POLLEN MORPHOLOGY OF *MIMOSA RUBICAULIS* LAMK. AND *M. HAMATA* WILLD.*

A. K. SAXENA AND VISHNU-MITTRE

Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

Pollen morphology of two species of *Mimosa* viz. *M. rubicaulis* Lamk. and *M. hamata* Willd. of Mimosaceae has been described. It is observed that these two species cannot be distinguished on the basis of pollen morphology.

INTRODUCTION

During the recent investigations of pollen morphology of Rajasthan flora, as an aid towards the identification of subfossil pollen grains and spores, we discovered that the polyads of *Mimosa rubicaulis* and *M. hamata* exhibit considerable overlap in their characters. Although pollen morphology of these two species has been reported earlier by VISHNU-MITTRE AND SHARMA (1962), NAIR AND SHARMA (1962), and GUINET (1969), the overlap in morphological characters has been pointed out by NAIR AND SHARMA (1962) and GUINET (1969). However, none of these workers have evaluated the characters statistically for their applicability towards recognition of their pollen in the dispersed state.

The statistical evaluation of the morphological data of these two species based upon more than one specimen has been attempted by us and the results obtained are presented in this communication.

Mimosa rubicaulis, distributed in the Sub-Himalayan tract and the outer Himalaya from Indus eastwards ascending to 1525 meters in western Himalayas, occurs commonly in low jungles, forest-glades, open grasslands along water-courses, along the banks of rivers, in ravines, waste-lands, in scrubs and in *Pinus roxburghii* forests. *M. hamata*, distributed in south-east Punjab plains, Hissar, Sirsa, arid belt of Western Rajasthan, Western Peninsula and southern India, is common in drier areas in association with other thorny shrubs.

These two species are closely allied taxonomically and they are well established (SAHNI, *pers. comm.*). *M. rubicaulis* reported from Rajasthan has been identified by mistake for *M. hamata* (BLATTER & HALLBERG, 1918, p. 245). The chief object of the paper is to determine whether these two species can be distinguished from one another on the basis of pollen morphology, so that the information can be applied in pollen-analytical investigations.

MATERIAL AND METHODS

The polliniferous material of four plants of *Mimosa rubicaulis* and two of *M. hamata* procured from the herbarium of the National Botanic Gardens, Lucknow was investigated. The voucher numbers of the specimens investigated are given below :

1. *Mimosa rubicaulis* Lamk.—Kumaon ; 57/531, NBG ; July 1909 ; Coll. N. Gill.

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2. *M. rubicaulis* Lamk.—NBG, Lucknow ; 4815/21528, NBG ; August 1954; Coll. S. L. Kapoor.

3. *M. himalayana* Gamble.—(syn. *M. rubicaulis* F. B. I.; in part)—Muzaffarnagar, U. P.; X/8486, NBG ; 1953 ; Coll. R. C. Bharadwaj.

4. *M. rubicaulis* Lamk.—Hazaribagh, Bihar ; 36896/21828, NBG ; August 1959 ; Coll. V. Chandra and Party.

5. *M. hamata* Willd.—Junagarh, Saurashtra ; 13794/11876, NBG ; Coll. S. L. Kapoor.

6. *M. hamata* Willd.—Nagor, Rajasthan ; 34965/22942, NBG ; July 1956 ; Coll. Hiralal and Party.

Pollen preparations, made by method of acetolysis (ERDTMAN, 1952), were mounted in glycerine-jelly. The measurements are based upon 100 grains each.

OBSERVATIONS

Pollen morphology of individual specimens examined is given below.

1. *Mimosa rubicaulis*—Polyads 4-13-celled ; transverse axis 12-13 μm, longitudinal axis 17-18 μm ; exine 1 μm thick, areolate (Pl. 1, Figs. 2a & b, 4).

2. *M. rubicaulis*—Polyads 8-12-celled ; transverse axis 12-13 μm, longitudinal axis 17-19 μm ; exine 1 μm thick, areolate.

3. *M. himalayana* Gamble (syn. *M. rubicaulis* F. B. I.; in part)—Polyads 8-12-celled ; transverse axis 12-13 μm, longitudinal axis 16-18 μm ; exine 1 μm thick, areolate.

4. *M. rubicaulis*—Polyads 8-12-celled ; transverse axis 11-13 μm, longitudinal axis 17-18 μm ; exine 1 μm thick, areolate.

5. *M. hamata*—Polyads 8-12-celled ; transverse axis 11-12 μm, longitudinal axis 17-19 μm ; exine 1 μm thick, areolate (Pl. 1, Fig. 3).

6. *M. hamata*—Polyads 8-12-celled ; transverse axis 11-12 μm, longitudinal axis 16-19 μm ; exine 1 μm thick, areolate (Pl. 1, Figs. 1 & 5).

POLLEN DIAGNOSES OF THE TWO SPECIES

Mimosa rubicaulis Lamk.—Polyads 4-13-celled ; transverse axis 11-13 μm, longitudinal axis 16-19 μm ; exine 1 μm thick, areolate.

M. hamata Willd.—Polyads 8-12-celled ; transverse axis 11-13 μm, longitudinal axis 16-19 μm ; exine 1 μm thick, areolate.

DISCUSSION

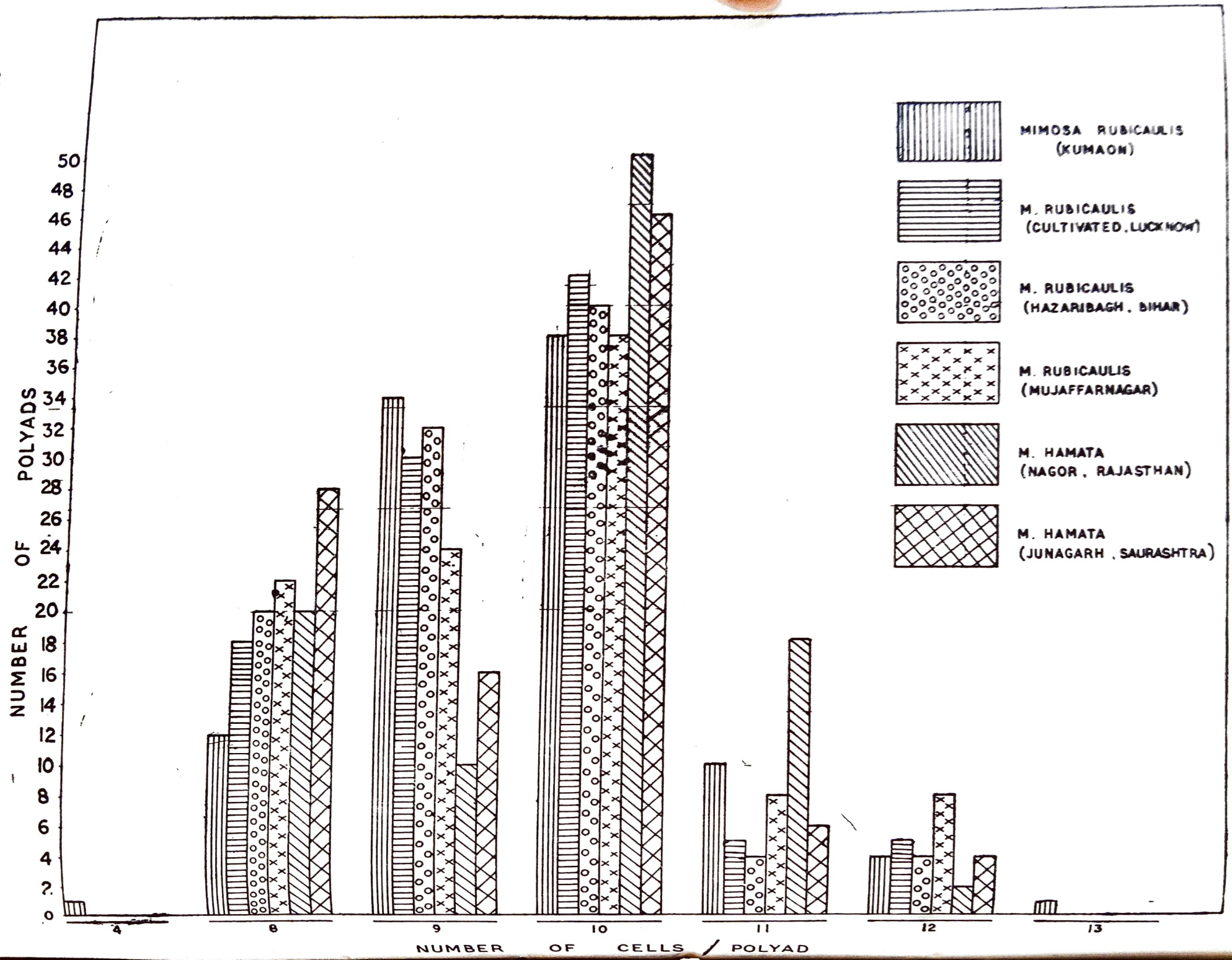
The pollen morphology of the two species reveals considerable similarity in their characters except variability in the number of cells in polyads (Text-fig. 1). The accompanying Table 1 gives the necessary data of dimensions and the variability in the number of cells.

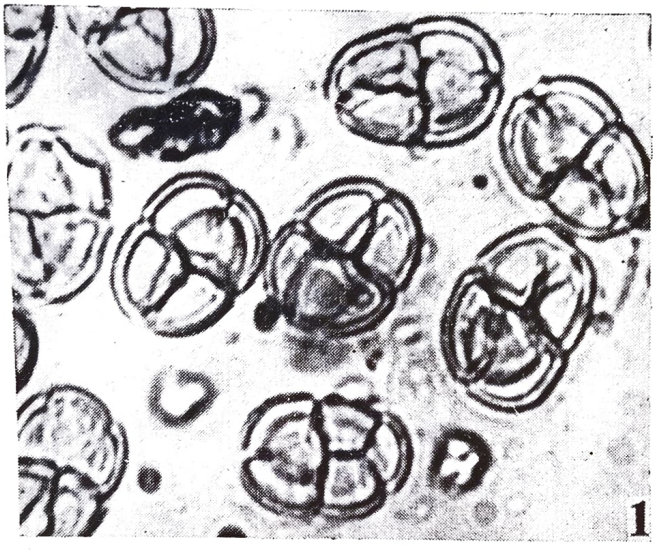
Text-fig. 1 reveals that the number of cells in polyads is very much variable. Four-celled tetrahedral tetrads are found only in one specimen of *M. rubicaulis* and this may be ascribed to meiotic disturbance causing at the same time the formation of 13-celled polyads in the same specimen and both the 4-celled and 13-celled polyads are extremely rare. The normal number of cells in a polyad varies from 8 to 10; the maximum number of polyads in both the species are 10-celled followed by 9-celled and 8-celled ones ; 11-celled and 12-celled polyads are comparatively less frequent. Against more than 8-celled polyads observed by us, GUINET (1969) has recorded only 8-celled polyads in both the species.

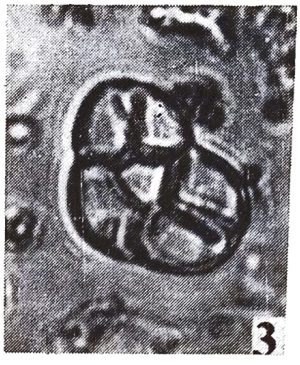
The extreme variability in the number of cells in polyads of these two species based

Table 1—Giving details of pollen morphological characters of *Mimosa rubicaulis* Lamk. and *M. hamata* Willd.

Specimen	Percentages of polyads with different number of cells (%)							Size Longitudinal axis	Size Transverse axis
	4-celled	8-celled	9-celled	10-celled	11-celled	12-celled	13-celled	μm	μm
Mimosa rubicaulis Lamk. Kumaon, 57/531, July 1909, N. Gill.	1	12	34	38	10	4	1	17-18	12-13
M. rubicaulis Lamk. NBG, LKO, Cultivated, 4815/ 21528, August 1954,S.L.Kapoor	0	18	30	42	5	5	0	17-18	12-13
M. rubicaulis Lamk. Hazaribagh, Bihar, 36896/21828, August 1959, V. Chandra & Party	0	20	32	40	4	4	0	17-18	11-13
M. himalayana Gamble syn. *M. rubicaulis* F.B.I. (in part) Muzaffarnagar, U. P., 1953-X/ 8486, R.C. Bhardwaj.	0	22	24	38	8	8	0	16-18	12-13
M. hamata Willd. Junagarh, Saurasthra 13794/ 11876, S. L. Kapoor.	0	28	16	46	6	4	0	17-19	11-12
M. hamata Willd. Nagor, Rajasthan, 34965/22942, July 1956, Hiralal and Party	0	20	10	50	18	2	0	16-19	11-13
M. rubicaulis (Vishnu-Mittre & Sharma, 1962)	4-6 celled polyads							18-20	12
M. hamata (Vishnu Mittre & Sharma, 1962)	8-celled polyads							14-16	10-12
M. rubicaulis (Nair & Sharma, 1962)	4(5, 6)-celled polyads							14-17.5	..
M. hamata (Nair & Sharma, 1962)	4(5, 6)-celled polyads							10.5-17.5	..
M. rubicaulis (Guinet, 1969)	8-celled polyads							16	11
M. hamata (Guinet, 1969)	8-celled polyads							19	12


NUMBER OF POLYADS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
4
8
9
10
11
12
13
NUMBER OF CELLS / POLYAD
MIMOSA RUBICAULIS (KUMAON)
M. RUBICAULIS (CULTIVATED, LUCKNOW)
M. RUBICAULIS (HAZARIBAGH, BIHAR)
M. RUBICAULIS (MUJAFFARNAGAR)
M. HAMATA (NAGOR, RAJASTHAN)
M. HAMATA (JUNAGARH, SAURASHTRA)

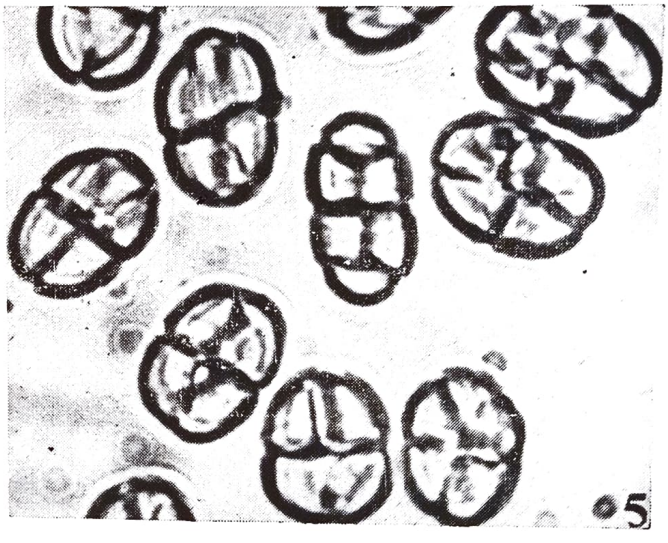

1


3


2a


2b


4


5

upon several specimens give useful information. We cannot assign any reasons responsible for this variability, but cannot help drawing attention of pollen-analysts to resolve their identification of dispersed pollen in cases where pollen morphology reveals variability through the study of population palynology to base the diagnostic characters.

The two species seem to be almost similar in their pollen morphology but for the minor differences in dimensions of the axis described by GUINET (*op. cit.*) which appear to be insignificant statistically. While dealing with dispersed polyads derived from several mother plants it appears practically impossible to refer the polyads to their respective species.

CONCLUSIONS

The observations recorded above support that the two species of *Mimosa* are indistinguishable pollen morphologically, although the distribution of these two species is controlled by climatic factors. For instance, *Mimosa rubicaulis* is distributed in the sub and outer Himalayan tracts and *M. hamata* is common in drier areas and associated with thorny shrubs. Pollen-analysts ought to take particular care in examining pollen morphology before depending upon the climatic inference of such pairs of species with distinct climatic requirements, otherwise the climatic inference is likely to be misleading, e.g. in work on vegetational history of Rajasthan desert by SINGH *et al.* (1974).

REFERENCES

BLATTER, E. & HALLBERG, F. (1918). The Flora of Indian Desert. *J. Bomb. nat. Hist. Soc.* **26** : 218-246.

ERDTMAN, G. (1952). *Pollen Morphology and Plant Taxonomy.* Almqvist and Wiksell, Stockholm.

GUINET, PH. (1969). Les Mimosacées étude de Palynologie fondamentale corrélations évolution. *Inst. fr. Pondicherry, Trav. Sec. Sci. Tech.* **9** : 1-293.

NAIR, P. K. K. & SHARMA, M. (1962). Pollen grains of some Indian plants-IV. *Bull. Nat. Bot. Gard. Lucknow.* **65** : 1-37.

SINGH, G., JOSHI, R. D., CHOPRA, S. K. & SINGH, A. B. (1974). Late Quaternary history of vegetation and climate of the Rajasthan Desert, India. *Phil. Trans. Roy. Soc.* **267**(889) : 467-501.

VISHNU-MITTRE & SHARMA, B. D. (1962). Studies of Indian pollen grains-1. Leguminosae. *Pollen Spores.* **1** : 5-45.

EXPLANATION OF PLATE 1

All figures are ×1,000.

1. Polyads in *Mimosa hamata* (Nagor, Rajasthan ; 34965/22942, NBG; July 1956 ; Coll. Hiralal and Party)
2. (a & b) Tetrahedral tetrads in *M. rubicaulis* Lamk. (Kumaon ; 57/531, NBG ; July 1909 ; Coll. N. Gill).
3. A 12-celled polyad in *M. hamata* Willd. (Junagarh, Saurashtra; 13794/11876, NBG; Coll. S. L. Kapoor).
4. Polyads in *M. rubicaulis* Lamk. (Kumaon ; 57/531, NBG ; July 1909 ; Coll. N. Gill).
5. Polyads in *M. hamata* Willd. (Nagor, Rajasthan ; 34965/22942, NBG ; July 1956; Coll. Hiralal and Party).