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Research Article

Palyno-taxonomic study of some members of Malvaceae in Purba Medinipur, West Bengal, India.

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Abstract: The Malvaceae is a large family of about 243 genera and 4225 species with medicinal and gardening importance. Palynological observations were carried out of 9 species collected from different localities of Purba Medinipur District during the period of February 2016 to December 2017. The present study reveals the pollen morphological characteristics, especially pollen shape classes like Oblate (1 species), Oblate-spheroidal (4 species), Sub-prolate (1 species) and Per-oblate (3 species) with diameter ranges between 35 µm (*Urena lobata* L.) to 115 µm (*Malvaviscus arboreus* Cav.). Pollen morphology is one of the most significant tool for the taxonomic study as well as systematics of plant taxa.

Keywords: Pollen Morphology, Malvaceae, Eurypalynous, Purba Medinipur

Introduction

Malvaceae**,** the mallow family (order Malvales) containing 243 genera and at least 4,225 species of herbs, shrubs, and trees. Representatives occur in all except the coldest parts of the world but are most numerous in the tropics (Hutchinson, 1967; Bates, 1968; Fryxell, 1975 and 1988; Krebs, 1994). Now a day's study of pollen is an important area of research. Various pollen morphological features such as symmetry, shape, apertural pattern and exine configuration are very conservative features for the taxonomic assessment of the plants (Perveen, 2006; Bera *et al*., 2007; Keshavarzi *et al*., 2012). The usefulness of pollen morphology as an interpretative key for a natural classification is now debated (Blackmore and Barnes, 1991; Nilsson & Praglowsky, 1992).

Pollen grains are widely used tool for taxonomical analysis of angiosperic plants. Taxonomists and botanists have recognized the necessity of pollen morphology in clarifying the classification of angiospermic plant groups upto species level or even upto variety level. Mature angiospermic pollen grains are unusual vegetative cells that contain sperm cells and complete with cell walls and plasma membranes (Sarkar *et al.,* 2017). This arrangement is accomplished soon after meiosis, when an asymmetric mitotic division produces a large cell that engulfs its diminutive sister, the generative cell (Yang and Sundaresan, 2000).

Morphological characteristics of pollen grains also can be useful characters in studies of plant taxonomy because many pollen traits are influenced by the strong selective forces involved in various reproductive processes, including pollination, dispersal, and germination (Erdtman 1952; Moore *et al.* 1991; Nowicke and Skvarla 1979; Stuessy 1990). Various pollen morphological features such as symmetry, shape, apertural pattern and exine configuration are very conservative features for the taxonomic assessment of the plants (Perveen, 1993). Pollen morphological data have also used by Dahlgren and Clifford (1982) and Dahlgren *et al.* (1985) during comparative studies and toward a more natural, phylogenetic system of classification of the monocotyledons. Zavada (1983) summarized the apertures and wall structures of monocot pollen and discussed evolutionary trends for those characters. Since then there has been a gradual increase in the use of pollen morphological data in phylogenetic analyses (Siddiqui and Qaiser, 1988; Goldblatt *et al*., 1991; Chaturvedi *et al*., 1998; and Furness and Rudall, 2003).

The present study aimed to compare pollen morphology of different species with same family and to improve the general knowledge of palynology to contribute the preparation of regional pollen flora.

Materials and Methods

The study was carried out during the period of February 2016 to December 2017. The plant specimen are collected from the different localities of Purba Medinipur district, West Bengal. The specimens were identified by standard taxonomic tool. The collected taxa are *Abutilon indicum*, *Hibiscus brackenridgei, Hibiscus diversifolius*, *Hibiscus rosa-sinensis*, *Hibiscus waimeae*, *Malvaviscus arboreus*, *Sida cordifolia,*

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Sida humilis and *Urena lobata***.** The mature flowers of the above plant taxa were collected from healthy plants and pollen morpho types studied by Acetolysis method according to Erdtman, 1960. Pollen morphological characters were studied under Light Microscope (Magnus MLX- Model No. 13A315).

Fig. 1. Study area from which specimen are collected.

Figure 2. (A) Sample preservation before centrifuge, (B) Sample after centrifuge.

Description of observed Pollen grains:

During the present work pollen morphology of 09 species belong to Malvaceae family were studied and photographs are taken under Light Microscopy (LM). The flowering period of the studied taxa are was recorded in Table-1.

***Abutilon indicum* (Link) Sweet**

Pollen 56 µm in diameter, Oblate in shape, colporate or porate, spines short, pointed or tapering apices.

Fig. 3: *Abutilon indicum*

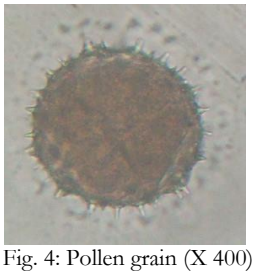

Fig. 4: Pollen grain (X 400)

Fig.5: *Hibiscus brackenridgei*

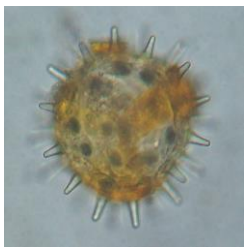

Fig. 6: Pollen grain (X 400)

***Hibiscus brackenridgei* A. Gray**

Pollen are 95 µm in diameter, apolar, Oblate-spheroidal, polypantoporate, aperture in spiral pattern, spines long, straight, slender, blunt apices.

***Hibiscus diversifolius* Jacq.**

Pollen are 92 µm in diameter, apolar, Oblate-spheroidal, polypantoporate, spine long, straight, slender, blunt apices.

Fig.7: *Hibiscus diversifolius*

Fig. 8: Pollen grain (X 400)

***Hibiscus rosa-sinensis* L.**

Pollen 96 µm in diameter, apolar, Oblate-spheroidal, colporate or porate, spine short, blunt apices.

Fig. 9: *Hibiscus rosa-sinensis*

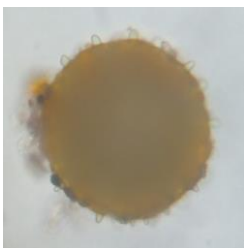

Fig. 10: Pollen grain (X 400)

***Hibiscus waimeae* A. Heller**

Pollen 99 in diameter, oblate- spheroidal, apolar, polypantoporate, spine long, slender, straight, tapering apices.


Fig. 11: *Hibiscus waimeae*


Fig. 12: Pollen grain (X 400)

***Malvaviscus arboreus* Cav.**

Pollen 115µm in diameter, Sub-prolate, apolar, polypantoporate, pores numerous, spines long, straight, pointed apices.


Fig.13. *Malvaviscus arboreus*


Fig. 14: Pollen grain (X 400)

***Sida cordifolia* L.**

Pollen 45 µm in diameter, Per-oblates, colporate or porate, spine short, rounded apices.


Fig.15. *Sida cordifolia*

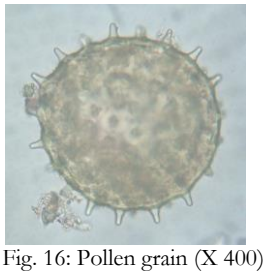
Fig. 16: Pollen grain (X 400)

***Sida humilis* L.**

Pollen 47 µm in diameter, Per-oblate, colporate or porate, spine short, pointed or tapering apices.

***Urena lobata* L.**

Pollen 35 µm in diameter, Per-oblate, polypantoporate, spine short, blunt apices.


Fig.17: *Sida humilis*

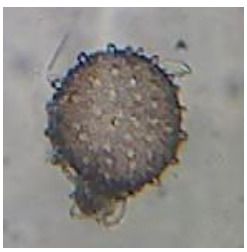
Fig. 18: Pollen grain (X 400)


Fig.19: *Urena lobata*

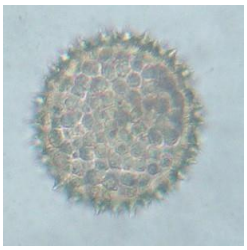
Fig. 20: Pollen grain (X 400)

Table 1. Comparative Assessment of pollen morphology among the plants belongs the family Malvaceae.

Investigated plant	Flowering time	Pollen grain Diameter (µm)	Shape	Aperture arrangement	Apertures shape	Spine
Abutilon indicum (L.) Sw.	Throughout the season	56	Oblate	Panto porate	Colporate or porate	Spines short, pointed or tapering apices.
Hibiscus brackenridgei A. Gray	Feb - May	95	Oblate-spheroidal	Panto porate	Porate	Spines long, straight, slender, blunt apices.
Hibiscus diversifolius Jacq.	Mar - June	92	Oblate-spheroidal	Panto porate	Porate	Spine long, straight, slender, blunt apices
Hibiscus rosa-sinensis L.	Throughout the season	96	Oblate-spheroidal	Panto porate	Colporate or porate	Spine short, blunt apices
Hibiscus waimeae A. Heller	Feb - May	99	Oblate-spheroidal	Panto porate	Porate	Spine long slender, straight, tapering apices.
Malvaviscus arboreus Cav.	May - Nov	115	Sub-prolate	Panto porate	porate	Spine long, straight, pointed apices.
Sida cordifolia L.	Oct - Dec	45	Per-oblate	Panto porate	Colporate or porate	Spine short, rounded apices
Sida humilis L.	Oct - Dec	47	Per-oblate	Panto porate	Colporate or porate	Spine short, pointed or tapering apices
Urena lobata L.	Apr - Nov	35	Per-oblate	Panto porate	Porate	Spine short, blunt apices

Discussion

Pollen morphology of Malvaceae is generally eurypalynous type. From the above study, the shape classes of pollen grains were observed as Oblate in *Abutilon indicum,* Oblate-spheroidal in *Hibiscus brackenridgei*, *Hibiscus diversifolius*, *Hibiscus waimeae* and *Hibiscus rosa-sinensis*, Sub-prolate in *Malvaviscus arboreus* and Per-oblate in *Sida cordifolia, Sida humilis* and *Urena lobata*. The shape of the pollen grains were varied depending on the diameter (µm) of pollen grain. Out of investigated taxa the smallest diameter pollen grain is *Urena lobata* (35 µm) while the largest one is *Malvaviscus arboreus* (115 µm). The

spines are short, pointed or tapering apices; short, blunt or rounded apices; long, straight, slender, tapering or blunt apices.

The pollen morphology of Fabaceae, out of 16 plant species tri-colporate (3-colporate) type of pollen grains were observed in 13 species and The polyad types of pollen grains were found in *Acacia auriculiformis*, *Acacia arabica* and *Albizzia lebbek* (Bhattacharya *et al.,* 2015). Pollen morphology of 22 species belonging 10 families were studied. Out of 22, Oblate-Spheroidal type is 5 species, Prolate type is 5 species, oblate type is 2 species, Triangular and Spheroidal type were also observed. Species belonging to same family also differ in pollen morphology (Sarkar *et al.,* 2017).

Conclusion

The present comparative assessment was done considering the morphological variation of pollen grains of some plants belong to Malvaceae which are important for medicinal use as well as Gardening use. These pollen morphological characteristics can be correlate with other characteristics like leaf architecture, phytochemicals, cytology, anatomy and seed character may significant in the subject of practical based means applied prospect in the systematics of plants. This study will also helpful for the preparation of pollen calendar of an area with foraging habit of honey bee species.

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