

Research article

Moss flora of Mount Abu (Rajasthan), India: An updated checklist

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Abstract: Mount Abu is an ignored mountain range to some extent by Indian bryologists. Very little information is available regarding bryoflora of this mountain range. In present study an attempt has been made to provide an updated checklist of moss flora of the region. The study is based on previous as well as newly collected moss taxa from the region. The new addition to the region include *Anoetangium clarum*, *Brachymenium indicum*, *Bryum uliginosum*, *Entodon plicatus*, *Entodon concinnus*, *Fissidens sylvaticus* var. *taraicola*, *Fissidens sylvaticus* var. *auriculatus*, *Hyophila spathulata*, *Plagiothecium cavifolium* and *Stereophyllum tavoyense*.

Keywords: Bryophytes - Musci - Mount Abu - Rajasthan.

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INTRODUCTION



Figure 1. Map of Rajasthan showing location of study area.

Mount Abu (72.7083°E 24.5925°N), the famous hill station in Rajasthan, is the highest elevated topography between Nilgiris and Himalayas. An isolated elevation of Aravalli ranges, Mt. Abu is situated in Sirohi district of Rajasthan bordering Gujarat (Fig. 1). With average height of 1400 m, the highest peak in Mt. Abu is Guru Shikhar (1722 m) (Bapna & Vyas 1962). Various rivers, lakes and, waterfalls originate from Mt. Abu, and general vegetation is evergreen forests, therefore the region is referred to as 'A heaven in the desert'. Mt. Abu mountain range is also famous for several ancient Hindu temples (e.g. Shri Raghunathji Temple, Adhar Devi temple, Dattatreya and famous Jain temples - Dilwara temples).

Climate of the region is usually dry like that of major regions of Rajasthan, in greater part of the year, but the temperature is always 10–15°C lower than the adjacent lowlands. Summer season prevails from mid of April to mid of June with average maximum temperature of around 36°C. The hottest month is May (32°C) and coolest is January (17°C). The region receives sufficient rains during the monsoons due to its relief and geographical settings. The annual rainfall is about 1778 mm. The annual mean humidity is 64%, reaches to maximum (99%) during monsoon. Winters are cool in Mt. Abu with mercury fluctuating around 16°C to 22°C. Average night temperature is around 4 to 12°C. Often night are chilling with the temperature dipping to as low as -2°C to -3°C during winters.

The soil is somewhat calcareous in texture with sufficient amount of Calcium carbonate, Potassium, phosphates and nitrates. Soil water content ranges from 22% to 30%. Soil pH ranges from 7.5 to 8, revealing alkaline nature (Bapna & Vyas 1962). Overall, the macro and microhabitats of Mt. Abu are suitable for the abundant growth of bryophytes. Bryofloristically Mount Abu is the richest place in Rajasthan with maximum diversification of corticolous as well as terricolous forms (Fig. 2).

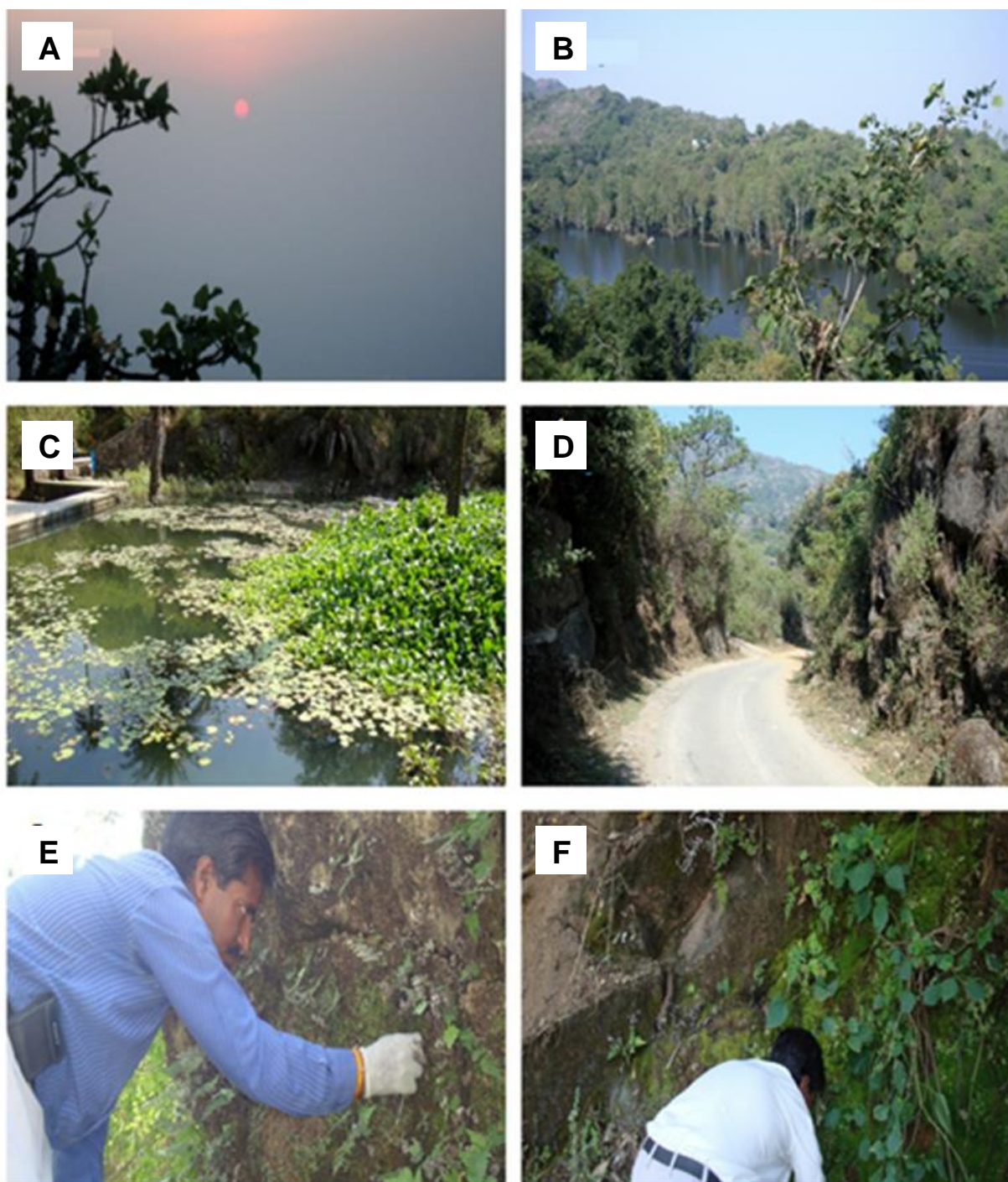


Figure 2. A–D, Different locations of Mount Abu (Rajasthan) at a glance; E–F, Collection of corticolous and terricolous mosses.

There are few reports available regarding floristic work in Mount Abu like Macdam (1890); King (1879); Champion (1937); Mahabale & Kharadi (1946) but all were related to spermatophyte. Bryologists of the country generally overlooked the exploration of this place for various reasons. As a consequence in earlier bryological works by Mitten (1859), Stephani (1901–1924) and Chopra (1938, 1943) there was no record of bryophytes. Later on Kashyap (1929, 1932) mentioned the presence of *Plagiochasma appendiculatum* and *Cyathodium tuberosum*. In 1945, Chavan & Mahabale noticed *Riccia discolor* and *Asterella angusta* beside *Plagiochasma appendiculatum*, however, they were dealing with hepatics of Gujarat mainly. While Mahabale & Kharadi (1946) mentioned the occurrence of *Riccia discolor* and *Plagiochasma appendiculatum* during ecological study of area. The first serious attempt was made by Bapna (1958) when he reported 24 species from Mount Abu. Afterward, Bapna & Vyas (1962) published a preliminary account about the liverworts of Mount Abu and

extended the list up to 28 taxa of liverworts and hornworts. This account is probably the only authentic record available so far as far as liverworts are concerned. Regarding mosses only few sporadic reports had been published with limited circulation and remain less known (Choudhary & Deora 2001).

This study is an effort has made to fill this lacuna. The study reveals the complete and updated status of mosses of this region. The earlier reported number of species (Bapna 1958, Bapna & Vyas 1962, Lal 2005) have also included along with newly reported taxa.

MATERIALS AND METHODS

The following checklist of mosses is based on moss specimens collected from different localities of Mount Abu during 2012–2013. The identification of taxa was done with the help of Gangulee (1969–1980). Earlier reported taxa are also included with their current status. All species listed in the literature were checked against the TROPICOS database (at the Missouri Botanical Garden). Present status is adopted from ‘The Plant List’ and taxa are listed according to the classification scheme of Buck & Goffinet (2000). The distribution of listed taxa in India is also given (Appendix I). The collected specimens are preserved and deposited in the Banasthali Vidyapith Herbarium (BVH), Tonk Rajasthan.

RESULTS

The present checklist of moss flora of Mt. Abu revealed the occurrence of 46 species of mosses which are belonging to 5 orders; 12 families and 30 genera. Out of these 44 retained their valid status, while 2 previously reported species come under the doubtful category *i.e.* unresolved name. Whereas, *Anoetangium clarum*, *Brachymenium indicum*, *Bryum uliginosum*, *Entodon plicatus*, *Entodon concinnus*, *Fissidens sylvaticus* var. *taraicola*, *Fissidens sylvaticus* var. *auriculatus*, *Hyophila spathulata*, *Plagiothecium cavifolium* and *Stereophyllum tavoyense* have been reported new from the region. This great diversity of mosses in this range confirms the potential of Mt. Abu in terms of bryodiversity particularly of mosses. Hence more explorations are required to this hilly range of Aravalli.

DISCUSSION

The checklist of mosses of these regions reveals that in terms of taxa the most diversified order is Pottiales with 1 family, 11 genera and 14 species. This is followed by order Bryales (2 families, 6 genera and 12 species) then comes order Hypnales (6 families, 8 genera and 11 species), followed by Dicranales (2 families, 2 genera and 6 species) and the least represented order is Funariales (1 family, 3 genera and 3 species). Overall, the most prominent family is *Pottiaceae* consisting of 11 genera with 14 species. Genera like *Bryum*, *Fissidens* and *Brachymenium* are most diversified while 16 genera are representation with a single species only.

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REFERENCES

- Bapna KR (1958) A note on the Hepatic flora of Mount Abu. *Current Science* 27: 259–260.
- Bapna KR & Vyas GG (1962) Studies in the liverworts of Mount Abu (India). A Preliminary Account. *Journal of the Hattori Botanical Laboratory* 25: 81–90.
- Buck WR & Goffinet B (2000) Morphology and classification of mosses. In: Shaw AJ & Goffinet B (eds) *Bryophyte Biology*. Cambridge University Press, pp. 71–119.
- Champion HG (1937) A preliminary survey of the forest types of India and Burma. *Indian Forster* 1: 1–286.
- Chaudhary BL & Deora GS (2001) The mosses of Mt. Abu (India). In: Nath V & Asthana AK (eds) *Perspectives in Indian bryology*. Bishen Singh Mahendra Pal Singh, Dehra Dun, India, pp. 87–125.
- Chavan AR & Mahabale TS (1945) Distribution of liverworts in Gujrat. *Proceeding 32nd Indian Science Congress*, p. 70.
- Chopra RS (1938) Notes on Indian Hepaticae. I. South India. *Proceeding Indian Academy of Science ser. B* 7: 239–251.
- Chopra RS (1943) A census of Indian hepatics. *Journal of Indian Botanical Society* 12: 35–62.
- Gangulee HC (1969–1980) *Mosses of Eastern India and Adjacent regions*. Fascicles, Books and Allied Limited, Calcutta, pp. 1–8.

- Kashyap SR (1932) *Liverworts of the W. Himalayas and the Punjab Plain, Part 2*. Lahore.
- Kashyap SR (1929) *Liverworts of the W. Himalayas and the Punjab Plain, part 1*. Lahore.
- King G (1879) The sketch of the flora of Rajputana. *Indian Forster* 72: 213–225.
- Lal J (2005) *A checklist of Indian Mosses*. Bishen Singh Mahendra Pal Singh. Dehra Dun, India. pp. 1–164.
- Mahabale & Kharadi (1946) On some ecological features of the vegetation of Mt. Abu. *Proceeding National Academy of Science* 116: 13–23.
- Mahabale TS & Chavan AR (1954) The distribution of liverworts in Gujarat. *J. M. S. Univ. Baroda* II (2): 13–16.
- Mcadam (1890) A list of trees and plants of Mount Abu. Jodhpur. pp. 1–28.
- Mitten W (1859) Musci Indiae Orientalis. *Linn. Soc. Bot. Suppl.* 1: 171.
- Stephani F (1901–1905) *Species Hepaticarum* 2: 1–615 (1901: 1–193; 1902: 194–341; 1903: 342–452; 1904: 453–502; 1905: 503–615) Geneve.
- Stephani F (1917–1924) *Species Hepaticarum* 6: 1–763 (1917: 1–128; 1918: 129–176; 1921: 177–240; 1922: 241–368; 1923: 369–432; 1924: 433–763). Geneve.

Appendix - I

Name of Species	Mount Abu	Western Himalayas	Eastern Himalayas	South India	Status
A. ORDER: POTTIALES M. Fleisch.					
1. FAMILY: Pottiaceae Schimp.					
i. <i>Anoetangium</i> Schwägr.					
1. <i>A. stracheyamum</i> Mitt.	+	+	+	+	Accepted (Choudhary & Deora 2001)
2. <i>A. clarum</i> Mitt.	+	+	+	-	Accepted (New reported)
ii. <i>Barbula</i> Hedw.					
3. <i>B. constricta</i> Mitt.	+	+	+	-	Accepted (Choudhary & Deora 2001)
iii. <i>Bryoerythrophyllum</i> P. C. Chen					
4. <i>B. recurvirostrum</i> (Hedw.) P. C. Chen	+	+	+	-	Accepted (Choudhary & Deora 2001)
iv. <i>Didymodon</i> Hedw.					
5. <i>Didymodon vinealis</i> (Brid.) R. H. Zander Syn. <i>Barbula vinealis</i> Brid.	+	+	+	-	Accepted (Choudhary & Deora 2001)
v. <i>Gymnostomiella</i> M. Fleisch.					
6. <i>G. vernicosa</i> (Hook. ex Harv.) M. Fleisch	+	+	+	+	Accepted (Choudhary & Deora 2001)
vi. <i>Hydrogonium</i> (Müll. Hal.) A. Jaeger.					
7. <i>H. arcuatum</i> (Griff.) Wijk & Margad.	+	+	+	+	Accepted (Choudhary & Deora 2001)
8. <i>H. consanguineum</i> (Thwaites & Mitt) Hilp.	+	+	+	+	Accepted (Choudhary & Deora 2001)
vii. <i>Hyophila</i> Brid.					
9. <i>H. involuta</i> (Hook.) A. Jaeger	+	+	+	+	Accepted (Choudhary & Deora 2001)
10. <i>H. spathulata</i> (Harv.) A. Jaeger	+	+	+	-	Accepted (New Report)
viii. <i>Semibarbula</i> Herz. & Hilp.					
11. <i>S. orientalis</i> (F. Weber) Wijk & Margad.	+	+	+	+	Accepted (Choudhary & Deora 2001)
ix. <i>Timmiella</i> (De Not.) Limpr.					
12. <i>T. anomala</i> (Bruch & Schimp.) Limpr.	+	+	-	+	Accepted (Choudhary & Deora 2001)
x. <i>Tortula</i> Hedw.					
13. <i>T. muralis</i> Hedw.	+	+	-	-	Accepted (Choudhary & Deora 2001)
xi. <i>Weissia</i> Hedw.					
14. <i>W. controversa</i> Hedw.	+	+	-	+	Accepted (Choudhary & Deora 2001)
B. ORDER: BRYALES Limpr.					

2. FAMILY: Bryaceae Schwägr**xii. Anomobryum** Schimp.

15. *A. auratum* (Mitt.) A. Jaeger + + + + Accepted
(Choudhary & Deora 2001)

xiii. Brachymenium Schwägr.

16. *B. acuminatum* Harv. + + + + Accepted
(Choudhary & Deora 2001)

17. *B. exile* (Dozy & Molk.) Bosch & Sande Lac. + + + + Accepted
(Choudhary & Deora 2001)

18. *B. indicum* (Dozy & Molk) Bosch & Sande Lac + - - - Accepted
(New Reported)

xiv. Bryum Hedw.

19. *B. argenteum* Hedw. + + - + Accepted
(Choudhary & Deora 2001)

20. *B. paradoxum* Schwagr. + + - + Accepted
(Choudhary & Deora 2001)

21. *B. recurvulum* Mitt. + - + + Accepted
(Choudhary & Deora 2001)

22. *B. uliginosum* (Brid.) Bruch & Schimp + + + - Accepted
(New Reported)

xv. Gemmabryum J. R. Spence & H. P. Ramsay

23. *G. apiculatum* (Schwagr.) J. R. Spence & H. P. Ramsay + + + + Accepted
(Choudhary & Deora 2001)

Syn. *Bryum plumosum* Dozy & Molk.

xvi. Ptychostomum Hornsch.

24. *P. capillare* (Hedw.) D. T. Holyoak & N. Pedersen + + + + Accepted
(Choudhary & Deora 2001)

Syn. *Bryum capillare* Hedw.

3. FAMILY: Bartramiaceae Schwägr.**xvii. Philonotis** Brid.

25. *P. mollis* (Dozy & Molk.) Mitt. + - - + Accepted
(Choudhary & Deora 2001)

26. *Philonotis thwaitesii* Mitt. + + + - Accepted
(Choudhary & Deora 2001)

Syn. *Philonotis revoluta* Bosch & Sande Lac.

C. ORDER: FUNARIALES M. Fleisch**4. FAMILY: Funariaceae** Schwägr.**xviii. Funaria** Hedw.

27. *F. hygrometrica* Hedw. + + + + Accepted
(Choudhary & Deora 2001)

xix. Loiseaubryum Bizot

28. *Loiseaubryum nutans* (Mitt.) Fife. + + + - Accepted
(Choudhary & Deora 2001)

Syn. *Funaria nutans* (Mitt.) Broth.

xx. Physcomitrium (Brid.) Brid.

29. *P. japonicum* (Hedw.) Mitt + + + - Accepted
(Choudhary & Deora 2001)

D. ORDER: HYPNALES (M. Fleisch.) W. R. Buck & Vitt**5. FAMILY: Fabroniaceae** Schimp.**xxi. Fabronia** Raddi

30. *F. minuta* Mitt. + + - - Accepted
(Choudhary & Deora 2001)

xxii. Levierella Müll. Hal.

31. *Levierella neckeroides* (Griff.) O' Shea & Matcham + + - - Accepted
(Choudhary & Deora 2001)

Syn. *Livierella fabroniacea* Mull. Hal.

6. FAMILY: Entodontaceae Kindb.**xxiii. Entodon** Müll. Hal.

32. *E. myurus* (Hook.) Hampe + + + - Accepted
(Choudhary & Deora 2001)

33. *E. prorepens* (Mitt.) A. Jaeger + + + - Accepted
(Choudhary & Deora 2001)

34. *E. cocinnus* (De Not.) Par. + - - - Accepted
(New Report)

35. *E. plicatus* Mull. Hal + + + + Accepted
(New Report)

7. FAMILY: Stereophyllaceae (M. Fleisch.) W. R. Buck & Ireland**xxiv. Stereophyllum** Mitt.

36. <i>S. tavoyense</i> (Hook. ex Harv.) A. Jaeger	+	+	-	+	Accepted (New report)
8. FAMILY: <i>Sematophyllaceae</i> Broth.					
xxv. <i>Wijkia</i> H. A. Crum					
37. <i>W. tanytricha</i> (Mont.) H. A. Crum	+	-	-	+	Accepted (Choudhary & Deora 2001)
9. FAMILY: <i>Plagiotheciaceae</i> (Broth.) M. Fleisch.					
xxvi. <i>Plagiothecium</i> Bruch & Schimp.					
38. <i>P. cavifolium</i> (Brid.) Z. Iwats	+	-	-	-	Accepted (New Report)
10. FAMILY: <i>Meteoriaceae</i> Kindb					
xxvii. <i>Diaphanodon</i> Renuald & Cardot.					
39. <i>D. procumbens</i> (Mull.Hal) Renault & Cardot	+	+	+	-	Accepted (Choudhary & Deora 2001)
xxviii. <i>Pseudobarbella</i> Nog.					
40. <i>P. compressiramea</i> (Renauld and Cardot) Nog.	+	+	+	-	Accepted (Choudhary & Deora 2001)
E. ORDER: DICRANALES H. Philib. & M. Fleisch.					
11. FAMILY: <i>Fissidentaceae</i> Schimp.					
xxix. <i>Fissidens</i> Hedw.					
41. <i>F. curvato-involutus</i> Dixon	+	+	+	+	Accepted (Choudhary & Deora 2001)
42. <i>F. diversifolius</i> Mitt.	+	+	-	+	Accepted (Choudhary & Deora 2001)
43. <i>Fissidens geminiflorus</i> Dozy & Molk Syn. <i>F. geminiflorus</i> var. <i>nagasakinus</i> (Besch) Z. Iwats	+	-	-	-	Accepted (Choudhary & Deora 2001)
44. <i>F. sylvaticus</i> var. <i>auriculatus</i> (Mull. Hal.) Gangulee	+	+	+	-	Unresolved (New Report)
45. <i>F. sylvaticus</i> var. <i>taraicola</i> (Mull. Hal.) Gangulee	+	+	+	-	Unresolved (New Report)
12. FAMILY: <i>Bruchiaceae</i> Schimp.					
xxx. <i>Trematodon</i> Michx.					
46. <i>T. sabulosus</i> Griff.	+	+	+	-	Accepted (Choudhary & Deora 2001)