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Scanning Electron Microscopy Based Palynomorph logical Variations in Some Genera of Family Malvaceae

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Abstract

Palynomorphological study of five genera of Family Malvaceae viz., *Gossypium hirsutum, Hibiscus rosa-sinensis,Malachra capitata, Sida acuta and Thespesia populnea* was investigated with the aid of light and Scanning electron microscope. Pollens from five genera of Malvaceae were collected and Prepared for LM and SEM. The morphological variations were noted in all studies acetolysed and unacetolysed pollen grain accompanying with size, shape, surface structure and surface pattern. The size of all the studied pollen ranges between 70-140µm. The maximum pollen size (136.17- 140.76 µm) across was found in *Hibiscus rosa-sinensis* whereas, minimum Pollen size (73.04 - 77.19) across was noted in *Sida acuta*. The shape of the pollen grain varies from oblate-spheroidal to prolate-spheroidal. The surface pattern of all studied genera was found to be spiny but variation occurs in spine structure. Bulbous spine base present in *Sida acuta*, *Thespesia populnea,* and *Gossypium hirsutum* whereas it was found to be absent in *Hibiscus rosa-sinesis* and *Malachra capitata*. Amb usually circular. Pantoporate condition were observed in all studied genera. SEM represents minor important features of pollen grains that were not found in LM observations and found to be vital instrument in studying pollen characters at high magnifying level.

Key words: Pollen morphology, Malvaceae, LM, SEM.

INTRODUCTION

Malvaceae Juss. is a large family of herbs, shrubs and trees; comprising about 110 genera and 2000 species. It is a globally distributed family with primary concentrations of genera in the tropical and subtropical regions (Hutchinson 1967; Fryxell 1997). In earlier studies on pollen morphology of family Malvaceae very meager importance has been given on minute characters which have its own importance in species discrimination. Hence, Palynomorphology of five genera of Malvaceae viz., *Gossypium hirsutum, Hibiscus rosa-sinensis, Malachra capitata, Sida acuta and Thespesia populnea* was investigated with the aid of Scanning Electron Microscope with special emphasis on minute characters. Pollen morphology is a useful tool to study the interrelationship of plant taxa.

MATERIALS AND METHODS

The polliniferous material of five genera of Malvaceae were collected from Sant Gadge Baba Amravati University, Amravati campus (Maharashtra) and stored in 70% alcohol. The studied taxa were identified from Floras (Naik, 1998 and Yadav, 2005). The collected material was crushed with a glass rod in plastic centrifuge tube and crushed material was filtered through fine meshes to isolate pollen grains. The pollen grains were prepared for light and scanning electron microscope by the standard method described by Erdtman (1960) and Arora & Modi (2008). For light microscopy, the pollen grains were mounted in stained glycerine jelly and observations were made with Trinocular Fluroscence Microscope (Axiostar HBO 50/AC Carl zeiss). For Scanning Electron Microscopy (SEM) studies, pollen grain were suspended in a drop of ethanol and directly transpired with a fine pipette to a metallic stubs using double sided cello tape and coated with gold palladium in a sputtering chamber (POLARON SPUTTER COATER). The SEM examination was carried out on a LEO electron microscope (LEO 430). The measurements are based on 10 readings from each pollen type by ocular micrometer and the pollen grain size, Spine size, pore size etc. was measured. The terminology used in accordance with Erdtman (1971), Faegri and Iverson (1964), Bhattacharya et al. (2006) and Agashe (2006).

OBSERVATIONS AND RESUETS

The pollen morphological characters of the studied genera are given below:

1. ***Gossypium hirsutum* L.**

Pollen grain, 91.08-100.98 µm in diameter, spheroidal- prolate spheroidal, pantoporate, outline circular, tectum echinate, spine 7.60 - 8.19 µm in length and 8.09 - 8.77 µm wide, distance between two spine 5.85-8.19 µm, bulbous spine base, 3.51- 4.09 µm long, spine acute at the end and broad bulbous base, spine base 8.19 - 8.77 µm long, spine densely arranged, pori not distinct, exine 4.16-4.85 µm thick, N7P6C6 [Fig. 1-2 (SEM, Mag. 1.70 KX, Table No. 01].

2. ***Hibiscus rosa sinensis* L.**

Pollen grain 136.17- 140.76 µm in diameter, pantoporate, spheroidal- prolate spheroidal, amb. circular, tectum echinate, spine 14.52-16.5 µm in length and 8.91-9.24 µm wide at the base, distance between two spine 8.58- 9.9 µm, spine narrow towards the end and broad at the base, spine blunt and sparsely arranged, pori circular, 5.28-7.92 µm in diameter, pori initiate between two successive spines, exine thick, N7P6C6 [Fig. 3-4 (SEM Mag. 916X, 2.29 KX, Table No. 01].

3. ***Malachra capitata* L. Syst. Nat. ed.**

Pollen grain 114.38 - 118.37 µm in diameter, oblate spheroidal- prolate speroidal, pantoporate, outline circular, tectum echinate, spine 11.52-18.56 µm long and 4.48- 5.76 µm wide, distance between two spine 8.32- 10.24 µm,spine tapering towards the end and broad at the base, nonbulbous spine base, pori distinct, circular, 4.48 - 5.12 µm in diameter, pori initiate between two successive spines, exine 4.55-5.70 µm thick, N7P6C6 [Fig. 5-6, (SEM, Mag. 1.54 KX, 3.13 KX, Table No. 01].

4. ***Sida acuta* Burm. F.Fl.Ind.**

Pollen grain 73.04 - 77.19 in diameter, oblate spheroidal- spheroidal-prolate spheroidal, pantoporate, outline circular, tectum echinate, spine 2.43- 2.70 µm in length and 4.05- 4.32 µm wide, distance between two spine 2.97- 4.05 µm, bulbous spine base, 1.35- 2.16 µm long, spine pointed, spine base broad, spine densely arranged, pori not distinct, exine 2.94-3.60 µm thick, N7P6C6 [Fig. 7-8 (SEM, Mag. 1.69 KX, 5.24 KX, Table No. 01].

5. ***Thespesia papulnea* (L.) Soland. ex. Corr. Ann. Mus.**

`Pollen grain 107.73-114.38 µm in diameter, pantoporate, spheroidal- prolate spheroidal, outline circular, tectum echinate ,spine tapering towards the end and broad at the base, spine 8.91-10.56 µm in length and 8.58-9.24 µm wide at the base, distance between two spine 6.6-11.88 µm, bulbous spine base, 3.96- 5.28 µm long, 1or 2 spinules originate from the spine base, spine acute and thin,pori circular, 3.96 µm wide, exine thick, N7P6C6 [Fig. 9-10 (SEM, Mag. 1.06 KX, Table No. 01].

Sr. No	Name of Varieties	Pollen shape	Pollen grain diameter (µm) min - max	Spine lenth (µm) min-max	Amb.	Pollen wall surface
1	*Gossypium hirsutum*	Spheroidal-Prolate spheroidal	91.08-100.98	7.60-8.19	Circular	Echinate
2	*Hibiscus rosa-sinensis*	Spheroidal-Prolate spheroidal	136.17- 140.76	14.52-16.5	Circular	Echinate
3	*Malachra capitata*	Oblate Spheroidal-Prolate speroidal	114.38-118.37	11.52-18.56	Circular	Echinate
4	*Sida acuta*	Oblate spheroidal-Spheroidal-Prolate speroidal	73.04 - 77.19	2.43- 2.70	Circular	Echinate
5	*Thespesia populnea*	Spheroidal-Prolate spheroidal	107.73-114.38	8.91-10.56	Circular	Echinate

Observation Table No. 1: Pollen Grain Characteristics

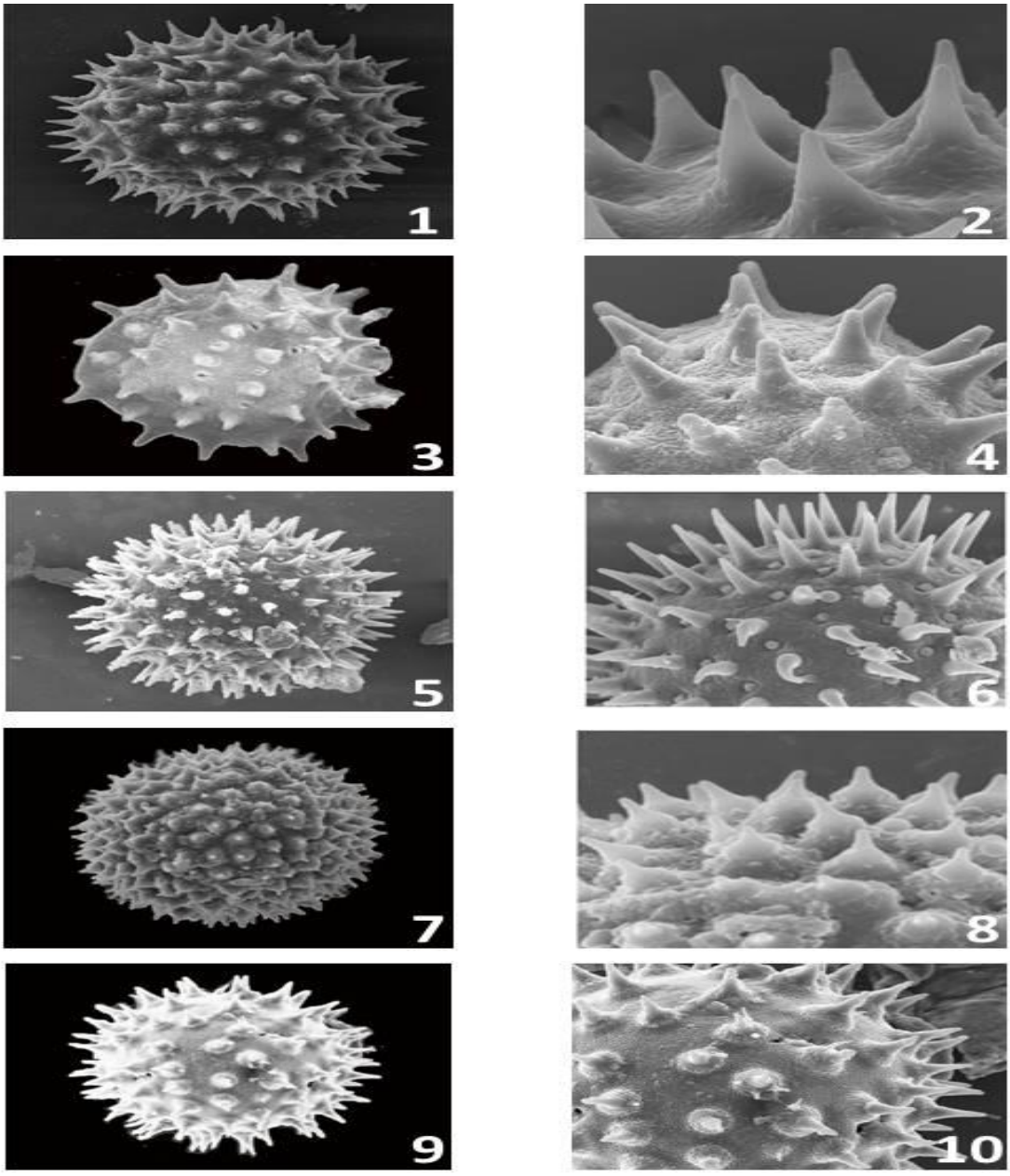

Fig.1-10: Scanning Electron Micrographs showing Structure and Surface pattern of pollen grains, *Gossypium hirsutum* (Fig. 1 and Fig.2), *Hibiscus rosa- sinensis* (Fig. 3 and Fig.4), *Malachra capitata* (Fig.5 and Fig.6), *Sida acuta* (Fig. 7 and Fig.8), *Thespesia populnea* (Fig. 9 and Fig.10)

DISCUSSION AND CONCLUSIONS

The morphological variations were noted in all studies five genera of Malvaceae accompanying with size, shape, surface structure and surface pattern. The size of all the studied pollen ranges between 70-140 µm. The maximum pollen size (136.17- 140.76 µm) across was found in *Hibiscus rosa-sinensis* whereas, minimum pollen size (73.04 - 77.19) across was noted in *Sida acuta*. The shape of the pollen grain varies from oblate-spheroidal to prolate-spheroidal. The surface pattern of all studied genera was found to be spiny but variation occurs in spine structure. El-Naggar (2004) mentioned the members of Malvaceae characterized by spiny tectum and the spines show reliable variation in size, shape and surface distribution. The findings of present investigation also reported that spine size vary from 2.70- 18.56 µm. Minimum spine

length observed in *Sida acuta* whereas maximum spine length observed in *Malachra capitata*. *Hibiscus* shows blunt end of spine whereas other genera shows pointed spine end. Bulbous spine base present in *Sida acuta*, *Thespesia populnea*, and *Gossypium hirsutum* whereas it was found to be absent in *Hibiscus rosa-sinesis* and *Malachra capitata*. Outline usually circular, pantoporate condition were observed in all studied genera. Above observations were strongly in accordance with earlier reports from Erdtman (1952), El-Nagger and Sawady (2008) and Perveen *et al.* (2004).

The pollen morphological study showed distinct variations in shape, size and surface structure which can be used as an identification character for the studied genera. SEM was found to expose minor important pollen features that were hidden in LM. Hence pollen morphology can be considered as an important parameter in discrimination of genera.

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