sub-tropical forests of Manipur in north east India. Therefore, the present study aims at analysing the plant diversity in the sub-tropical forests of Manipur.

MATERIALS AND METHODS

The study site is situated between 24°45'-24°51' N lat. and 93°48'-93°55' E long, in the Kangchup hills of Manipur state at an altitude ranging from 865m to 1785m above MSL. these forests falls under type 8 B/C1 Eastern Himalayan sub-tropical wet hill forests classified by Champion and Seth (1968). The climate of the area is monsoonic with warm moist summer and cool dry winter. The mean maximum temperature varied from 21.3°C (January) to 30.7°C (September) and mean minimum temperature ranged from 3.1°C (January) to 21.3°C (September). The mean RH varied between 61.9% (March) and 81.1% (July). The average annual rainfall was 1298.5 mm during 1993-1995. The soil of the forest sites is blackish brown and clayey loam textured with alluvial in nature. To study the plant biodiversity, the selected sites were divided into five parts depending on topography and altitude. Each pan was sampled using one 100m x 10m transect containing five (10m x 10m) randomly laid quadrats. From each quadrat, sample twigs of tree, shrubs, herbs, lianas and ferns were collected and identified with the help of experts of the Regional Botanical Survey of India, Shillong and Calcutta and also from NBRI, Lucknow.

RESULTS AND DISCUSSION

Plant biodiversity: A total of 195 species belonging to 145 genera and

72 families were recorded from different forests sites. Of these, 69,49,57, 12 and 8 were trees, shrubs, herbs, lianas and ferns respectively (Appendix-I). Among the families, Lauraceae (16 species), Rubiaceae and Poaceae (14 species each), Euphorbiaceae (10 species), Asteraceae (9 species), Fabaceae (8 species), Fagaceae and Urticaceae (6 species each) were the most diverse. Moraceae, Rosaceae and Orchidaceae families were represented by 5 species each; Verbenaceae and Lamiaceae exhibited 4 species each. Nine families namely, Anacardiaceae, BetuJaceae, Jugiandaceae, Temstroemiaceae, Commelinaceae, Cyperaceae, Haemodoraceae, Zingiberaceae and Aspiadaceae were represented by 3 species each and Araliaceae, Acanthaceae, Annonaceae, Balsaminaceae, Caprifoliaceae, Gesneraceae, Myrsinaceae, Apiaceae, Liliaceae, Piperaceae, Pteridaceae and Vioiaceae exhibited 2 species each, while the remaining 38 families were monospecific (Table 1). The number of species (195) recorded in the present study was found to be higher than the number of species reported by other workers in different forest types of India, Ganesh *et al.*, (1996) found 173 species in Western Ghats, Kadavul and Parthasarathy (2000) reported 49 species from Tropical Semi- Evergreen, Khera *et al.*, (2001) recorded 92 species in Central Himalaya, Uma Shanker (2001) reported 87 species from Eastern Himalaya, Mishra *et al.* (2005) found 133 species in sub-tropical humid forests, Supriya and Yadava (2006) recorded 123 species in Tropical Semi-Evergreen, Krishnamurthy *et al.*, (2010) recorded 46 species in tropical dry deciduous forest and lower than the value reported by Gentry (1988) in tropical forests (289 species) of Terra firme while Hsieh *et al.*, (1998) recorded 243 species in Evergreen broad-leaved forest on Mount Lopei, Taiwan. Thus the present study reveals that these forests are not only rich in plant species diversity but are also rich in the diversity of families. Hence, there is an urgent need to conserve these forests not only for maintaining the biodiversity but also to meet the basic needs of present and future generations of human being.

Table 1 : No. of plant families and species in sub-tropical mixed forest of Kangchup hills, Manipur.

Family	No. of species	Family	No. of species
Lauraceae	16	Cyperaceae	3
Rubiaceae	14	Haemodoraceae	3
Poaceae	14	Zingiberaceae	3
Euphorbiaceae	10	Aspiadaceae	3
Asteraceae	9	Araliaceae	2
Fabaceae	8	Acanthaceae	2
Fagaceae	6	Caprifoliaceae	2
Urticaceae	6	Gesneraceae	2
Moraceae	5	Myrsinaceae	2
Rosaceae	5	Annonaceae	2
Orchidaceae	5	Apiaceae	2
Verbenaceae	4	Balsaminaceae	2
Lamiaceae	4	Liliaceae	2
Anacardiaceae	3	Piperaceae	2

Betulaceae	3	Pteridaceae	2
Juglandaceae	3	Violaceae	2
Ternstroemiaceae	3	Other (38)	1 each
Commelinaceae	3		
		Total 72	195

Appendix – I : List of Plant families and species observed at the study sites.

Planttype	Family	Species name
Tree	Anacardiaceae	Drimycarpus racemosus Hook f. Rhus semialata Murr. Rhus succedanea Linn.
	Aquilariaceae	Aquilaria agallocha Roxb.
	Araliaceae	*Macropanax undulatus (G. Don.) Schefflera hypoleucoides Harms.
	Betulaceae	Alnus nepalensis D. Don. Betula alnoides Buch-Ham. *Carpinus viminea Wall.
	Bombaceae	Bombax malabaricum DC.
	Caesalpinaceae	Bauhinia purpurea Linn.
	Cephalotaxaceae	*Cephalotaxus griffithii Hook. f.
	Cornaceae	*Cornus capitata Wall
	Ebenaceae	*Diospyros nigricans Wall.
	Elaeocarpaceae	*Elaeocarpus serratus Bl.
	Euphorbiaceae	*Aporosa roxburghii Baill. *Daphniphyllum himalyense Muell. Emblica officinalis Gaertner *Glochidion assamicum Hook. f. Macaranga denticulata Muell. Castanopsis tribuloides A. DC. Lithocarpus dealbata (Miq.) Rehder. L. fenestrata (Roxb.) Rehder. Quercus griffithii Hook.f. and Thoms. Quercus serrata Thunb. Quercus spicata Smith.
	Juglandaceae	*Engelhardtia colebrookiana Lindl. Engelhardtia spicata Blume. Juglans regia Linn.
	Lauraceae	Alseodaphne owdenii Parker. Cinnamomum cecicodaphne Missn Cinnamomum tamala Nees & Eberm. C. zeylanicum Breyn. Machilus bombycina King ex Hook. f. *Machilus kingii Hook. f. Machilus odoratissima (Nees) Kosterm *Lindera caudata, Benth. Lindera pulcherrima (Nees) Benth. Litsaea citrata Blume *Litsaea foliosa Nees. *Litsaea polyantha Juss *Litsaea sebifera Blume *Litsaea thomsonii Meissn. *Phoebe pallida Nees
	Mimosaceae	Albizia chinensis (Osb.) Merr. A. lebbeck (Linn.) Benth
	Moraceae	Ficus cunia Ham. Ficus hirta Vahl=F. roxburghii King. *Ficus pomifera Wall. *Ficus pyriformis Hook and Arn
	Meliaceae	Cedrela toona Roxb.
	Myricaceae	*Myrica esculenta Buch-Ham.
	Olacaceae	Schoepfia fragrans Wall.
	Proteaceae	*Helicia robusta Wall.
	Pittosporaceae	*Pittosporum floribundum W and A
	Rosaceae	Docynia indica Decne
	Rubiaceae	*Morinda angustifolia Roxb. Wendlandia grandis Cowan. *Meliosma simplicifolia Walp.
	Sabiaceae	Itea macrophylla Wall.
	Saxifragaceae	Saurauia punduana Wall.
	Saurauiaceae	Sapindus attenuatus Wall.

Shrub

Symplocaceae	Symplocos theaeifolia Ham.
Tiliaceae	*Grewia rothii DC
Ternstroemiaceae	Camellia drupifera Lour. Eurya japonica Thunb. Schima wallichii Choisy *Celtis australis Linn.
Ulmaceae	Callicarpa psilocalyx Clarke
Verbenaceae	Phlogacanthus guttatus Nees. Strobilanthus discolor T. Anders.
Acanthaceae	*Artemisia vulgaris Linn. Eupatorium odoratum Linn. Senecio densiflorus Wall Vernonia volkameriaefolia DC.
Asteraceae	*Sambucus canadensis Linn. Viburnum coriacum Blume. Euonymus theaeifolius Wall. Chloranthaceae Euphorbiaceae
Caprifoliaceae	*Sauropus macrophyllus Hook. f. *Actephila excelsa Muell. Antidesma diandrum Roth. *Baliospermum meeboldii Pax et Hoffin Brenia retusa (Kostel) Alston. Loxostigma griffithii C. B. Clarke Rhynchosycheum ellipticum A. DC.
Celastraceae	*Leucosceptrum canum Smith.
Chloranthaceae	*Pogostemon elsholtzioides Benth.
Euphorbiaceae	Litsaea salicifolia Hook.f.Roxb. ex Wall Osbeckia nutans Wall. *Desmodium laxum DC. *D. racemosum DC. Indigofera atropurpurea Buch.-Ham.
Gesneraceae	Ardisia virens Kurz. Maesa indica Wall.
Lamiaceae	*Ficus fulva Blume.
Lauraceae	Polygonum chinense Linn.
Melastomaceae	*Adenosacme longifolia Wall.
Papilionaceae	*Carlemannia tetragona Hook. f. Ixora subsessilis Wall. Mussaenda roxburghii Hook. f. *Psychotria adenophylla Wall. Psychotria calocarpa Kurz. Psychotria denticulata Wall. Psychotria symplicifolia Kurz *Psychotria thomsoni Hook. f. Styrax serrulatum Roxb.
Myrsinaceae	Boehmeria platyphylla D. Don. *Boehmeria rotundifolia Wedd. *Debregeasia velutina Gaud. Pilea viminea Wedd.
Moraceae	Callicarpa rubella Lindl. *Clerodendron colebrookianum Walp.
Polygonaceae	*Leuca trifoliata Lawson.
Rubiaceae	*Daphne papyrifera Ham *Unona discolor Vahl. Unona longiflora Roxb *Lea sambucina Willd.
Styraceae	*Achyranthus bidentata Blume.
Urticaceae	Hydrocotyl javanica Thunb. *Oenanthe thomsonii Clarke. Anaphalis contorta Hook. f. Ainsliaea pteropoda DC. Elephantopus scaber Linn. *Eupatorium adenophorum Spreng. Vernonia subsessilis DC.
Verbenaceae	*Periploca calophylla Falc.
Vitaceae	Impatiens leavigata (Wt.) Wall.
Thymeleaceae	I. arguta Hook. f. and Thoms.
Annonaceae	*Begonia laciniata Roxb. *Cyanotis cristata D. Don. Floscopa scandens Lour. Murdannia divergens (Cl.) Bruck.
Ampellidaceae	*Carex vesiculosa Boott.
Amarantaceae	*Scleria levis Retz.
Apiaceae	
Asteraceae	
Asclepiadaceae	
Balsaminaceae	
Begoniaceae	
Commelinaceae	
Cyperaceae	

Herb

		* <i>S. terrestris</i> (L.) Fass.	Sci. (USA). 85: 156-159.
	Fabaceae	<i>Abrus pulchellus</i> Wall.	6. Hsieh, C.F., Chen, Z.S., Hsu, Y.M., Yang, K.C. and Hsieh, T.H., 1998. Altitudinal zonation of evergreen broad-leaved forest on Mount Lopei, Tanvan, J. Veg. Sc., 9: 201-212.
	Haemodoraceae	<i>Ophiopogon wallichianus</i> Hook. f.	7. Kadavul, K. and Parthasarathy, N., 2000. Regeneration patterns of woody species in tropical Semi-evergreen Forest of Shervarayan Hills, Eastern Ghats, South India. Int. Jr. Ecol. Envr., 26:37-48.
		* <i>Peliosanthes macrophylla</i> Wall.	8. Khan, M.L., Rai, J.P.N. and Tripathi, R.S., 1987. Population structure of some tree species in disturbed and protected subtropical forests of north-east India. Acta Oecologia, 8:247-255.
		<i>Peliosanthus teta</i> Andr.	9. Khan, M.R., Yadava, P.S. and Kikim, A., 2007. Additions to the flora of Manipur. Bull Bot.
	Hypoxidaceae	<i>Curculigo orchioides</i> Gaertner.	a. Surv. India, 49: 215-218.
	Lamiaceae	<i>Ajuga macrosperma</i> Wall.	10. Khera, N., Kumar, A. Ram, J. and Tewari, A., 2001. Plant biodiversity assessment in relation to disturbance in mid elevation forest of Central Himalaya, India. Trop. Ecol., 42:88-95.
		<i>Pogostemon elsholtzioides</i> Benth.	11. Krishnamurthy, Y.L., Prakasha, H.M., Nanda, A., Krishnappa, M., Dattaraja, H.S. and Suresh, H.S., 2010. Vegetation structure and floristic composition of a tropical dry deciduous forest in Bhadra Wildlife Sanctuary, Karnataka, India. Trop. Ecol., 51:235-246.
	Liliaceae	<i>Paris polyphylla</i> Smith.	12. Mishra, B.P., Tripathi, O.P. and Laloo, R.C., 2005. Community characteristics of a climax subtropical humid forest of Meghalaya and population structure of ten important tree species. Trop. Ecol., 46:241-251.
		* <i>Streptopus simplex</i> Don.	13. Rao, P., Barik, S.K. Pandey, H.N. and Tripathi, R.S., 1990. Community composition and tree population structure in a sub-tropical broad-leaves forest along a disturbance gradient. Vegetatio, 88:151-162.
	Orobanchaceae	<i>Aeginetia indica</i> Linn.	14. Roach, J., 2005. Conservationists name, nine new "Biodiversity Hotspots". National Geographic News. University of Chicago Press, 392pp.
	Orchidaceae	* <i>Chrysoglossum maculatum</i> Hook. f.	15. Shalini, L., '2009. Plant biodiversity, vegetation analysis and regeneration of key stone species in Khonghampat forest. Manipur. Ph.D. thesis, Manipur University.
		<i>Habenaria acuiifera</i> Wall ex. Lindl.	16. Shukla, U. and Baishya, A.K., 1979. A contribution to the flora of Manipur. J. Bomb. Nut. Hist. Soc. 76:224-230.
		* <i>Liparis nervosa</i> (Sw.) Lindl.	17. Singh, E.J. and Yadava, P.S., 1996. New records of orchids from Ukhrul, Manipur. Flora and Fauna. 2:51-52.
		<i>Peristylus goodyeroides</i> Lindl.	18. Singh, E.J., Yadava, P.S. and Singh, Th.B., 1995. A contribution to the flora of Shiroy hills, Ukhrul Manipur. Bull Bot. Surv. India. 35:99-105.
		* <i>Apostasia wallichii</i> Br.	19. Uma Shanker, 2001. A case of high tree diversity in sal (<i>Shorea robusta</i>) dominant lowland forest of eastern Himalaya:Floristic composition, regeneration and conservation. Curr. Sci., 81:776-786.
	Poaceae	* <i>Capillipedium assimile</i> (Stered.)	20. Upadhaya, K., Pandey, H.N. Law, P.S. and Tripathi, R.S., 2004. Diversity and Populati characteristics of woody species in subtropical humid forests exposed to cultural disturbances in Meghalaya, North-Eastern India. Trop. Ecol., 45:303-314.
		* <i>Cymbopogon flexuosus</i> (Nees) Watson	
		* <i>Cymbopogon khasianus</i> (Hack.) Stapf.	
		* <i>Cymbopogon martini</i> (Roxb.) Watson.	
		* <i>Cyrtococcum oxyphyllum</i> Stapf.	
		* <i>Festuca leptopogon</i> Stapf.	
		<i>Isachne albens</i> Trin.	
		<i>Isachne pulchella</i> Roth ex Roem et Shult	
		* <i>Iseilema anthephoroides</i> Hack.	
		* <i>Oplismenus burmanni</i> (Retz.) Beauv.	
		<i>Oplismenus compositus</i> (L) Beauv.	
		<i>Pogonatherum crinitum</i> Kunth.	
		* <i>Lophatherum gracile</i> Brongn.	
		* <i>Setaria palmifolia</i> (Koenig) Stapf.	
	Piperaceae	* <i>Piper diffusum</i> Vahl.	
	Rubiaceae	<i>Hedyotis vestita</i> Br.	
		<i>Oldenlandia diffusa</i> (Willd.) Roxb.	
	Zingiberaceae	* <i>Alpinia allughas</i> Rose.	
		* <i>Globo bulbifera</i> Roxb.	
		<i>Hedychium spicatum</i> Buch.- Ham.	
	Urticaceae	* <i>Elatostema dissectum</i> Wedd.	
		* <i>Pilea smilacifolia</i> Wedd.	
	Violaceae	<i>Viola patrinii</i> DC.	
		<i>Viola serpens</i> Wall.	
Lianas	Rosaceae	* <i>Rubus furfuraceus</i> Wall.	
		* <i>R. khasianus</i> Card.	
		<i>R. lasiocarpus</i> Smith.	
		<i>R. moluccanus</i> Linn.	
	Smilacaceae	<i>Smilax roxburghiana</i> Wall.	
	Verbenaceae	<i>Lantana camera</i> Linn.	
	Fabaceae	* <i>Derris cuneifolia</i> Benth.	
	Dioscoreaceae	<i>Dioscorea hamiltonii</i> Hook. f.	
	Malpighiaceae	<i>Hiptage benghalensis</i> (L.) Kurz.	
	Piperaceae	<i>Piper attenuatum</i> Ham.	
	Rubiaceae	* <i>Hedyotis costata</i> (Roxb.) Kurz.	
	Vitaceae	<i>Vitis rumicisperma</i> M. Laws.	
Fern	Adiantaceae	<i>Adiantum philippense</i> Linn.	
	Aspiadaceae	<i>Arachnoides aristata</i> (Forst.f.) Tindale.	
		<i>Cyclosorus arbusculus</i> (Desu.) Chr.	
		<i>Diacalpe aspidioides</i> (Bl.)	
	Gleicheniaceae	<i>Dicranopteris linearis</i> (Burm.f.)	
	Lygodiaceae	<i>Lygodium flexuosum</i> Sw.	
	Pteridaceae	<i>Dryopteris blanfordii</i> (Hope) C. Chr.	
		<i>Pteris ensiformis</i> (Burm.)	

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