www.gbtrp.com
International Journal of Biological Technology (2011) 2(2):76-82.
ISSN: 0976 – 4313

Original Article

Biodiversity of Lithophytes in Madukkarai Hills of Southern Western Ghats of Coimbatore district, Tamil Nadu, India

Jayanthi, P., Rajendran, A., Binu Thomas, Aravindhan, V. and *R. Sivalingam
Department of Botany, School of Life Sciences,
Bharathiar University, Coimbatore - 641 046, Tamil Nadu.
*Corresponding author- *E-mail: drsivar@gmail.com*
Received: 19.7.2011; Revised: 21.07.2011; Accepted: 14.08.2011; Published:15.08.2011.

Abstract

The present study highlights the diversity of lithophytic species in rocky habitats of Madukkari hills situated in Western Ghats of Coimbatore district, Tamil Nadu. A total of 121 species were documented in which 116 are Angiosperms while the remaining 4 are Pteridophytes and one Bryophytic species. The Euphorbiaceae and Poaceae are the dominant families of in the Angiospermic flora of this region. The life forms are observed that, 14- species of trees, 19- shrubs, 16- climbers and 72- herbs which display a variety of habitat diversity like epilithic, hypolithic and chasmo-endolithic.
Keywords: Diversity, Lithophytes, Madukkarai Hills, Southern Western Ghats.

Introduction

Lithophytes are a type of plants that grow in or on rocks. The term lithophytes denotes that a plant that lives on stones. The lithophytes vegetation also adapted to low water, litter, soil, low nutrient content and often direct sunlight and acidic or alkaline soil. They belong to growth forms that are capable over the rock outface and it absorbing water derived from rain dew, melting snow or water running down the rocks (Alves and Kolbeck, 1993). Such superficial vegetation is of course ecologically very important (Kurtz and Netoff, 2001).

The vegetation of a rocky tract is an external characteristic. The lithophytes plants growing on rocks which are able as the first of their kind to colonize the rock permanently and which display on distribution or structure a more or less pronounced dependence up on rock as a substratum. Based on the growing pattern the lithophytic plants are two types *viz*., *epilithophytes* and *endolithophytes*. The epilithophytes are the plants that colonize on the surface of the rocks, while endolithophytes are colonized in rocks (Friedmann, 1980).

The rock plants differ growing upon the rock itself or in clefts. The composition of the rock is important to determining the distribution of plants that prefer lime of not, and so on. The harness, cleavage, specific heat and water bearing capacity of porosity also important factors. Owing to the or irregulation of the surface, lithophilous plants are of variable characters as regards their adaptation to dry or moist conditions. It feed off moss, nutrients in rain water, litter and even their own dead tissue (Tozer, 2005). More over they possess certain biological peculiarities enabling them to occupy this type of habitat (Gold and Blis, 1995).

The vast topographical and climatic diversity of the Southern Western Ghats has endowed with a rich lithophytic flora, both in terms of abundance and species diversity. A comprehensive account on the plain flora of Coimbatore district was published by Chandrabose and Nair (1988). Similar works was done in the Southern Western Ghats of Kerala. (Vajravelu, 1990; Manilal, 1988). Despite intense efforts at exploration and survey our knowledge about the lithophytes still remains unexplored.

Materials and Methods

Madukkarai is located at 10.9˚N 76.97˚E along the hill sides of the Southern Western Ghats (a biodiversity hot spot), of Coimbatore, Tamil Nadu and also a part of Nilgiri Biosphere Reserve. The name "Madukkarai" originated from the colloquial use of the words "Mathil" (means Great wall in Tamil) + "Karai" (means Shore in Tamil). It has one of the oldest cement plants in India. The temperature ranges from 47.5˚C and 16˚C respectively. The study is being carried out for the documentation and characterization of species composition and nature of vegetation types.

The vegetation types were observed from the study area is of different types such as tropical dry deciduous forests, thorn shrub forests and wastelands respectively. The area has

www.gbtrp.com
International Journal of Biological Technology (2011) 2(2):76-82.
ISSN: 0976 – 4313

predominant with alluvial soil and sandy soil and majority of the parts are consisting of rocky habitats. Frequent field surveys were undertaken to collect the plant species and are identified with the local floras (Gamble, 1956; Henry *et al*., 1987; 1989; Matthew, 1983; Manickam and Irudayaraj, 2003). The voucher specimens are deposited at the herbarium of Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu.

Results and Discussion

In this study, a total of 121- lithophytic plant species were collected and among these 116- species are Angiosperms, 4- species of Pteridophytes and a Bryophytic species (Table-1 & 2). Out of 116- angiosperm species belonging to 49- families were distributed in 89- genera have been documented. The habitat diversity was analyzed from the study and found that, out of the total lithophytic angiospermics, 45- are chasmo- endolithic, followed by 61- epilithic and 15- hypolithic species (Fig. 1).

Euphorbiaceae is the largest family with 9 - species, followed by Poaceae (8- species), Lamiaceae (7- species), Acanthaceae, Asclepiadaceae and Fabaceae, (6- species each), Tiliaceae (5- species), Amaranthaceae and Commelinaceae (4 species each). The life forms of lithophytic plants were analyzed and found that, there are about 72- Herbs, 19- Shrubs, 13- Trees and 15- Climbers respectively (Fig. 2). Among the documented species, most of them are distributed in common, some are sporadic and some are rarely distributed in the study area.

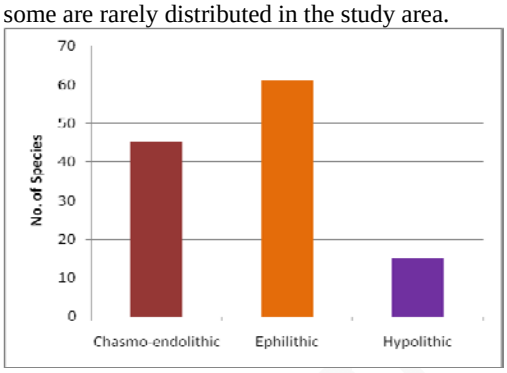

Fig. 1: Analysis of lithophytic habitat diversity with respect to no. of species

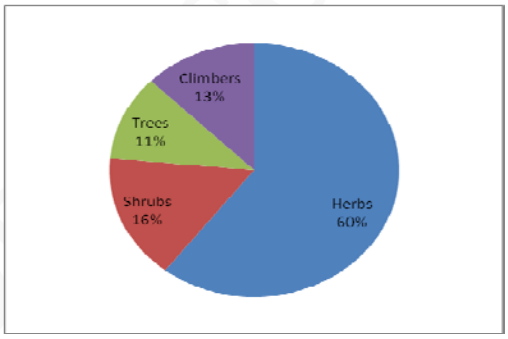

Fig. 2: Analysis of lithophytic life forms with respect to no. of species in the study

Table-1: List of lithophytic angiosperms in the Southern Western Ghats of Madukkarai hills.

S.No	Botanical Name	Family Name	Vernacular Name	Habitat	Habit	Status
1	*Abrus precatorius* L.	Fabaceae	Kundumani	Epilithic	Climber	Rare
2	*Acacia leucophloea* (Roxb.) Willd.	Mimosaceae	Velamaram	Epilithic	Tree	Common
3	*Acalypha lanceolata* Willd.	Fabaceae	-	Epilithic	Herb	Common
4	*Aerva lanata* (L.) Juss.	Amaranthaceae	Pulaipoo	Epilithic	Herb	Common
5	*Aerva monsoniea* (Retz.) Mart.	Amaranthaceae	Perumpulai	Epilithic	Herb	Rare
6	*Alangium salvifolium* (L.F.) Wang.	Alangiaceae	Alangi	Epilithic	Tree	Rare
7	*Alysicarpus monilifer* (L.) DC.	Fabaceae	Kasukkodi	Chasmoendolithic	Herb	Sporadic
8	*Alysicarpus rugosus* (Willd.) DC.	Fabaceae	-	Chasmoendolithic	Herb	Common
9	*Andrographis*	Acanthaceae	-	Chasmoendolithic	Herb	Rare

	echinoides (L.) Nees.					
10	*Anisochilus carnosus* (L.) Wall.	Lamiaceae	Saetruppunthazhai	Chasmoendolithic	Herb	Common
11	*Anisochilus malabarica* (L.) R. Br. *ex* Sims	Lamiaceae	Peymeratti	Hypolithic	Herb	Rare
12	*Argemone mexicana* L.	Papaveraceae	Nai kadugu	Epilithic	Herb	Common
13	*Aristolochia indica* L.	Aristolochiaceae	Perumaruthangodi	Epilithic	Herb	Sporadic
14	*Arundinella mesophylla* Nees.	Poaceae	-	Epilithic	Herb	Sporadic
15	*Asparagus asiaticus* L.	Liliaceae	-	Chasmoendolithic	Climber	Rare
16	*Asparagus fysoni* Mac.	Liliaceae	-	Chasmoendolithic	Climber	Rare
17	*Atalantia monophylla* (L.) DC.	Rutaceae	Kattuelumichai	Epilithic	Tree	Rare
18	*Barleria buxifolia* L.	Acanthaceae	Sullimullu	Epilithic	Herb	Sporadic
19	*Barleria cristata* L.	Acanthaceae	Kattukanakambarm	Epilithic	Herb	Common
20	*Barleria prionitis* L.	Acanthaceae	Shemmuli	Epilithic	Shrub	Common
21	*Begonia malabarica* Lam.	Begoniaceae	Sengurangu	Chasmolendoithic	Herb	Rare
22	*Biola indica* L.	Asteraceae	-	Chasmoendolithic	Herb	Common
23	*Biophytum sensitivum* (L.) DC.	Oxalidaceae	Mukkuthipoodu	Chasmoendolithic	Herb	Sporadic
24	*Blepharis repens* (Vahl.) Roth.	Acanthaceae	-	Epilithic	Herb	Common
25	*Boerhavia diffusa* L.	Nyctaginaceae	Mukurattai	Epilithic	Herb	Common
26	*Boerhavia erecta* L.	Nyctaginaceae	-	Epilithic	Herb	Common
27	*Brachiaris miliformis* (J.Press.) A.Chase.	Poaceae	-	Epilithic	Herb	Common
28	*Brachiaris ramosa* (L.) Stap.	Poaceae	-	Epilithic	Herb	Sporadic
29	*Bulbostylis barbata* (Roth.) Kunth.	Cyperaceae	-	Epilithic	Herb	Common
30	*Calotropis gigantea* (L.) R. Br.	Asclepidaceae	Yerukku	Epilithic	Shrub	Common
31	*Cardiospermum canescens* Wall.	Sapindaceae	Peria mudakkathan	Chasmoendolithic	Climber	Rare
32	*Cardiospermum halicacabum* L.	Sapindaceae	Mudakkathan	Chasmoendolithic	Climber	Common
33	*Caralluma adscendens* (Roxb.) Haw.	Asclepidaceae	Muyalkombu chedi	Chasmoendolithic	Herb	Sporadic
34	*Caralluma diffusa* (Wight.) N.E.Br.	Asclepidaceae	-	Hypolithic	Herb	Sporadic
35	*Cassia auriculata* L.	Caesalpinaceae	Aavaram	Epilithic	Shrub	Common
36	*Cassia siamae* Lam.	Caesalpinaceae	Manjakkonnai	Epilithic	Tree	Common
37	*Catharanthus roseus* (L.) Don.	Apocynaeae	Nithya kalyani	Epilithic	Herb	Common
38	*Capparis divericata* Lam.	Capparidaceae	-	Epilithic	Shrub	Common
39	*Chloroxylon swietenia* DC.	Rutaceae	Porasu	Epilithic	Tree	Rare
40	*Cissus quadrangularis* L.	Vitaceae	Perandai	Chasmoendolithic	Climber	Sporadic
41	*Cleome viscosa* L.	Capparidaceae	Naivelai	Chasmoendolithic	Herb	Common
42	*Cipadessa buccifera* (Roth.)	Meliaceae	Pulippanchedi	Epilithic	Shrub	Rare

	Miq.					
43	*Commiphora berryi* (Arn.) Engler.	Burseraceae	Mullukiluvai	Chasmoendolithic	Shrub	Rare
44	*Corchorus capsularis* L.	Tiliaceae	-	Epilithic	Herb	Common
45	*Corchorus trilocularis* L.	Tiliaceae	Vazhukkai poodu	Chasmoendoithic	Herb	Common
46	*Cyanotis arachnoidea* Clake.	Commelinaceae	-	Hypolithic	Herb	Common
47	*Cyanotis cristata* (L.)D	Commelinaceae	-	Hypolithic	Herb	Common
48	*Cyanotis villosa (Spreng.)* Schult.	Commelinaceae	-	Hypolithic	Herb	Common
49	*Cyanodon dactylon* (L.) Pers.	Poaceae	Arugampul	Chasmoendolithic	Herb	Sporadic
50	*Cymbopogon caesium* Stapf.	Commelinaceae	-	Epilithic	Herb	Common
51	*Cyphostemma setosum* (Roxb.) Alston.	Vitaceae	-	Epilithic	Climber	Rare
52	*Dendrophthes faltata* (L.f.) Etting.	Loranthaceae	-	Epilithic	Parasitic herb	Rare
53	*Desmodium triflorum* (L.) DC.	Fabaceae	Airpulai	Epilithic	Herb	Common
54	*Dichrostachys cinerea* (L.) Wight & Arn.	Mimosaceae	Vedathala	Epilithic	Tree	Common
55	*Dodonaea viscosa* (L.)Jacq.	Sapindaceae	Virali	Epilithic	Shrub	Sporadic
56	*Eragrostiella bifaria* (Vahl.) Bor.	Poaceae	-	Epilithic	Herb	Common
57	*Euphorbia antiquorum* L.	Euphorbiaceae	Sadurakalli	Chasmoendolithic	Shrub	Common
58	*Euphorbia hirta* L.	Euphorbiaceae	Amman patcharisi	Chasmoendoithic	Herb	Common
59	*Euphorbia tortillis* Rottl.	Euphorbiaceae	Thrugukkali	Chasmoendolithic	Shrub	Common
60	*Ficus religiosa* L.	Moraceae	Arasamaram	Hypolithic	Tree	Common
61	*Glinus oppositifolium* (L.) A.DC.	Molluginaceae	Mollugo	Chasmoendolithic	Herb	Common
62	*Grewia rhamnifolia* Heyne.	Tiliaceae	-	Epilithic	Shrub	Rare
63	*Grewia tilifolia* Vahl.	Tiliaceae	Unu	Chasmoendolithic	Shrub	Rare
64	*Grewia villosa* Willd.	Tiliaceae	-	Epilithic	Shrub	Rare
65	*Gymnema sylvestre* (Retz.) R.Br. ex Schultes.	Ascleipiadaceae	Kannuminnayakodi	Epilithic	Climber	Common
66	*Gyrocarpus americanus* Jacq.	Hernandiaceae	Tanakku	Chasmoendolithic	Shrub	Rare
67	*Heteropogon contortus* (L.) P.	Poaceae	Oosipul	Epilithic	Herb	Sporadic
68	*Icnocarpus frutescens* (L.)R.Br	Apocynaceae	Udargodi	Epilithic	Climber	Rare
69	*Indigofera linnaei* Ali.	Fabaceae	Seppunerungi	Chasmoendolithic	Herb	Sporadic
70	*Indigofera nummularifolia* (L.) Livera ex Alston.	Fabaceae	-	Chasmoendolithic	Herb	Sporadic
71	*Ipomoea wightii* (Wall.) Choisy	Convolvulaceae	-	Epilithic	Climber	Rare
72	*Ipomoea pes-tigridis* L.	Convolvulaceae	-	Epilithic	Climber	Common
73	*Jasminum augustifolium* (L.) Willd.	Oleaceae	Kattumalligai	Chasmoendolithic	Climber	Rare
74	*Jasminum azoricum*	Oleaceae	Ranabanam	Chasmoendolithic	Climber	Rare

	L.					
75	*Jatropha gossypifolia* L.	Euphorbiaceae	Aatalai	Chasmoendoithic	Shrub	Common
76	*Jatropha villosa* W.	Euphorbiaceae	Tanakku	Epilithic	Shrub	Rare
77	*Justicia transquebariensis* L.f.,	Acanthaceae	Sivanarvempu	Hypolithic	Herb	Common
78	*Lantana indica* Roxb.	Verbenaceae	Unni	Hypolithic	Herb	Common
79	*Laptadenia reticulata* W. & A.	Ascleipiadaceae	Paalai chedi	Hypolithic	Climber	Rare
80	*Leucas aspera* (Willd.) Link.	Lamiaceae	Thumbai	Epilithic	Herb	Common
81	*Merrimia tridenta* (L.) Hall.	Convolvulaceae	Savurikodi	Epilithic	Climber	Sporadic
82	*Moringa concanensis* Nimmo.	Moringaceae	Kattumurungai	Chasmoendolithic	Tree	Rare
83	*Ocimum americanus* L.	Lamiaceae	Naithulasi	Epilithic	Herb	Common
84	*Ocimum gratissimum* L.	Lamiaceae	Perunthulasi	Epilithic	Herb	Sporadic
85	*Ocimum tenuiiflorum* L.	Lamiaceae	Nallathulasi	Epilithic	Herb	Common
86	*Opuntia striata* Haw.	Cactaceae	Sappathikkalli	Epilithic	Shrub	Common
87	*Plectranthus barbatus* (Andr.) Benth.	Lamiaceae	-	Chasmoendolithic	Herb	Common
88	*Pleurostylia opposita* (Wall.) Alston.	Celastraceae	Chirupiviri	Epilithic	Tree	Common
89	*Phyllanthus amarus* Schum & Thorn.	Euphorbiaceae	Kezhanelli	Epilithic	Herb	Common
90	*Phyllanthus madraspatensis* L.	Euphorbiaceae	Melanelli	Chasmoendolithic	Herb	Common
91	*Phyllanthus virgatus* Forst.	Euphorbiaceae	-	Chasmoendolithic	Herb	Rare
92	*Polygala chinensis* L.	Polygalaceae	-	Chasmoendolithic	Herb	Common
93	*Polygala rosmarinifolia* W. & A.	Polygalaceae	-	Chasmoendolithic	Herb	Common
94	*Pouzolzia zeylanica* (L.)	Urticaceae	Kallurkki	Chasmoendolithic	Herb	Common
95	*Prosopis juliflora* (Sw.) DC.	Mimosaceae	Mul	Epilithic	Tree	Common
96	*Psilanthus wightianum* Wight & Arn.	Rubiaceae	-	Epilithic	Shrub	Rare
97	*Pterolobium hexapetalum* (Roth.) Sant & Wagh.	Caesalpinaceae	Karuindu	Epilithic	Shrub	Rare
98	*Sansevieria roxburghiana* Schultes.	Agavaceae	-	Hypolithic	Herb	Rare
99	*Sarcostemma brunonianum* W. & A.	Ascleipiadaceae	Perumaathaankodi	Epilithic	Climber	Rare
100	*Sebastiana chamaelea* (L.) Muell.	Euphorbiaceae	-	Chasmoendolithic	Herb	Rare
101	*Sesamum verticillata* Klein.	Pedaliaceae	Kattu ellu	Chasmoendolithic	Herb	Rare
102	*Setaria pumila* (Poir.)Roem.	Poaceae	-	Chasmoendolithic	Herb	Rare
103	*Setaria verticillata*	Poaceae	Ottumpullu	Chasmoendolithic	Herb	Rare

	(L.) Poit.					
104	*Strychnos potatorum* L.f.	Loganiaceae	-	Chasmoendolithic	Tree	Rare
105	*Tarenna asiaticus* (L.) Kuntze.	Rubiaceae	Thaeranai	Epilithic	Tree	Sporadic
106	*Tephrosia purpurea* (L.) Pers.	Fabaceae	Kolinji	Epilithic	Herb	Common
107	*Toddalia asiatica* (L.) Lam.	Rubiaceae	-	Epilithic	Shrub	Common
108	*Tribulus terrestris* L.	Zygophyllaceae	Nerunji	Chasmoendolithic	Herb	Sporadic
109	*Trichodesma indicum* L.	Boraginaceae	-	Epilithic	Herb	Common
110	*Urena lobata* L.	Malvaceae	Ottuttuti	Chasmoendolithic	Herb	Common
111	*Vanda spathulata* (L.) Sperng.	Orchidaceae	-	Epilithic	Epiphytic herb	Rare
112	*Vernonia cinerea* (L.) Less.	Asteraceae	Mukkuthi poodu.	Chasmoendolithic	Herb	Sporadic
113	*Vigna trilobata* (L.) Verdc.	Fabaceae	Panipayir	Chasmoendolithic	Herb	Rare
114	*Waltheria indica* L.	Sterculiaceae	Shembudu	Epilithic	Herb	Common
115	*Wrightia tinctoria* (Roxb.) R.Br.	Apocynaceae	Nilapalai	Hypolithic	Tree	Common
116	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	Chooraimullu	Epilithic	Tree	Common

Table-2: List of Pteridophytes and Bryophytes in the Southern Western Ghats of Madukkarai hills

S. No.	Botanical Name	Family Name	Vernacular Name	Habitat	Habit	Status
1	*Actinopteris australis* (L.f.) Link.	Pteridaceae	Sumaithangi	Hypolithic	Herb	Common
2	*Adianthus incisum* Forsk.	Adiantaceae	-	Hypolithic	Herb	Rare
3	*Cheilanthes mysorensis Wallich.*	Pteridaceae	-	Hypolithic	Herb	Rare
4	*Marsilea Sp.*	Marsileaceae	-	Hypolithic	Herb	Rare
5	*Riccia Sp.*	Ricciaceae	-	Hypolithic	Herb	Rare

Conclusion

This type of studies may be useful to assess the impact of climate change on their growth lithometric analysis and distribution, to use abundance distribution of species within genera, to evaluate phytogeographic patterns and also to evaluate the environmental determination of biodiversity in the Western Ghats. It is recommended that the lithophytic vegetation has to be protected for the sustainable utilization of biodiversity which will be benefit to the mankind. Some of the threatened factors like heavy influence of pilgrims during full moon days, recreational pressures, collection of fire wood, unsustainable grazing and lack of suitable management, quarrying and other construction activities adversely affect the existing eco-system. It is suggested that the lithophytic vegetation needs to be protected for the sustainable utilization.

Acknowledgement

Authors are thankful to the Head and Professor, Department of Botany, Bharathiar University for providing necessary facilities to carry out the study.

References

Alves, R. and Kolbek, J. 1993. Penumbral rock communities in Campo-Rupestre sites in Brazil. *J. Veget. Sci*., 4: 357 - 366.

Chandrabose, M. and Nair, N.C.1988. *Flora of Coimbatore*, Bishan Singh Mahendra Pal Singh, Dehra Dun.

Friedmann, E.I. 1980. Endolithic communities in hot and cold deserts. *Origins Life Evol. Biosph.*, 10:223 - 235.

Gamble, J.S. and Fischer, C.E.C.1956. *Flora of the Presidency of Madras*, 1(3). Adlard & Son Ltd., London.

Gold, W.G. and Bliss, L.C.1995. Water limitations and plant community development in a polar desert. *Ecol*.,76: 1558 - 1568.

Henry, A.N., Kumar, G.R. and Chitra, V. 1987. *Flora of Tamilnadu, India*: Analysis I (1 & 2), Botanical Survey of India, Southern Circle Coimbatore.

Henry, A.N., Chitra, V. and Balakrishnan, N.P. 1989. *Flora of Tamilnadu, India*: Analysis I (3). *Botanical Survey of India*, Southern Circle, Coimbatore.

Kurtz, H.D. and Netoff, D.I. 2001. Stabilization of friable sandstone surfaces in a desiccating, wind-abraded environment of south-central Utah by rock surface microorganisms. *J. Arid Environ.*, 48: 89 - 100.

Manickam, V.S. and Irudayaraj, V. 2003. *Pteridophyte Flora of Nilgiris, South India*. Bishen Singh Mahendra Pal Singh, Dehra Dun.

Manilal, K.S. 1988. *Flora of Silent Valley, Tropical Rain Forests of India*. Department of science and Technology, Government of India, New Delhi.

Matthew, K.M. 1983. *The Flora of Tamilnadu Carnatic*. Vol. 1-3. Rapinat Herbarium, Tiruchirapalli.

Tozer, W.C., Hackell, D., Miers, D.B. and Silvester, W.B. 2005. Ex tree isotopic depletion of nitrogen in New Zealand lithophytes and epiphytes. *Oecol.*, 144: 628 - 635.

Vajaravelu, E. 1990. *Flora of Palghat District including Silent Valley National Park, Kerala*. Botanical Survey of India, New Delhi.