



Taxonomic Studies of Bryophytes In Madhya Pradesh- A Review

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Abstract

The present paper deals with the survey of research work done on various aspects of bryophytes in Madhya Pradesh state. The study revealed that very little work has been done on bryophytes in this state and only 83 taxa have been reported as compared to 2523 freshwater taxa from India and 16236 species in the world (Chapman, 2009 and Singh & Dash, 2014). Out of the total 83 species belonging to 56 genera and 32 families reported from M.P., 33 species belong to liverworts, 7 species to hornworts and 43 species to mosses. The ratio of genera to species is 1.48 which is slightly low as compared to 1,51 in India. This lends support to the generalization that smaller the flora, the genus-species ratio should decline within the same floral region. Fissidentaceae (8sp.), Hypnaceae (7 sp.), Rebouliaaceae (5 sp.) and Marchantiaceae (5 sp.) are the dominant families with 5 more taxa in surveyed districts of Madhya Pradesh. As regards bryophytic studies in M.P. so far it has been done only in 11 districts out of 52 districts. i.e., Anuppur, Barwani, Bhopal, Chhindwara, Gwalior, Hoshangabad, Khargone, Mandla, Rajnandgaon, Sagar and Ujjain. The study suggests that there is still much necessity of doing further research work in bryophytes of other districts of this state.

Keywords

Central India, enumeration, amphibious plants, lower embryophyta, , lower cryptogams, liliputian plants

INTRODUCTION

Bryophytes are seedless plants without specialized water conducting tissues. They are non-vascular embryophytic plants. Instead of a monophytic group, it is an informal group consisting of 3 paraphytic groups. Its plants are monoecious. In past years, enough focus has not been given to study the bryophytes in India. This group has been and still is a somewhat neglected branch of Botany in India. It has been ignored for many reasons especially their relatively less economic value, but recent studies have proven that they could be the resource of many phytochemical and pharmaceutical compounds. The progress of bryophytic systematics has been reviewed from time to time in the past not only in

taxonomy and morphology of the group, but also in such fascinating fields as cytology, physiology, palynology, palaeobotany, and tissue culture morphogenesis. However, a great deal of information has yet to be obtained from investigations on these plants which are so richly represented in India due to favourable conditions of their growth.

The present review deals with the work done on the taxonomy of bryophytes by the research workers of Madhya Pradesh up to the period 2015. In the past few decades some important publications and monographs on bryophytes have been published in India (Bapna, 1958; Bharadwaj, 1948; Bir, 1970; Blatter, 1929; Brothier, 1898; Chopra, 1960;

Chatterjee,1964 Chopra & Kanta,1966; ,1943 ; Dixon,1909; Evans,1939; Kachroo,1951; Khanna,1959; Kuwahara1965; Mahabale,1958; Maheshwari & Kapil,1963; Mehra,1967; Mehra & Handoo, 1963; Mizutani,1963; Pande & Udar,1959 and Sedgwick,1910)

TAXONOMY

Kashyap (1914) is considered as the founder of Indian bryology on account of his excellent publication on West Himalayan hepatics as it was the first publication by an Indian worker. This created a renaissance in bryological research in India and a number of workers started investigations on bryology and through active work at some research centers, such as Lucknow, Bhopal and Ujjain and they are still contributing to our knowledge about these group of plants. Although Kashyap's research influenced extensive work on Indian hepatics, the mosses remained a neglected field of study for a long time.

Taxonomic studies in Madhya Pradesh continue to receive attention from various workers as in the past (Saksena, 1947; Pandey and Srivastava,1952; Udar,1956; Handoo,1959; Bhargava and Thampi,1960; and Nath, 1971) Bryophytic genera and species discovered and described by various research workers of M.P. have been listed and are not referred to individually. All the species of bryophytes reported from the state belong to freshwater habitats.

Although an attempt has been made to include most of the bryophytic members described so far from this state up to the year 2015, no claim is made that the list is complete. Omissions if any, may be pointed out by the readers. The preset authors do not take the responsibility for the correctness of the identification made by various workers listed under references. The main object of this paper is to provide information about the scattered literature at one place along with the list of bryophytes published. Madhya Pradesh appears to be sufficiently rich in bryoflora but still it needs an extensive survey for the exploration of bryophytic wealth from all possible habitats which have not been explored so far. This important task is continuing by various bryologists at Gwalior, Bhopal, Ujjain, and Sagar stations. In Mandla district some fossils are collected but there is some doubt that these fossils belong to late jurassic or the early and mid-jurassic period.

Singh (1966) has mentioned that Madhya Pradesh state has a varied topography but almost one-third of its area is forested from the total forest area of 20.68% in India. The forest area of M.P. includes mainly tropical moist forest (8.95%), tropical dry deciduous forest (88.65) and tropical thorn forest (0.26%). From the total RFA of 94689 sq.km. area of this state, 61886

sq. Km. Area is reserved forest, 31098 sq.km. under protected forest and 1705 sq. Km. is unclassed forests. The biodiversity is stunning with over 1300 species of plants including numerous rare bryophytes and pteridophytes in Satpura range of M.P which includes the Satpura Tiger Reserve forest of Pachmarhi (Hoshangabad) but as far as bryophytes are concerned, they are yet to be described and many remote geographical areas need to be adequately surveyed. Till now 83 species belonging to 56 genera and 32 families have been reported from the state and all these taxa belong to fresh water (Table I). Now a days palynological and tissue culture morphogenesis work on bryophytes is also attracting the attention of the bryologists.

Because of conflicting opinions of various bryologists, the order of presentation of the various divisions does not confirm to any particular system of classification. The bryological taxa under each division have been arranged in alphabetical order and wherever possible, reference has been made as to which system has been followed for the arrangement of genera and species.

Class I. Hepaticopsida:

Most of the taxa of this class have been described mainly from Pachmarhi . In all 33 species belonging to 22 genera and 12 families are reported from the state. Class II. Anthocerotopsida: Only 7 species belonging to 4 genera of 3 families are reported mainly from Pachmarhi, Bhopal, Gwalior, Mandla and Khargone stations.

Class III. Bryopsida: This class is represented by 43 species and 30 genera and 17 families. Members of this group are reported mainly from Pachmarhi, Amarkantak, Bhopal and Sagar stations. A majority of the bryophytic species are found on damp habitats but some species grow as epiphytes (Plagiochilla, Porella and Lejeunea), epiphyllous (Radula perrittotii), xerophyllous (Asterella aungusta, Reboulia hemispherica, Targionia hypophylla) and submerged species (Riccia fluitans) The epixylic species mostly belong to the family Dicranaceae, Cephalozieaceae, Brachytheciaceae, Hypnaceae, Fissidentaceae, Plagichilaceae, Radulaceae, Leucobryaceae, Lejeuneaceae, Sematophyllaceae, Stenophyllaceae , Metzgerineae and Lepidoziaceae .

Studies have shown that in Central India (including Madhya Pradesh) ,Pottiaceae is a dominant family and Fissidens is a dominant genus with 26 taxa and on account of this , it is considered as one of the bryogeographical zones. Due to water pollution by textile industries complex of Birla Nagar, Gwalior, M.P., a gradual decline in aquatic bryophytes has occurred. Mosses and liverworts traits are considered useful indicators of deadwood decay in forest management. In a study it has been found that out of 56 species of

bryophytes, 29 species are reported to possess antibacterial activity. In India out of 269 endemic species, Riccia, Frullenia, Lejeunea, Pallavicinia, Plagiochasma, and Jungermannia are among liverworts, Anthoceros in Hornworts and Fissidens, Bryum, Campylopus species are endemic in large numbers among mosses.

Table 1. shows the biodiversity of bryophytes in different regions of India, Table 2. shows the distribution of total species, genera and families belonging to different classes of bryophytes in different zones and districts of Madhya Pradesh, Table 3. Indicates the alphabetical enumeration of bryophytic taxa and Table 4 indicates the total species and genera belonging to various families.

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Table 1. Biodiversity of Bryophytes in different regions of India

S.No.	Name of region	Liverworts			Hornworts			Mosses		
		Spp.	Gen.	Fam.	Spp.	Gen.	Fam.	Spp.	Gen.	Fam.
1	India	675	122	-	25	6	-	1786	355	-
2	Western Ghat	211	56	32	8	4	2	493	189	44
3	Eastern Ghat (Bothomerald hills)	20	-	-	2	-	-	9	-	-
4	Endemic species	152	--	-	19	-	-	169	-	-
5	North -East India- Mizoram	26	20	18	2	2	1	37	28	17
6	Madhya Pradesh	33	22	12	7	4	3	43	30	17

Table 2. Distribution of bryophytic members in different regions and districts of Madhya Pradesh surveyed up to 2015

S.No.	Area surveyed	Species	genera
1	orld	24000	960
2	India	2486	483
3	Central India (Mosses)	210	94
4	Western Ghat (Kerala)	493	189
5	Western Ghat (Tamil Nadu)	211	56
6	Eastern Ghat (Bothomerald hills)	31	22
7	Amarkantak (Mosses)	28	22
8	North-East India (Mizoram)	65	56
9	Madhya Pradesh	83	56

Table 3. showing the list of bryophytic species with class, families, habitat and altitude of occurrence in Madhya Pradesh, India reported up to 2015.

Sl.No.	Name of species	class	Family	Habitat	Altitude
1	<i>Anoetangium clarum</i> Mitt.	B	Pottiaceae	Soil	1000
2	<i>Anthoceros erectus</i> Kashyap	A	Anthocerotaceae	Soil	1000
3	<i>Anthoceros punctatus</i> L.	A	Anthocerotaceae	Soil	1050
4	<i>Anthoceros</i> sp.	A	Anthocerotaceae	Soil	1000
5	<i>Aplozia</i> sp.	H	Cephaloziaceae	Soil	1050
6	<i>Asterella angusta</i> St.	H	Rebouliaaceae	Soil	950
7	<i>Asterella blumeana</i> Nees	H	Rebouliaaceae	Soil	950
8	<i>Brachymenium exile</i> Bosch et. Lac	B	Bryaceae	Soil	1000
9	<i>Bryosedgwickia nurea</i> (Schwgr.) Flasch	B	Hypnaceae	Soil	1000

10	<i>Bryum capillare</i> L. Ex Hedw. Insp. Musc.	B	Bryaceae	Soil	1100
11	<i>Bryum cernatum</i> Schwaegr.	B	Bryaceae	Soil	1100
12	<i>Campylopus erioides</i> Jaeger	B	Leucobryaceae	Soil	1050
13	<i>Cephalozia connivens</i> (Dicks)Lindb.	H	Cephaloziaceae	Soil	1050
14	<i>Chiloscyphus argutus</i> Nees.	H	Cephaloziaceae	Soil	1050
15	<i>Cyathodium bardae</i>	H	Targioniaceae	Rock	600
16	<i>Dumortiera hirsuta</i> (SW.) Nees.	H	Marchantiaceae	Rock	950
17	<i>Ectropothecum cygnicolum</i> (Mitt.) Jaeg.	B	Hypnaceae	Soil	1000
18	<i>Entodon rubicundus</i> (Mitt) Jaeg.	B	Entodontaceae	Soil	950
19	<i>Entodon sariosus</i> Ren & Card.	B	Entodontaceae	Soil	1000
20	<i>Entodontopsis anceps</i> (Bosch & Lac)Buck & Ireland	B	Steriophyllaceae	Soil	1000
21	<i>Entodontopsis leucostegae</i> (Brid.) Buck & Ireland	B	Steriophyllaceae	Soil	1000
22	<i>Entodontopsis nitens</i> (Mitt.) Buck & Ireland	B	Steriophyllaceae	Soil	1000
23	<i>Erythrodontium julaceum</i> (Schwegr.) Par.	B	Entodontaceae	Soil	1100
24	<i>Exormotheca paleacea</i> Bert.	H	Marchantiaceae	Soil	1100
25	<i>Fissidens aspirisetus</i> ver. <i>Andamanensis</i> Gangulee	B	Fissidetaceae	Soil	950
26	<i>Fissidens ceylonensis</i> Molk.	B	Fissidentaceae	Soil	950
27	<i>Fissidens crispulus</i> Brid.	B	Fissidentaceae	Soil	950
28	<i>Fissidens involutus</i> Mitt. <i>Subsp. Curvato-involutus</i> (Dix.) Gangulee	B	Fissidentaceae	Soil	950
29	<i>Fissidens involutus</i> Wills ex Mitt.	B	Fissidentaceae	Soil	950
30	<i>Fissidens pulchellus</i> Norkett	B	Fissidentaceae	Soil	950
31	<i>Fissidens pulchellus</i> Mitt.	B	Fissidentaceae	Soil	950
32	<i>Fissidens toxifolius</i> Mitt.	B	Fissidentaceae	Soil	950
33	<i>Fossombronina himalayensis</i> Kashyap.	H	Fossobroiaceae	Soil	1000
34	<i>Funaria hygrometrica</i> Hedw.	B	Funariaceae	Soil	850
35	<i>Herpetineuron toccoeae</i> Card.	B	Leskeaceae	Soil	1000
36	<i>Hypnum aduncoides</i> (Brid.) C.Muell.	B	Hypnaceae	Soil	1000
37	<i>Hyophila involuta</i> (Jaeg.) Hook..	B	Pottiaceae	Soil	1050
38	<i>Isopterygium micans</i> (SW.)Kindb.	B	Hypnaceae	Soil	1050
39	<i>Jungermannia humilis</i> Kashyap.	H	Jungermanniaceae	Tree bark	1000
40	<i>Jungermannia</i> sp.I	H	Jungermanniaceae	Tree bark	1000
41	<i>Jungermannia</i> sp.II	H	Jungermanniaceae	Tree bark	1000
42	<i>Lavieraella fabroniacea</i> C.Muell.	B	Fabroniaceae	Soil	1050
43	<i>Leptocolea</i> sp.	H	Lejeuniaceae	Soil	1050
44	<i>Leucolema amoene-virens</i> (Mitt.)	B	Dicranaceae	Soil	1050
45	<i>Leucobryum junepidium</i> (Brid.)Muell.	B	Leucobryaceae	Soil	1050
46	<i>Lopholejeunia</i> sp.	H	Lejeuniaceae	Soil	1000
47	<i>Marchantia nepalensis</i> L.et. L.	H	Marchantiaceae	Soil	850
48	<i>Marchantia paleacea</i> Bertol	H	Marchantiaceae	Soil	850

49	<i>Marchantia palmata</i> Nees.	H	Marchantiaceae	Soil	650
50	<i>Meiothecium microcarpum</i> (Hook.) Mitt.	B	Sematophyllaceae	Soil	900
51	<i>Megaceros flagellaris</i> (Mitt.) Steph.	B	Dendrocerotaceae		1100
52	<i>Microlejeunea aphanella</i> (Spruce) Staph.	H	Lejeuneaceae	Soil	1000
53	<i>Nanomitrium tenerum</i> (Bruch.) Lind.	B	Ephemeraceae	Soil	1000
54	<i>Notothylas indica</i> Kashyap	A	Notothylaceae	Soil	850
55	<i>Notothylas levieri</i> Schiffn.	A	Notothylaceae	Soil	900
56	<i>Octoblepharum albidum</i> Hedw.	B	Calymperaceae	Soil	1000
57	<i>Pallavicinia canaras</i> St.	H	Pallaviciniaceae	Soil	950
58	<i>Phaeoceros communis</i> (St.) Schffn. et Pande comb. Nov.	A	Anthocerotaceae	Soil	1250
59	<i>Plagiochasma appendiculatum</i> Lehm & Lindenb.	H	Rebouliaaceae	Rock	950
60	<i>Plagiochasma intermedium</i> L et G	H	Rebouliaaceae	Rock	950
61	<i>Platygyriella aurea</i> Schwgr.	B	Hypnaceae	Soil	1000
62	<i>Plagiochilla spinulosa</i> (Dicks.) Dumort.	H	Plagiochilaceae	Tree bark	1000
63	<i>Pohlia gedeania</i> (Bosch & Lac) Gangulee	B	Bryaceae	Soil	1000
64	<i>Pseudotaxiphyllum elegans</i> (Brid.) I.wats	B	Hypnaceae	Soil	1000
65	<i>Racopilum arthocarpum</i> Welw. Ex Mitt.	B	Racopilaceae	Soil	1000
66	<i>Radula perrottetii</i> G.	H	Radulaceae	Tree bark	1000
67	<i>Reboulia hemispherica</i> (L.) Reddi.	H	Rebouliaaceae	Soil	950
68	<i>Rectolejeunea aloba</i> (Sande Lac)	H	Lejeuneaceae	Soil	1100
69	<i>Rhyncostegium celebicum</i> (Lac.) Jaeg.	B	Brachythecaceae	Soil	1100
70	<i>Riccardia levieri</i> Schff.	H	Riccardiaceae	Soil	1150
71	<i>Riccardia platyclada</i> Schff.	H	Riccardiaceae	Soil	1150
72	<i>Riccardia santapani</i> Udar et Srivastava	H	Riccardiaceae	Soil	1150
73	<i>Riccia disclor</i> Lehm. & Lindenb.	H	Ricciaceae	Soil	1000
74	<i>Riccia fluitans</i> L.	H	Ricciaceae	Submerged	1100
75	<i>Riccia gangetica</i> Ahmad	H	Ricciaceae	Soil	1000
76	<i>Riccia</i> sp. Udar	H	Ricciaceae	Soil	1000
77	<i>Targionia hypophilla</i> L.	H	Targioniaceae	Rock	950
78	<i>Taxiphyllum giraldii</i> (C.Muell.) Fleisch	B	Hypnaceae	Soil	1000
79	<i>Thuidium investe</i> (Mitt.) Jaeg.	B	Thuidiaceae	Soil	900
80	<i>Thuidium kiasense</i> Williams	B	Thuidiaceae	Soil	900
81	<i>Thuidium koelziti</i> Robinson	B	Thuidiaceae	Soil	900
82	<i>Trachyphyllum inflexum</i> (Harv.) Gepp.	B	Thuidiaceae	Soil	850
83	<i>Vesicularia dubyana</i>	B	Hypnaceae	Soil	950

H = Hepaticopsida , A = Anthocerotopsida , B =Bryopsida

Table 4. showing the research work done on total families, species and genera in Madhya Pradesh up to the year 2015.

S.No.	Name of family	Species	Genera
1	Anthocerotaceae	4	2
2	Brachythecaceae	1	1
3	Bryaceae	4	3
4	Calymperaceae	1	1
5	Cephaloziaceae	3	3
6	Dendrocerotaceae	1	1
7	Dicranaceae	1	1
8	Entodontaceae	3	2
9	Ephemeraaceae	1	1
10	Fabronaceae	1	1
11	Fissidentaceae	8	1
12	Fossombroniaceae	1	1
13	Funariaceae	1	1
14	Hypnaceae	7	7
15	Jungermanniaceae	3	1
16	Lejeuniaceae	4	4
17	Laskeaceae	1	1
18	Leucobryaceae	2	2
19	Marchantiaceae	5	3
20	Notothylaceae	2	1
21	Pallaviciniaceae	1	1
22	Plagiocladiaceae	1	1
23	Pottiaceae	2	2
24	Racopilaceae	1	1
25	Radulaceae	1	1
26	Rebouliaaceae	5	3
27	Riccardiaceae	3	1
28	Ricciaceae	4	1
29	Sematophyllaceae	1	1
30	Stereophyllaceae	3	1
31	Targioniaceae	2	2
32	Thuidiaceae	4	2
Total		83	56

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