Journal of Agroecology and Natural Resource Management
p-ISSN: 2394-0786, e-ISSN: 2394-0794, Volume 3, Issue 2; July-September 2016 pp. 145-151

http://www.krishisanskriti.org/Publication.html

Floristic Composition, Life Form and Biological Spectrum from the Mapithel Mountain, North-East India

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Abstract—*To characterize the biological spectrum, an explorative survey was undertaken periodically in the two selected sites during 2012 to 2013. The flora consisted of 207 plant species belonging to 57 families. These includes 110 herbs (53.14%), 39 shrubs (18.84%), and 58 trees (28.02%). The study of floristic spectrum reveals 46.86% of Phanerophytes, followed by17.39% of Hemicryptophytes, 12.08% of Therophytes, 10.63% of Cryptophytes and 13.04% of Chamaephytes in the two study areas. Differences in the life-form distribution between the normal spectrum and a biological spectrum pointed out the prevalence of Phanero-Hemicryptophytic phytoclimate as in the floristic spectrum. The most represented life forms were the Phanerophytes and Hemicryptophytes. The study concludes that the investigated area was under certain biotic pressure.*

Keywords*: Life form, Biological Spectrum, Floristic, Manipur, North-East India.*

1. INTRODUCTION

The increasing population trend over the last few decades and their consequent dependence on plant and bio-products has led to the vast exploitation of natural flora. It indicates micro and macroclimate [l, 2] as well as human disturbance of a particular area [3]. Plants can be grouped into life-form on the basis of similarities in structure and function [4]. A life form of the plant is the sum of all life processes and evolved directly in response to the environment [5]. The life form composition of the community is the manifestation of the adaptations of its component species to the climatic condition and contributes to community architecture [6, 7].

For the first time [8] formulated the concept of the life forms for which he considered the location of perennating buds or organs. According to this system [9], plant species can be grouped into five main classes: phanerophytes, chamaephytes, hemicryptophytes, cryptophytes and therophytes. The percentage of various life form classes put together is called as the biological spectrum. Raunkiær's normal spectrum indicates a phanerophytic community for the World 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 distribution between the normal spectrum and a biological spectrum would point out which life-form characterizes the phytoclimate or the vegetation under study. The Biological spectrum varies in different climate. Conversely the major vegetation formation is also delimited by climate data [10]. Since each forest has a distinct composition, the impact of various land use on the composition of vegetation cover reveals the adaptation characteristics of the plants to the environment. The present paper explores the floristic composition, life form and biological spectrum of trees, shrubs and herbs.

2. DESCRIPTION OF THE STUDY AREA

The Mapithel Mountain lies between 24^0 47'42''N - $24^0$54'43''N Latitudes and: $94^0$08'96''E - $94^0$16'48''E Longitudes in the Ukhrul District of Manipur, North-East India (Fig. 2.1). Two sites had been selected viz. Lower site (Station-I) and Upper site (Station-II) separated by about 500m with the altitude varying from 900m to 2015m asl. The dominating tree species in site-I, are *Albizia Splendens, Schima Wallichii, Quercus serrata, Lithocarbus dealbatus, Stereospermum cheloniodes and Lithocarpus pachyphylla* whereas in site-II, *Albizia splendens Quercus serrata, Quercus griffithii, Cinnamomum zeylanicum, Lithocarpus fenestrata* and *Lithocarpus dealbatus* are dominated. The mountain is located at around 35 km from Imphal. The soil varies from clay loam to sandy loam and temperature ranges from sub-zero to 36 °C with an average annual rainfall of 933 mm at Imphal.

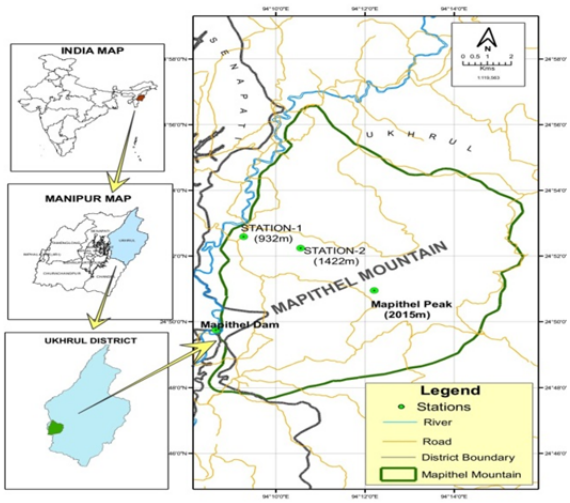

Fig. 2.1: Map showing study area

3. MATERIAL AND METHOD

Survey for plant collections and observations were carried out in wet and dry seasons throughout the whole year to cover the overall vegetation and species diversity during 2012 - 2013. Phytosociological data was collected by laying 10m x 10m quadrates for tree species, 5m x 5m for shrubs, 1m x 1m for herbs. The numbers of sample plots were finalized in consultation with species accumulation curves. The collected plants were classified into tree, shrub and herb. In the forest, the biological life form, habit, height and the location of perennating buds of species were observed. The species were further placed in various life forms classes [11]. The plant specimens collected during field study were processed for herbarium preservation and taxonomically worked out for confirming identification with the help of pertinent literature [12, 13, 14, 15], BSI Shillong, Kolkota and authentic specimens preserved in the herbarium of State Forest Department and Manipur University.

4. RESULT

Out of the 57 families, 207 species were recorded from the two stations of the Mapithel Mountain (see Table 4.1) Families recorded with maximum species were Poaceae with 22 species (10.63%), Asteraceae and Fabaceae with 15 species each (7.25%), Pteridaceae with 11 species (5.31%), Verbenaceae with 10 species (4.83%), Acanthaceae with 9 species (4.35%), Zingiberaceae with 8 species (3.86%), Urticaceae with 7 species (3.38%), followed by Fagaceae and Moraceae with 6 species each (2.9%), followed by Euphorbiaceae, Rosaceae and Rubiaceae with 5 species each (2.41%). Habit-wise information of species provides a clear picture of high species richness among herbaceous category (see Table 4.2). The life form exhibited by trees and shrubs comprised of Phanerophytes only but herbs belong to five major life forms *viz*., Phanerophytes (Ph), Chamaephytes (Ch), Hemicryptophytes (H), Cryptophytes (Cr) and Therophytes (Th). These includes 110 herbs (53.14%), 39 shrubs (18.84%), and 58 trees (28.02%). **T**he study of floristic spectrum reveals 46.86% of phanerophytes followed by17.39% of hemicryptophytes, 12.08% of therophytes, 10.63% of cryptophytes and 13.04% of chamaephytes in the two study areas (see Table 4.3 and Fig. 4.1). From amongst the 58 species of trees, 23 species have been represented at both study areas such as *Albizia lebbeck, Albizia procera, Albizia Splendens, Artocarpus lacucha, Schima wallichii, Quercus serrata, Stereospermum cheloniodes, Lithocarbus dealbatus, Lithocarpus fenestrata, Lithocarpus pachyphylla*, etc.

Table 1: An inventory of the floristic composition from Mapithel Mountain.

Family	Name of the Species	Life form	S-I	S-II
Acanthaceae	*Andrographis paniculata* (N.L.Burman) Wall. ex Nees	Ch	+	+
Acanthaceae	*Justicia procumbens* L.	Ch	+	-
Acanthaceae	*Lepidagathis incurva* Buch.-Ham. Ex D. Don	Ch	-	+
Acanthaceae	*Phlogacanthus pubinervius* T. Anders	Ph	-	+
Acanthaceae	*Platystemma violoides* Wall.	H	-	+
Acanthaceae	*Strobilanthes oliganthtus* Miq.	Ch	-	+
Acantheceae	*Strobilanthes asymmetrica* J.R.I. Wood & J.R. Benn.	Ch	-	+
Acanthaceae	*Strobilanthes clarkei* J.R.I. Wood	Ch	-	+
Acanthaceae	*Thunbergia coccinea* Wall.	Ch	-	+
Amaranthaceae	*Amaranthus aspera* L.	Th	+	-
Amaranthaceae	*Achyranthes viridus* L.	Th	+	-
Amaryllidaceae	*Molineria capitulata* (Lour.) Herb.	Cr	-	+
Anacardiaceae	*Toxicodendron succedaneum* (L.) Kuntze	Ph	+	-
Anacardiaceae	*Holigarna caustica* (Dennst.) Oken	Ph	-	+
Anacardiaceae	*Rhus succedanea* L.	Ph	+	+
Apiaceae	*Angelica cyclocarpa* (C.Norman) M. Hiroe	Ch	-	+
Apiaceae	*Centella asiatica* (L.) Urb.	Ch	+	-
Apocynaceae	*Cynanchum auriculatum* Royle ex wight	Ch	+	-
Araceae	*Alocasia fornicata* (Roxb.) Schott	Cr	-	+
Araceae	*Alocasia macrorrhizos* (L.) G. Don	Cr	+	+

Araceae	*Amorphophallus napalensis* (Wall.) Bogner & Mayo	Cr	-	+
Araceae	*Arisaema toruosum* (Wall.) Schott.	Cr	-	+
Araliaceae	*Brassaiopsis mitis* C.B.Clarke	Ph	-	+
Araliaceae	*Schefflera venulosa* (Wight & Arn.) Harms	Ph	-	+
Arecaceae	*Daemonorops jenkinsiana* (Griff.)	Ph	-	+
Asteraceae	*Ageratum conyzoides* L.	Th	+	+
Asteraceae	*Artemisia nilagirica* (C.B. Clarke) Pamp.	Ph	-	+
Asteraceae	*Artemisia vulgaris* L.	Ph	+	+
Asteraceae	*Bidens pilosa* L.	Th	+	+
Asteraceae	*Blumea balsamifera* L. (D.C.)	Th	+	+
Asteraceae	*Crassocephalum crepidioides* (Benth.) S.Moore	Th	+	-
Asteraceae	*Crepis japonica* (L.) Benth.	Th	+	+
Asteraceae	*Dichrocephala integrifolia* (L.f.) Kuntze	Th	+	+
Asteraceae	*Eupatorium adenophorum* Spreng	Ch	-	+
Asteraceae	*Eupatorium odorantum* Benth.	Ph	+	+
Asteraceae	*Galinsoga parviflora* Cav.	Th	+	+
Asteraceae	*Inula cappa* DC.	Ph	+	-
Asteraceae	*Sigesbeckia orientalis* L.	Th	+	+
Asteraceae	*Spilanthes acmella* Murr.	Th	+	-
Asteraceae	*Vernonia cinerea* (L.) Less.	Th	+	+
Betulaceae	*Alnus nepalensis* D. Don	Ph	-	+
Betulaceae	*Betula alleghaniensis* Britton	Ph	-	+
Bombacaceae	*Bombax ceiba* L.	Ph	+	-
Boraginaceae	*Cordia grandis* Roxb.	Ph	-	+
Boraginaceae	*Maharanga emodi* (Wall.) A. DC.	Th	+	+
Bignoniaceae	*Oroxylum indicum* (L.) Kruz	Ph	+	+
Bignoniaceae	*Stereospermum chelonoides* (L.f.) DC	Ph	+	+
Commelinaceae	*Commelina paludosa* Blume	H	+	+
Commelinaceae	*Cyanotis barbata* D.Don.	Ch	+	-
Cyperaceae	*Cyperus odoratus* L.	Cr	+	+
Cyperaceae	*Cyperus polystachyos* Rottb.	Cr	+	+
Cyperaceae	*Cyperus rotundus* L.	Cr	+	-

Dilleniaceae	*Dillenia indica* L.	Ph	-	+
Dilleniaceae	*Dillenia pentagyna* Roxb.	Ph	+	+
Dioscoreaceae	*Dioscorea bulbifera* L.	Cr	+	+
Dioscoreaceae	*Dioscorea opposita* Thunb.	Cr	+	-
Elaeocarpaceae	*Elaeocarpus sylvestris* (Lour.) Poir.	Ph	-	+
Euphorbiaceae	*Bischofia javanica* Blume	Ph	-	+
Euphorbiaceae	*Bridelia stipularis* (L.) Blume	Ph	+	-
Euphorbiaceae	*Euphorbia hirta* L.	H	+	-
Euphorbiaceae	*Mallotus philippensis* (Lam.) Mull.Arg.	Ph	-	+
Euphorbiaceae	*Macaranga denticulata* (Blume) Mull.Arg.	Ph	+	+
Fabaceae	*Albizia lebbeck* (L.) Benth.	Ph	+	+
Fabaceae	*Albizia procera* (Roxb.) Benth.	Ph	+	+
Fabaceae	*Albizia splendens* Miq.	Ph	+	+
Fabaceae	*Acacia etbaica* Schweinf	Ph	-	+
Fabaceae	*Acasia intsia* Willd.	Ph	+	-
Fabaceae	*Bauhinia purpurea* L.	Ph	+	+
Fabaceae	*Bauhinia variegata* L.	Ph	+	+
Fagaceae	*Castanopsis hystrix* A.DC.	Ph	+	+
Fagaceae	*Castanopsis tribuloides* (Sm.) A.DC.	Ph	+	+
Fabaceae	*Cassia laevigata* Willd.	Ph	-	+
Fabaceae	*Desmodium pulchellum* Benth.	Ph	+	-
Fabaceae	*Desmodium pseudotriguetrum* DC.	Ch	+	-
Fabaceae	*Desmodium gangeticum* (L.) DC.	Ch	+	+
Fabaceae	*Entada rheedii* Spreng	Ph	-	+
Fabaceae	*Erythrina indica* Lam.	Ph	+	+
Fagaceae	*Lithocarpus dealbatus* (Hook.f. & Thomson ex Miq.) Rehder	Ph	+	+
Fagaceae	*Lithocarpus fenestratus* (Roxb.) Rehder	Ph	+	+
Fagaceae	*Lithocarpus pachyphyllus* (Ksurz) Rehder	Ph	+	+
Fabaceae	*Millettia pachycarpa* Benth.	Ph	+	+
Fagaceae	*Quercus graffithii* Hook.f. & Thomson ex Miq.	Ph	-	+
Fagaceae	*Quercus serrata* Murray	Ph	+	+
Flacourtiaceae	*Flacourtia jangomas* (Lour.) Raeusch.	Ph	-	+
Flacourtiaceae	*Xylosma longifolia* Clos	Ph	-	+
Gesneriaceae	*Aeschynanthus parviflorus* (D. Don) Spreng	Ph	-	+

Hypoxidaceae	*Curculigo ensifolia* R.Br.	H	-	+
Juglandiaceae	*Engelhardtia spicata* Lechen ex Blume	Ph	+	-
Juglandiaceae	*Juglans regia* L.	Ph	-	+
Lamiaceae	*Anisomeles indica* (L.) Kuntze	Th	-	+
Lamiaceae	*Leucosceptrum canum* Sm.	Ph	+	+
Lamiaceae	*Scutellaria discolor* Colebr.	H	-	+
Lauraceae	*Cinnamomum zeylanicum* Blume	Ph	-	+
Lauraceae	*Litsea glutinosa* (Lour.) C.B.Rob.	Ph	-	+
Lauraceae	*Litsea monopetala* (Roxb.) Pers.	Ph	+	+
Lauraceae	*Ocotea lancifolia* (Schott) Mez	Ph	-	+
Liliaceae	*Smilx zeylanica* L.	Ph	+	+
Liliaceae	*Smilax lanceifolia* Roxb.	Ph	+	-
Magnoliaceae	*Michelia champaca* L.	Ph	-	+
Malastomataceae	*Melastoma malabathricum* L.	Ph	+	-
Malastomataceae	*Osbeckia stellata* Don ex C.B. Clarke	Ph	+	-
Malastomataceae	*Osbeckia nepalensis* Hook	Ph	+	+
Malvaceae	*Kydia calycina* Roxb.	Ph	+	+
Malvaceae	*Triumfetta rhomboidea* Jacq.	Ph	-	+
Malvaceae	*Sida cordifolia* L.	Ch	-	+
Malvaceae	*Urena lobata* L.	Ch	+	-
Melanthiaceae	*Paris polyphylla* Sm.	Cr	-	+
Meliaceae	*Azadirachta indica* A. Juss.	Ph	+	-
Meliaceae	*Toona ciliata* M. Roem.	Ph	+	+
Moraceae	*Artocarpus lacucha* Buch.-Ham.	Ph	+	+
Moraceae	*Ficus auriculata* Lour.	Ph	-	+
Moraceae	*Ficus benjamina* L.	Ph	-	+
Moraceae	*Ficus hispida* L.f.	Ph	+	-
Moraceae	*Ficus semicordata* Buch.-Ham.ex Sm.	Ph	+	+
Moraceae	*Ficus virens* Aiton	Ph	-	+
Musaceae	*Musa balbisiana* Colla	Cr	-	+
Myrtaceae	*Syzygium praecox* (Roxb.) Rathakr. & N.C.Nair	Ph	+	+
Orobanchaceae	*Aeginetia indica* L.	H	+	-
Orchidaceae	*Habenaria stenopetala* Lindl.	Cr	-	+
Phyllanthaceae	*Antidesma bunius* (L.) Streng.	Ph	-	+
Phyllantheceae	*Phyllanthus emblica* L.	Ph	+	+
Phyllantheceae	*Phyllantus niruri* L.	Ch	+	+
Pinaceae	*Pinus kesiya* Royle ex. Gordon	Ph	+	-
Poaceae	*Arundinella setosa* Trin.	H	+	-
Poaceae	*Cephalostachyum pergracile* Munro	Ph	+	-
Poaceae	*Cymbopogon flexuosus* (Nees ex Steud.) W.Watson	H	+	+
Poaceae	*Cynodon dactylon* (L.) Pers.	H	+	-
Poaceae	*Dactyloctenium aegypticum* (L.)Willd.	H	+	-
Poaceae	*Denderocalamus strictus* Nees	Ph	-	+
Poaceae	*Dichanthelium sciurotoides* (Zuloaga & Morrone) Davidse	Th	+	+
Poaceae	*Eragrostis unioloides* Nees ex Steud.	H	+	+
Poaceae	*Heteropogon contortus* (L.) P.Beauv. Ex Roem. & Schult.	H	+	-
Poaceae	*Lasiacis ligulata* Hitchc. & Chase	Th	-	+
Poaceae	*Leptaspis banksii* R.Br.	Ch	+	+
Poaceae	*Paspalum conjugatum* P.J.Bergius	H	-	+
Poaceae	*Paspalum dilatatum* Poir	H	+	+
Poaceae	*Paspalum floribundanum* Michx.	H	+	-
Poaceae	*Paspalum longifolium* Roxb.	H	+	+
Poaceae	*Paspalum scrobiculatum* L.	H	+	+
Poaceae	*Oplismenus compositus* (L.) P.Beauv.	Th	+	+
Poaceae	*Panicum brevifolium* L.	Th	+	+
Poaceae	*Setaria glauca* (L.) P.Beauv.	H	+	-
Poaceae	*Sporobulus indicus* Br.	H	+	-
Poaceae	*Themeda triandra* Forssk.	H	+	-
Poaceae	*Thysanolaena maxima* Kuntze	Ph	-	+
Polygonaceae	*Bistorta emodi* (Meisn.) Petrov	Th	+	-
Polygonaceae	*Polygonum chinense* L.	Ph	+	-
Pteridaceae	*Adiantum caudatum* L.	H	+	+
Pteridaceae	*Adiantum phillipense* L.	H	-	+
Pteridaceae	*Drynaria propinqua* (wall. Ex Mett.) J.Sm	Ch	-	+
Pteridaceae	*Dryopteris cochleata* (Buch.-Ham. Ex D. Don) C. Chr.	Hc	+	+
Pteridaceae	*Lepisorus subconfluens* Ching	Ch	-	+
Pteridaceae	*Lycopodium cernnum* L.	Ch	+	-
Pteridaceae	*Lygodium flexuosum* (L.) Sw.	H	+	+
Pteridaceae	*Lygodium japonicum* (Thunb.) Sw.	H	+	-
Pteridaceae	*Pityrogramma calomelanos* (L.) Link	H	-	+

Pteridaceae	*Pteris biaurita* L.	H	+	+
Pteridaceae	*Pteris quadriaurita* Ret.	H	-	+
Ranunculaceae	*Clematis montana* Buch.-Ham. Ex DC.	Ch	-	+
Ranunculaceae	*Ranunculus diffusus* DC.	Th	-	+
Rosaceae	*Docynia indica* Wall Decue	Ph	-	+
Rosaceae	*Duchesnea indica* (Jacks.) Focke	H	+	-
Rosaceae	*Pyrus pashia* Buch.-Ham. Ex D.Don	Ph	-	+
Rosaceae	*Rubus ellipticus* Sm.	Ph	-	+
Rosaceae	*Rubus moluccanus* L.	Ph	+	+
Rubiaceae	*Meyna laxiflora* Robyns	Ph	-	+
Rubiaceae	*Wendlandia wallichii* Wight & Arn.	Ph	+	+
Rubiaceae	*Mussaenda frondosa* L.	Ph	+	+
Rubiaceae	*Pavetta indica* L.	Ph	+	-
Rubiaceae	*Spermacoce ocymoides* Burm.f.	Th	+	-
Rutaceae	*Zanthoxylum acanthopodium* DC.	Ph	+	+
Sapindaceae	*Allophylus cobbe* (L.) Raeusch.	Ph	-	+
Sapindaceae	*Decomonorop jenkinsiana* (Griff.) Mart	Ph	+	+
Saururaceae	*Houttuynia cordata* Thunb.	Cr	-	+
Scrophulariaceae	Buddleja asiatica Lour.	Ph	-	+
Scrophulariaceae	*Scoparia dulcis* L.	Th	+	-
Solanaceae	*Physalis peruviana* L.	Th	-	+
Solanaceae	*Solanum nigrum* L.	Th	-	+
Theaceae	*Schima wallichii* Choisy	Ph	+	+
Tiliaceae	*Triumfetta tomentosa* Bojer ex Bouton	Ch	-	+
Urticaceae	*Boehmeria nivea* (L.) Gaudich.	Ch	-	+
Urticaceae	*Boehmeria platyphylla* D. Don	Ch	+	+
Urticaceae	*Elatostema platyphyllum* Wedd.	H	-	+
Urticaceae	*Elatostema sessile* J.R.Forst. & G.Forst.	H	-	+
Urticaceae	*Pilea glaberrima* (Blume) Blume	H	-	+
Urticaceae	*Pilea scripta* (bunch.-Ham. Ex D. Don) Wedd.	H	-	+
Urticaceae	*Pilea umbrosa* Blume	H	-	+
Verbenaceae	*Callicarpa arborea* Roxb.	Ph	+	+
Verbanaceae	*Gmelina arborea* Roxb.	Ph	-	+
Verbenaceae	*Callicarpa macrophylla* Vahl	Ph	+	+
Verbenaceae	*Clerodendrum colebrookianum* Walp.	Ph	-	+
Verbanaceae	*Clerodendrum indicum* (L.) Kuntze	Ch	+	-
Verbenaceae	*Clerodendrum philippinum* Schauer	Ph	-	+
Verbenaceae	*Clerodendrum serratum* Moon	Ph	+	-
Verbenaceae	*Clerodendrum viscosum* Vent	Ph	+	+
Verbenaceae	*Stachytarpheta urticifolia* Sims	Th	+	-
Verbenaceae	*Vitex negundo* L.	Ph	+	-
Vitaceae	*Cissus javana* DC.	Ch	+	+
Vitaceae	*Leea crispa* Willd.	Ch	-	+
Zingiberaceae	*Alpinia galanga* (L.) Willd.	Cr	-	+
Zingiberaceae	*Amomum subulatum* Roxb.	Cr	-	+
Zingiberaceae	*Cautleya spicata* (Sm.) Baker	Cr	-	+
Zingiberaceae	*Costus speciosus* (J. Koenig) Sm	Cr	+	+
Zingiberaceae	*Curcuma angustifolia* Roxb.	Cr	+	-
Zingiberaceae	*Hedychium coccineum* Buch.-Ham. Ex Sm.	Cr	+	+
Zingiberaceae	*Hedychium gardnerianum* sheppard ex Ker Gawl.	Cr	-	+
Zingiberaceae	*Zingiber zerumbet* (L.) Rosc.ex Sm.	Cr	-	+

Phanerophyte=Ph; Chamaephyte=Ch; Cryptophyte=Cr; Hemicryptophyte=H; Therophyte=Th

Table 2: Distribution of Species in two sites of Mapithel Mountain.

Habit	Site-I	Site-II	Sites (I&II)
Tree	34	52	58 (28%)
Shrub	23	28	39 (18%)
Herb	66	79	110 (53.14)
Total Species	123	159	207

Table 3: Comparison of Observed Biological Spectrum of the Mapithel Mountain with Raunkiaer's Normal Biological Spectrum

Life form	Raunkiær Value (%)	Site-I (%)	Site-II (%)	Sites (I&II) %
Ph	46	46.34	50.63	46.86
Ch	9	11.38	12.66	13.04
H	26	18.70	13.92	17.39
Cr	6	7.32	12.02	10.63
Th	13	16.26	10.76	12.08

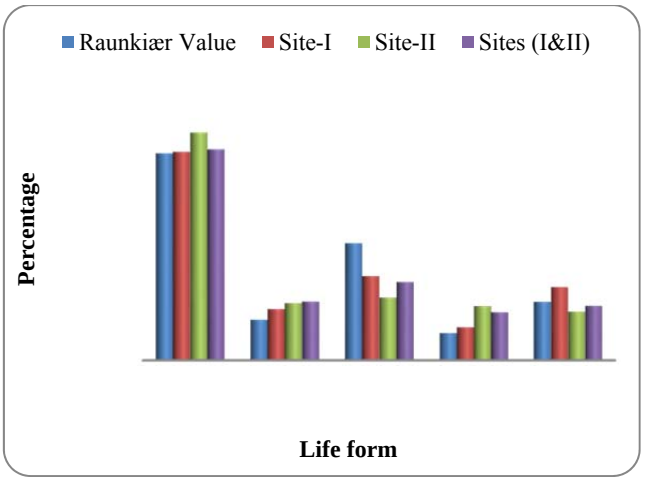

Fig. 4.1. Comparison of Observed Biological Spectrum of Mapithel Mountain with Raunkiaer's Normal Biological Spectrum

5. DISCUSSION

According to [16] the proportions of the flora in the various categories (which Raunkiær called the Biological spectrum) vary from one climate to another. Each of the species within the community has large measure of its structural and functional individualism and has more or less different ecological amplitude and modality [17]. It is shown usually that growth form of plants displays an obvious relationship to key environmental factors [18]. As the life form and biological spectrum of a region reflect upon the climate of that region, most of these spectrums for different regions are related to their bioclimates [19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32]. Biological spectrum also reflects on the biotic pressure on the grazing lands and consequently on the successive trends [33], here was a decrease in phanerophytes and therophytes from lower to higher elevation and this decrease was accompanied by a gradual increase in chamaephytes and hemicryptophytes up to an elevation of 3500m asl. According to [34] reported that the native vegetation was disturbed due to having therophytes in an area. The thero-phanerophytic spectrum has been discerned for disturbed wooded areas like forest in Brahmyone hills, Gaya [35]. It is reported that hemicryptophytes and therophytes were dominating in Tungnath and Panwalikantha area of Himalayan region [36, 37]. Chamaephytes are able to flourish in areas which are subjected to heavy disturbance especially grazing by animals [38]. However, [39] reported that chamaephytes and phanerophytes as dominant life-forms in Rudranath alpine region. Chamaephytes and hemicryptophytes as dominant life-forms for the snowline vegetation at central Himalaya are documented [40, 41]. According to [3] and [1] hemicryptophytes are characteristics of temperate regions whereas therophytes are characteristics of desert climate. As [42] in the Northen New Jersey also found the hemicryptophytic habit as the prevailing type in the grazing pastures. Chamaephytes and therophytes are considered indicators of unfavourable environment [43]. Regarding therophytes, [44] has stated that these develop especially in an area where the native vegetation has been disturbed.

Besides these biotic influencing factors, climate changes can also influence plant changes in species composition and dominance-diversity patterns. In climatic conditions, increasing temperature favours early initiation of plants, which increases the length of growing season to increase long growth cycle of plants. Combination of rising temperatures and longer season favours life forms of some dominant alpine plants [45]. Also, environmental heterogeneity is an important mechanism promoting co-existence of similar species. It is widely accepted that two species that cannot coexist locally in a homogenous habitat may nonetheless co-exist stably in a network of many habitat patches. In general, plants with short growth cycle expanded initially during the onset of favourable conditions, and plants with long vegetative growth cycled subsequently exist during rest of the growth period. The life forms are reflected by the bioclimate of the area. Thus, in humid regions, the bioclimate should be phanerophytic, in arid regions and intensively cultivated areas as therophytic and in temperate, high altitudinal zones, arctic regions as chamaephytic. Therophytic proportion in floristic biological spectrum of Jakaram RF, Warangal district in Andhra Pradesh was high (47%) which was receiving annual rainfall of 1000mm [43]. The montane humid forests of Meghalaya receive annual rainfall of 5500 mm and represents 51% of phanerophytes [6]. So rainfall appears to be most important operative factors in the evolution of biological spectrum. Our study reveals the presence of phaenerophytic climate predominantly.

Analaysis of the present study reveals the phytoclimate to be of Phanero-Hemicrytophtic type. The climate is ideal for sustaining the forest trees. This can be evidenced from comparing with (46.86%) proportion of Phanerophtes with Raunkiær's normal values (46%). The Hemicryptophytes are much more improverished than the normal condition to keep the forest floor very much disturbed. The therophytes presented almost similar proportion to the normal life-form classes. Among herbs, the Hemicryptophytes predominated the vegetation in all sites. The Chameophytes and Crytophytes are presented at higher proportion than expected of the life-form classes. Performance of Chamaephytes affects other associated species through the competitive ability. The sites facing anthropogenic stress show majority of Chamaephytes, Cryptophytes forming next dominant vegetation reflecting the best performance of species belonging to these life forms.

6. CONCLUSION

Biological spectrum may be changed due to the abiotic and biotic factors such as rainfall, altitude, temperature, anthropogenic pressure etc which are affecting the forest of

the study area. The overall vegetation in the present study area is prevailed by Phanero-Hemicryptophytic phytoclimate.

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