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Life-form classification and biological spectrum of Amambilok Sacred Grove, Andro, Manipur in Northeast India

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Abstract

The present study deals with the different life form categories and biological spectrum of Amambilok Sacred Grove, Andro, Manipur. A total of 157 species belonging to 70 families and 135 genera was recorded from the study area which was categorized in different life forms based on the position of their perennating buds. Among the life forms, Phanerophytes (55.41 %) and Therophytes (19.74 %) were found to be dominant followed by Hemicryptophytes (10.19 %), Cryptophytes (8.28 %) and Chamaephytes (6.36%). Biological spectrum based on life forms was compared with Raunkiaer's normal biological spectrum. On comparison with Raunkiaer's normal spectrum, the study area was classified as Phanero-therophytic type of phytoclimate.

Key words: Life forms, Biological Spectrum, Phytoclimate

INTRODUCTION

A life form of a plant is the sum of its all life processes and evolved directly in response to the environment (Cain 1950). A life form is determined by plant's adaptation to certain ecological conditions (Meera *et al.* 1999) and, thus, is an important physiognomic characteristic that have been widely used in vegetation analysis. It indicates micro and macroclimate (Shimwell 1971) as well as human disturbances of a particular area (Cain & Castro 1959). Humboldt (1886) for the first time formulated the concept of the life forms based on the location of perennating buds or organs. Raunkiaer (1934) used it as descriptive tool for classifying plant life forms based on the position and degree of protection of the propagating buds which would renew the plant's shoot part when the favorable season comes. Under this system, plant species can be grouped into five main classes, *viz.*, Phanerophytes, Chamaephytes, Hemicryptophytes, Cryptophytes and Therophytes. The percentages of various life form classes put together is called as the biological spectrum. The life form spectrum (Raunkiaer 1934) is an indication of phytoclimate of the habitats and micro- and macro-climate (Asmus 1990). Raunkiaer (1934) constructed a normal spectrum which could act as a null model against which different life form spectra could be compared. Raunkiaer's normal spectrum indicates a phanerophytic community and deviation from it determines the phytoclimate of the habitats. The occurrence of similar biological spectra in different regions indicates similar climatic conditions. Differences in the life form distributions between the normal spectrum and a biological spectrum would point out which life form characterizes the phytoclimate or the vegetation under study.

Climatic types can be characterized by the prevailing plant life forms in the plant communities under a given climatic regime (Raunkiaer 1934; Cain 1950; Mueller-Dombois & Ellenberg 1974). The biological spectra of the Indian region have been related to specific climatic, edaphic and altitudinal factors (Meher-Homji 1964; Pandey & Parmar 1993; Sharma & Dhakre 1993; Reddy *et al*. 1999; Rana *et al*. 2002; Pattanaik *et al*. 2007).

MATERIALS AND METHODS

The study area is located between 24° 45' 23" and 24° 45' 33" North Latitude and 94° 02' 22" and 94° 02' 44" East Longitude in the northeastern part of India in the altitudinal range of 820 – 920 m amsl. Two study sites (I and II) each of the size of 1.0 ha were selected along elevation gradient, one at the foothill (820 – 830 m) and another on the hillslope (849 – 890 m), with a distance of 160 m between the two study sites for the study of floristic composition and life forms. The climate of the study site is subtropical having monsoon from June to October while the winter prevails during November to February.

A floristic survey was conducted during the years 2009 – 2010 in the two study sites of Amambilok Sacred Grove, Andro, Manipur, Northeast India. All species of vascular plants, pteridophytes and angiosperms, were collected, identified and enumerated. The voucher specimens were identified by matching at ASSAM and CAL herbaria. The life-form of each species was recognized based on Raunkiaer's (1934) guide-line and were assigned a suitable life-form such as Therophytes (Th), Phanerophytes (Ph), Chamaephytes (Ch), Hemicryptophytes (H) and Cryptophytes(C). The percentage life form was calculated as follows.

$$\% \text{ Life Form} = \frac{\text{Number of species in any life form}}{\text{Total number of species of all life forms}} \times 100$$

Biological spectrum was prepared for the study area and was compared with the Raunkiaer (1934) normal biological spectrum (Fig. 1).

RESULT AND DICUSSION

In the present study, a total of 157 plant species belonging to 70 families and 135 genera was recorded and categorized in different life forms based on the position of their perennating buds (Table 1). Among the families recorded, the maximum species were reported from Acanthaceae (9 spp.) followed by Rubiaceae (8 spp.), Moraceae (7 spp.), Phyllanthaceae (7 spp.), Anacardiaceae (6 spp.), Asteraceae (5 spp.), Lauraceae (5 spp.), Meliaceae (5 spp.), etc. Out of the 58 species of trees, 11 species were represented at both the study sites, namely, *Spondias pinnata, Mangifera sylvatica, Mitrephora tomentosa, Celtis timorensis, Litsea monopetala, Cedrela serrata, Albizia procera, Artocarpus lakoocha, Antidesma bunius, Randia wallichii* and *Calicarpa arborea*. The study area, extending from 820 to 920 m, represents subtropical vegetation. Dominant tree species present in the study area include *Mitrephora tomentosa* (Site-I) and *Semecarpus anacardium* (Site-II). The understorey canopy is prominently represented by *Antidesma bunius, Syzygium jambos, Syzygium praecox,* etc. in Site - I and *Rhus succedanea, Castanopsis indica, Sapindus attenuatus,* etc. in Site-II. The study Site-I, at lower altitude, is dominated by shrubs like *Randia griffithii, Lantana camara, Eranthemum pulchellum, Beaumontia grandiflora,* etc. while Site-II, at higher elevation, is dominated by *Clerodendrum colebrookianum, Eranthemum pulchellum, Phlogacanhus tubiflorus, Trevesia palmata*, etc. The herbaceous layer, structurally and numerically most prominent during post monsoon season, is represented by *Oplismenus burmanii, Achyrospermum wallichianum, Zingiber*

Table 1. Life Forms of Plants observed at the Study Sites (I & II) of Amambilok Sacred Grove, Andro, Manipur, India

Family	Plant	Habit	Life Form	Site-I	Site-II
Acanthaceae	***Asystasia neesiana*** (Wallich) Nees	Herb	Th	+	-
	Eranthemum pulchellum Andreánszky	Shrub	Ph	+	+
	Justicia gendarussa Burman f.	Shrub	Ph	+	+
	Lepidagathis incurva Buchanan-Hamilton *ex* D. Don	Herb	Th	-	+
	Peristrophe roxburghiana (Roemer & Schultes) Bremekamp	Herb	Ch	-	+
	Peuderanthemum andersonii (Masters) Lindau	Herb	Th	+	+
	Phlogacanthus tubiflorus Nees	Shrub	Ph	-	+
	Strobilanthes hamiltoniana (Steudel) Bosser & Heine	Shrub	Ph	-	+
	Justicia adhatoda Linnaeus	Shrub	Ph	+	-
Aceraceae	***Acer oblongum*** Wallich *ex* de Candolle	Tree	Ph	+	-
Amaranthaceae	***Achyranthes bidentata*** Blume	Herb	Th	+	+
	Cyathula prostrata (Linnaeus) Blume	Herb	Th	+	+
Anacardiaceae	***Lannea coromandelica*** (Houttuyn) Merrill	Tree	Ph	+	-
	Mangifera sylvatica Roxburgh	Tree	Ph	+	+
	Rhus succedanea Linnaeus	Tree	Ph	-	+
	Semecarpus anacardium Linnaeus f.	Tree	Ph	-	+
	Spondias pinnata (Linnaeus f.) Kurz	Tree	Ph	+	+
Annonaceae	***Desmos longiflorus*** (Roxburgh) Safford	Shrub	Ph	-	+
	Goniothalamus sesquipedalis (Wallich) Hooker f. & Thomson	Shrub	Ph	-	+
	Mitrephora tomentosa Hooker f. & Thomson	Tree	Ph	+	+
Apiaceae	***Centella asiatica*** (Linnaeus) Urban	Herb	H	-	+
	Hydrocotyle sibthorpioides Lamarck	Herb	H	-	+
Apocynaceae	***Beaumontia grandiflora*** Wallich	Shrub	Ph	+	-
Araceae	***Aglaonema tenuipes*** Engler	Herb	H	-	+
	Arisaema tortuosum (Wallich) Schott	Herb	Cr	+	+
	Colocasia lihengiae C.L. Long & K.M. Liu	Herb	Cr	-	+
	Typhonium venosum (Dryand. *ex* Aiton) Hetterscheid & P.C.Boyce	Herb	Cr	+	-
Araliaceae	***Aralia armata*** (Wallich) Seemann	Shrub	Ph	+	+
	Brassaiopsis glomerulata (Blume) Regel	Tree	Ph	-	+
	Trevesia palmata (Roxburgh *ex* Lindley) Visiani	Shrub	Ph	+	+
Arecaceae	***Wallichia oblongifolia*** Griffith	Shrub	Ph	-	+
Asteraceae	***Bidens pilosa*** Linnaeus	Herb	Th	+	+
	Elephantopus scaber Linnaeus	Herb	Cr	+	-
	Eupatorium adenophorum Sprengel	Herb	Th	-	+
	Mikania micrantha Kunth	Herb	Th	+	+
	Spilanthes acmella (Linnaeus) Linnaeus	Herb	Th	-	+
Begoniaceae	***Begonia palmata*** D. Don	Herb	Cr	-	+
Betulaceae	***Alnus nepalensis*** D. Don	Tree	Ph	-	+
Bignoniaceae	***Stereospermum chelonoides*** (Linnaeus f.) de Candolle	Tree	Ph	+	-

Family	Plant	Habit	Life Form	Site-I	Site-II
Bignoniaceae	***Oroxyllum indicum*** (Linnaeus) Bentham *ex* Kurz	Tree	Ph	+	-
Caesalpiniaceae	***Bauhinia scandens*** Linnaeus	Shrub	Ph	+	+
	Cassia floribunda Cavanilles	Shrub	Ph	-	+
Campanulaceae	***Lobelia nicotianaefolia*** Heyne	Herb	Th	+	-
Cannabaceae	***Celtis timorensis*** Spanoghe	Tree	Ph	+	+
	Celtis tetendra Roxburgh	Tree	Ph	-	+
	Trema orientalis (Linnaeus) Blume	Tree	Ph	-	+
Capparaceae	***Capparis tenera*** Dalzell	Shrub	Ph	+	+
	Crataeva nurvala Buchanan-Hamilton	Tree	Ph	+	-
Chloranthaceae	***Chloranthus officinalis*** Blume	Shrub	Ph	-	+
Clusiaceae	***Garcinia xanthochymus*** Hooker *f. ex* T. Anderson	Tree	Ph	-	+
Commelinaceae	***Commelina benghalensis*** Linnaeus	Herb	H	+	+
	Commelina diffusa Burman f.	Herb	H	-	+
	Murdannia elata (Vahl) G. Bruckner	Herb	H	-	+
	Murdannia loureiroi (Hance) R.S. Rao & Kammathy	Herb	H	+	-
Convallariaceae	***Disporum pullum*** Salisbury	Herb	H	-	+
Cordiaceae	***Cordia grandis*** Roxburgh	Tree	Ph	+	-
Cornaceae	***Alangium chinense*** (Loureiro) Harms	Tree	Ph	+	-
Cucurbitaceae	***Trichosanthes*** tricuspidata Loureiro	Herb	Th	-	+
Cyperaceae	***Carex baccans*** Nees	Herb	Th	-	+
	Cyperus rotundus Linnaeus	Herb	Cr	+	-
	Fuirena umbellata Rottboell	Herb	Th	-	+
Dioscoreaceae	***Dioscorea bulbifera*** Linnaeus	Herb	Cr	+	+
	Dioscorea pentaphylla Linnaeus	Herb	Cr	+	-
Dryopteridaceae	***Dryopteris marginalis*** (Linnaeus) A. Gray	Herb	Cr	+	+
Elaeocarpaceae	***Elaeocarpus braceanus*** Watt *ex* C.B. Clarke	Tree	Ph	+	-
Euphorbiaceae	***Croton caudatus*** Geiseler	Shrub	Ph	+	+
	Glochidion assamicum (Muller-Argoviensis) Hooker f.	Tree	Ph	-	+
Fabaceae	***Milettia pachycarpa*** Bentham	Shrub	Ph	+	+
	Mucuna monosperma Wight	Shrub	Ph	-	+
Fagaceae	***Castanopsis indica*** (Roxburgh) A.de Candolle	Tree	Ph	-	+
	Quercus serrata Murray	Tree	Ph	+	-
Gleicheniaceae	***Gleichenia linearis*** (Burman f.) C.B.Clarke	Herb	Cr	-	+
Hypoxidaceae	***Molineria capitulata*** (Loureiro) Herbert	Herb	H	-	+
Juglandaceae	***Engelhardtia roxburghiana*** Wallich	Tree	Ph	-	+
	Juglans regia Linnaeus	Tree	Ph	-	+
Lamiaceae	***Achyrospermum wallichianum*** (Bentham) Bentham *ex* Hooker f.	Herb	Th	+	-
	Clerodendrum colebrookianum Walpers	Shrub	Ph	+	+
	Gomphostemma parviflorum Wallich *ex* Bentham	Shrub	Ph	+	+
	Meriandra benghalensis (Konig *ex* Roxburgh) Bentham	Shrub	Ph	-	+
Lauraceae	***Cinnamomum zeylanicum*** Blume	Tree	Ph	-	+
	Cinnamomum cecicodaphne Meissner	Tree	Ph	-	+
	Litsea cubeba (Loureiro) Persoon	Tree	Ph	-	+

Family	Plant	Habit	Life Form	Site-I	Site-II
Lauraceae	***Litsea monopetala*** (Roxburgh) Persoon	Tree	Ph	+	+
	Machilus bombycina King *ex* Hooker *f.*	Tree	Ph	-	+
Lygodiaceae	***Lygodium flexuosum*** Linnaeus	Herb	Th	-	+
Magnoliaceae	***Michelia champaca*** Linnaeus	Tree	Ph	-	+
Malastomataceae	***Memecylon pauciflorum*** Blume	Shrub	Ph	-	+
Malvaceae	***Pterospermum acerifolium*** (Linnaeus) Willdenow	Tree	Ph	+	-
	Triumfetta rhomboidea Jacquin	Shrub	Ph	+	+
	Urena lobata Linnaeus	Shrub	Ph	-	+
Meliaceae	***Cedrella serrata*** Royle	Tree	Ph	+	+
	Cedrela toona Roxburgh *ex* Rottler	Tree	Ph	-	+
	Lansium domesticum Corrêa	Tree	Ph	+	-
	Melia composita Willdenow	Tree	Ph	-	+
Menispermaceae	***Cissampelos pareira*** Linnaeus	Herb	Th	+	+
Mimosaceae	***Albizia odoratissima*** (Linnaeus f.) Bentham	Tree	Ph	+	-
	Albizia lucidior (Steudel) I. Nielsen *ex* Hara	Tree	Ph	+	-
	Albizia procera (Roxburgh) Bentham	Tree	Ph	+	+
	Albizia stipulata (de Candolle) Boivin	Tree	Ph	-	+
	Entada rheedii Sprengel	Shrub	Ph	-	+
Moraceae	***Atocarpus lakoocha*** Buchanan-Hamilton	Tree	Ph	+	+
	Ficus benjamina Linnaeus	Tree	Ph	+	-
	Ficus esquiroliana H. Leveille	Tree	Ph	-	+
	Ficus heteropleura Blume	Tree	Ph	-	+
	Ficus semicordata Buchanan-Hamilton *ex* Smith	Tree	Ph	-	+
	Ficus virens Linnaeus	Tree	Ph	+	-
Myrsinaceae	***Maesa indica*** (Roxburgh) de Candolle	Shrub	Ph	+	+
Myrtaceae	***Syzygium jambos*** (Linnaeus) Alston	Tree	Ph	+	-
	Syzygium praecox (Roxburgh) Rathakr. & N.C. Nair	Tree	Ph	+	-
Oxalidaceae	***Oxalis corniculata*** Linnaeus	Herb	H	-	+
Phyllanthaceae	***Antidesma acidum*** Retzius	Shrub	Ph	-	+
	Antidesma bunius (Linnaeus) Sprengel	Tree	Ph	+	+
	Baccaurea ramiflora Loureiro	Tree	Ph	-	+
	Breynia oblongifolia Muller-Argoviensis	Shrub	H	+	+
	Sauropus macrophyllus Hooker *f.*	Shrub	Ph	+	-
Piperaceae	***Piper nigrum*** Linnaeus	Herb	H	-	+
Plantaginaceae	***Plantago erosa*** Wallich	Herb	Ch	-	+
Poaceae	***Chrysopogon aciculatus*** (Retzius) Trinius	Herb	Th	+	-
	Oplismenus burmanii (Retzius) P. Beauvois	Herb	Th	+	+
	Oplismenus compositus (Linnaeus) P. Beauvois	Herb	Th	-	+
	Panicum humidorum Buchanan-Hamilton *ex* Hooker *f.*	Herb	Th	-	+
	Setaria palmifolia (J. Koenig) Stapf	Herb	Th	-	+
Polygonaceae	***Polygonum chinense*** Linnaeus	Herb	Th	-	+
Primulaceae	***Ardisia elliptica*** Thunberg	Shrub	Ph	+	+
Pteridaceae	***Pteris biaurita*** Linnaeus	Herb	Cr	-	+
	Pteris cretica Linnaeus	Herb	Cr	-	+
	Pteris ensiformis Burman *f.*	Herb	Cr	-	+
Rosaceae	***Duchesnia indica*** (Andréanszky) Focke	Herb	Th	-	+

Family	Plant	Habit	Life Form	Site-I	Site-II
Rosaceae	***Rubus elipticus*** J.E. Smith	Shrub	Ph	+	+
Rubiaceae	***Chassalia parvifolia*** K. Schumann	Shrub	Ch	-	+
	Hedyotis scandens Roxburgh	Shrub	Ch	-	+
	Mussaenda frondosa Linnaeus	Shrub	Ph	-	+
	Mussaenda glabra Vahl	Shrub	Ph	-	+
	Psychotria calocarpa Kurz	Shrub	Ch	-	+
	Psychotria yunnanensis Hutchinson	Shrub	Ch	-	+
	Randia griffithii J.D. Hooker	Shrub	Ph	+	+
	Randia wallichii Hooker *f.*	Tree	Ph	+	+
Rutaceae	***Murraya paniculata*** (Linnaeus) Jack	Shrub	Ph	+	+
	Micromelum integerrimum (Buchanan-Hamilton *ex* de Candolle) Wight & Arnott *ex* M. Roemer	Shrub	Ph	-	+
	Zanthozylum alatum Roxburgh	Shrub	Ph	+	+
Salicaceae	***Flacourtia jangomas*** (Loureiro) Raeuschel	Tree	Ph	+	-
	Xylosma longifolium Clos	Tree	Ph	+	-
Sapindaceae	***Sapindus attenuatus*** Wallich	Tree	Ph	-	+
	Sapindus mukorossi Gaertner	Tree	Ph	+	-
Scrophulariaceae	***Bonnaya brachiata*** Link & Otto	Herb	Th	-	+
Smilacaceae	***Smilax zeylanica*** Linnaeus	Shrub	Ph	+	+
Solanaceae	***Solanum torvum*** Swartz	Shrub	Ph	-	+
Theaceae	***Eurya acuminata*** (Candolle) Blume	Tree	Ph	-	+
Tiliaceae	***Grewia serrulata*** de Candolle	Shrub	Ph	+	-
Ulmaceae	***Ulmus lanceifolia*** Roxburgh *ex* Wallich .	Tree	Ph	+	-
Urticaceae	***Boehmeria tricuspis*** (Hance) Makino	Shrub	H	+	-
	Elatostema reticulatum Weddell	Herb	Th	-	+
Verbenaceae	***Calicarpa arborea*** Roxburgh	Tree	Ph	+	+
	Lantana camara Linnaeus	Shrub	Ph	+	+
	Vitex yunnanensis W.W. Smith	Tree	Ph	-	+
Vitaceae	***Cayratia trifolia*** (Linnaeus) Domin	Herb	Th	-	+
Zingiberaceae	***Zingiber cernuum*** Dalzell	Herb	Cr	+	-

Table 2. Total number of species and percentage of different life-form classes

Life Form	No. of Species	Percentage (%)
Ph	87	55.41%
Ch	10	6.36%
H	16	10.19%
Cr	13	8.28%
Th	31	19.74%

cernuum, Cyathula prostrata, Typhonium venosum, etc. in Site-I and *Oplismenus burmanii, Colocasia lihengiae, Eupatorium adenophorum, Commelina diffusa, Cyathula prostrata,* etc. in Site-II. Climbers have been represented by *Cissampelos pareira, Dioscorea bulbifera, Mikania micrantha,* etc. in Site-I while *Piper nigrum, Cissampelos pareira, Hedyotis scandens, Rubus ellipticus,* etc. in Site-II.

The life forms exhibited by trees and shrubs comprised of phanerophytes only but herbs belong to four major life forms *viz*., Chamaephytes (Ch), Hemicryptophytes (H),

Table 3. Comparison of biological spectrum of study area with Raunkiaer's (1934) Normal Biological Spectrum

Life form	TH	PH	CH	H	C
Percentage life form (present study)	19.74	55.41	6.36	10.19	8.28
Percentage life form in normal spectrum	13.0	46.0	9.0	26.0	6.0
Percentage Deviation	+6.74	+9.41	-2.64	-15.81	+2.28

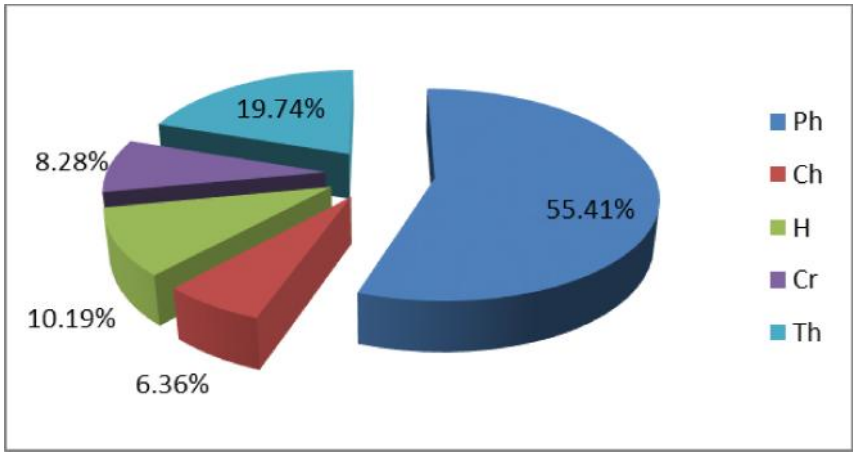

Fig. 1. Graphical Representation of Different Life forms of Amambilok Sacred Grove

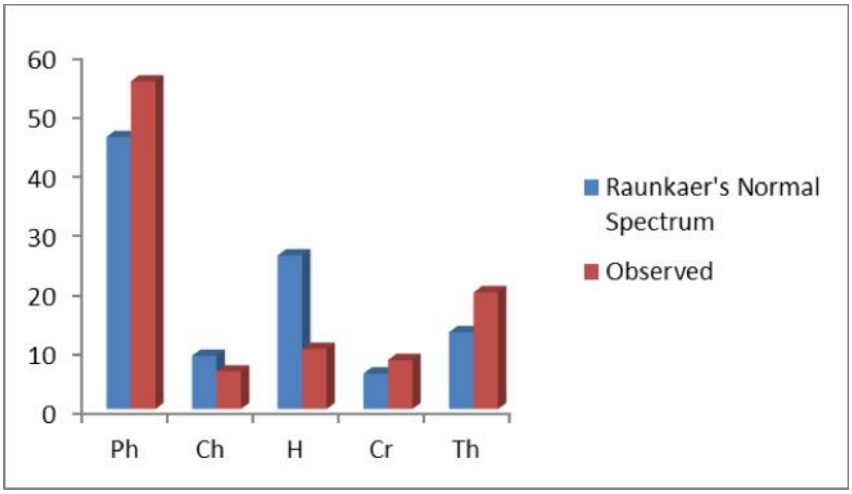

Fig. 2. Comparision of Biological Spectrum of Amabilok Sacred Grove with Raukiaer's Normal Spectrum

Cryptophytes (Cr) and Therophytes (Th). Thus, the study shows that 55.41 % of the whole life forms are Phanerophytes, 6.36 % Chamaephytes, 10.19 % Hemicryptophytes, 8.28 % Cryptophytes, and 19.74 % Therophytes (Fig. 1). The Phanerophytes (55.41 %) dominated in the biological spectrum of the study area followed by Therophyte (19.74 %), Cryptophyte (8.28 %), Hemicryptophyte (10.19 %) and Chamaephyte (6.36 %) [Table 2; Fig. 1]. The chamaephytic life form shows low percentage (6.36), whereas Phanerophytic

life form has the highest percentage (55.41) probably partly due to the local protection under certain taboos of the sacred grove. The Phanerophytes and Therophytes together constitute 75.15 % of the life-forms proportion. As phanerophytes showed maximum divergence from the normal spectrum given by Raunkier, accordingly the phytoclimate of the area may be termed as phanero-therophytic (Table 3; Fig. 2). Similar phytoclimatic association has also been reported by other workers for different tracts of vegetation (Lakshmanan 1962; Misra *et al*. 1979; Saxena 1980; Saxena *et al.* 1982; Rajendraprasad *et al*. 1998; Khatri 2000).

The higher percentage of therophytes occurring in the area is the characteristic of subtropics and often related to soil and climatic conditions (Subramani *et al*. 2007). The predominance of therophytes is attributed to various factors like prevalent microclimate of the region coupled with anthropogenic activities like grazing, looping, felling, deforestation, introduction of annual weeds, etc., as has also been reported by other workers (Sharma 2003; Sher & Khan 2007; Khan *et al.* 2011). Thus, the present study revealed that the vegetation is predominantly sub-tropical type having a higher percentage of phanerophytes and therophytes as compared to normal biological spectrum. On the basis of this study, the phytoclimate of the area, as per Raunkiaer's terminology, has been described as phanero-therophytic phytoclimate. This indicates influence of anthropogenic activities in the study area which favors the chances of growth of short lived annuals. It has also been reported that therophytes stand next to phanerophytes (Thakur 2015). Prevalence of therophytes is also an indicator of biotic pressure (Bharucha & Dave 1944). The growth of therophytes was much favoured in disturbed areas (Keeley & Albert 1977; Vora & George 1987). According to Meher-Homji (1964), the life-forms are reflected by bioclimate of the area. Thus, in humid regions, the bioclimate should be phanerophytic and, in arid regions, therophytic. As reported by Jamir *et al*. (2006), the montane humid forests of Meghalaya receive annual rainfall of 5500mm and represent 51 % of phanerophytes. So, the amount of rainfall appears to be most important operative factor in the evolution of biological spectrum. Structurally and floristically the tropical dry forests are less complex than wet forests, comprising about half or less of the tree species of wet forest (Murphy & Lugo 1986). In this regard, the study area is floristically rich and potential for further research in future.

CONCLUSION

Analysis of life-forms gives clear picture of the biological spectrum of the study area. In the present study, both phanerophytes and therophytes share the importance in depicting the phytoclimate of the study area i.e. phanero-therophytic type. This indicates the influence of anthropogenic disturbance in the study area which favors the growth of more therophytes. Thus, further disturbance to the present study area may facilitate change of its present phytoclimate into thero-phanerophytic type in future. The study area being a sacred grove may be well protected by further understanding its importance to the ecosystem of the locality and its useful resources for the future as well.

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