

Pollen morphodiversity in some genera of family Asteraceae.

Rajurkar AV

Lokmanya Tilak Mahavidyalaya, Wani, Dist. Yavatmal (M.S.) India.

Email: rajpollen@gmail.com

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ABSTRACT

Pollen morphology of four genera viz. *Lagascea mollis*, *Parthenium hysterophorus*, *Tridax procumbens*, *Vernonia cineria* belonging to family Asteraceae have been examined by Light and Scanning Electron Microscope (SEM). The four genera of Asteraceae studied during present investigation showed considerably small sized of pollen grains. Pollens size ranges from 12.24-24.48 μm , the smallest grain is of *Parthenium hysterophorus*; whereas largest one is of *Tridax procumbens*. Among the four genera tricolporate aperture type found in the *Parthenium*, *Lagasca* and *Tridax*; whereas pantoporate condition in *Vernonia* type. The shape of the all pollen varied from oblate-spheroidal to prolate spheroidal. Spines are found to be very small, pointed and ranges from 1.53- 2.72 μm . *Parthenium*, *Lagasca* and *Tridax* having echinate exine ornamentation whereas *Vernonia* shows echinolophate exine type. In conclusion SEM analysis was found to be more informative than LM and it is a vital instrument in studying pollen characters at high magnifying level.

Keywords: Pollen morphology, Asteraceae, LM, SEM.

INTRODUCTION

Pollen morphology is a useful tool to study the interrelationship of plant taxa. Morphologically pollen grains are reckoned to be a very conservative organ, facilitating the identification of plants at various taxonomic level. Previously, Pollen Morphology of Family Asteraceae was studied by Erdtman[1], Nair [2], Nayer [3].

Angulo and Dematteis[5] studied pollen morphology of some South American genera of Asteraceae and its taxonomic implication. Zavada and Villiers[6] studied pollens of Asteraceae from the Paleocene of South Africa. Meo [7] studied pollen morphology of Asteraceae with only Light microscopy. Bunwong and Chantaranothai [8] examined pollen morphology of the tribe Vernonieae (Asteraceae) in Thailand and enlisted the diversity of pollen morphology and evolution. The present study was undertaken to know the variations in pollen morphology of 4 genera Viz., *Lagascea mollis*, *Parthenium hysterophorus*, *Tridax procumbens*, *Vernonia cinerea* belonging to Family Asteraceae growing along roadside have been examined by Light and Scanning Electron Microscope (SEM).

METHODOLOGY

The four genera viz. *Lagascea mollis*, *Parthenium hysterophorus*, *Tridax procumbens*, *Vernonia cineria* belonging to family Asteraceae were collected and Herbarium specimen of each species was prepared and kept at departmental herbarium, Lokmanya Tilak Mahavidyalaya, Wani .Anthers were collected from the mature flowers and stored in 70% alcohol. The collected material was crushed with a glass rod in plastic centrifuge tube. The crushed material was filtered through fine meshes to isolate pollen grains.

The pollen grains were prepared for light and scanning electron microscopy by the standard method described by Erdtman [9] and Arora and Modi [10]. For light microscopy, the pollen grain were mounted in stained glycerine jelly and observations were made with Trinocular Fluorescence Microscope (Axiostar HBO 50/AC Carl zeiss). For 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 and the pollen grain size, colpi size, pore size was measured. The terminology used in accordance with Erdtman[11], Fageri and Iverson [12], Bhattacharya *et. al.* [13] and Agashe [14].

RESULTS AND DISCUSSION

Description of Pollen type:

1. *Lagascea mollis* Cav.in Anal. Sci.Nat.

Pollen grain 20.8-21.5 μm in diameter, spheroidal-prolate spheroidal, radially symmetrical, polar and equatorial outline circular, tricolporoidate, colpi 5.6 μm long, 2.2-2.5 μm wide, ori indistinct, sculpturing echinate, spine triangular in outline, spine tapering towards end and broad at the base, blunt, spine 2.4-4.21 μm in length and 2.92- 3.27 μm broad at the base, spine densely arranged, distance between two spine 1.6 - 2 μm , nearly equidistantly distributed, exine 1.95-2.64 μm thick, N3P4C5 [Fig.1, LM Mag.40 X, Fig.2 SEM, Mag. 5.50 KX]

2. *Parthenium hysterophorus* L.

Pollen grain 12.24-13.57 μm in diameter, oblate-spheroidal, radially symmetrical, polar and equatorial outline circular trizonocolporate, colpi 7.24 μm long, 3.25-3.62 μm wide, sculpturing echinate, spine triangular in outline, spine acute at the end and broad at the base, spine 1.53-2.17 μm in length and 1.81-2.35 μm broad at the base, spine densely arranged, distance between two spine 0.81 - 1.4 μm , equidistantly not distributed, exine 1.81- 2.58 μm thick, N3P4C5, [Fig.3, LM Mag.40 X, Fig.4, SEM, Mag. 8.96 KX].

3. *Tridax procumbens* L.

Pollen grain 22.57-24.48 μm in diameter, oblate-spheroidal- spheroidal, rarely prolate spheroidal, polar and equatorial outline circular amb. spherical, tricolporate, colpi faint, pori 3.65-3.85 μm wide, sculpturing echinate, echinae narrow triangular in outline, spine acute at the end and broad at the base, spine 2.17-2.72 μm in length and 1.36-1.63 μm wide at the base, distance between two spine 2.44 - 2.99 μm , nearly equidistantly distributed, exine1.92-2.58 μm thick, N3P4C5, [Fig.5, LM Mag.40 X, Fig.6, SEM, Mag. 5.03 KX].

4. *Vernonia cinerea* (L.)Less. in Linnaea

Pollen grain 20.25-22.12 μm in diameter, oblate-spheroidal, polar and equatorial outline circular, pantoporate, pori circular to oblong, 4.5- 5.25 μm in diameter, covered by ridges, exine thick, echinolophate, echinae triangular in outline, small,

1.5- 1.87 μm long, spine acute at the tips, 0.937-1.31 μm wide at the base, spines arranged on tetragonal or pentagonal ridges formed by exine, lacunae

irregularly circular 5.85 μm across, N7P6C6, [Fig.7, LM Mag.40 X, Fig.8, SEM, Mag. 5.39 KX].

Table No. 33 Pollen grain characteristics of family **Asteraceae**

Sr. No.	Name of taxa	Pollen grain size (μm) P×E	Pollen shape	Aperture pattern	Colpi/pori size (μm)	Exine ornamentation
1	<i>Lagascea mollis</i>	20.8 × 21.5	Spheroidal- prolate spheroidal	Trizonocolporate	5.6 × 2.2	echinate
2	<i>Parthenium hysterophorus</i>	12.24 × 13.57	Oblate-Spheroidal	Tricolporoidate	7.24 × 3.62	echinate
3	<i>Tridax procumbens</i>	22.57-24.48	Oblate-Spheroidal-spheroidal	Tricolporate	3.65-3.85	echinate
4	<i>Vernonia cineria</i>	20.25-22.12	Oblate-Spheroidal	Pantoporate	5.25	echinolophate

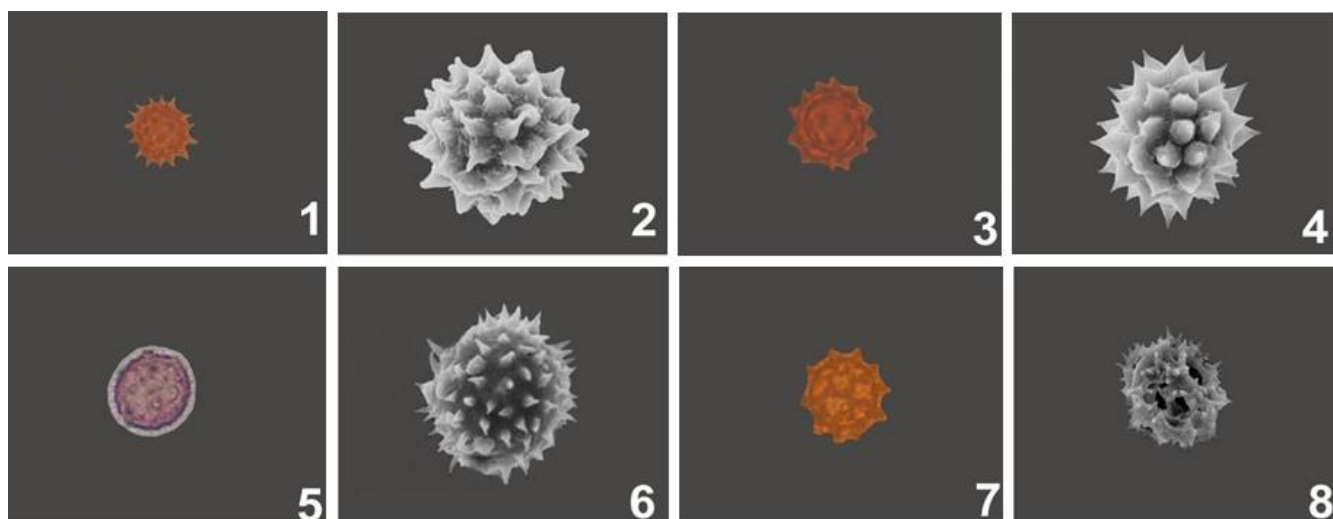


Fig. 1-8: Light (LM) and Scanning Electron Micrograph (SEM) showing pollen structure, Fig. 1-2 *Lagascea mollis*, Fig. 3-4 *Parthenium hysterophorus*, Fig. 5-6 *Tridax procumbens*, Fig. 7-8 *Vernonia cineria*

DISCUSSION

The four genera of **Asteraceae** studied during present investigation showed considerably small sized of pollen grains. Pollens size ranges from 12.24-24.48 μm , the smallest grain is of *Parthenium hysterophorus*; whereas largest one is of *Tridax procumbens*.

Among the four genera tricolporate aperture type found in the *Parthenium*, *Lagasca* and *Tridax*; whereas pantoporate condition in *Vernonia* type. The shape of the all pollen varied from oblate-spheroidal to prolate spheroidal. Spines are found to be very small, pointed and ranges from 1.53- 2.72 μm . *Parthenium*, *Lagasca*

and *Tridax* having echinate exine ornamentation whereas *Vernonia* shows echinolophate exine type.

Wodehouse outlined the principles of morphological evolution of spine form in Compositae and suggested the reduction series from long to minute spines. The peculiar spine character represents a climax in the apertural evolution. The species with spinate pollen is a primitive character as compared to the species with spineless pollen which is considered as primitive feature due to reduction of spines within the family Compositae. The character of pollen spine is of significance at specific and generic level in classification of family Compositae.[15] The variation

in spine structure was noted during the present study. Spine length ranged from 2.1 to 5.7mm among the genera. Maximum spine length values 2.4- 4.21 is observed in *Lagascea mollis* and the minimum values 1.5- 1.87 μm in *Vernonia cinerea*

Adekanmbi [4] mentioned that the pollen grains in Asteraceae are relatively stenopalynous with less variation exhibited in the pollen morphology and noted tricolpate, tricolporate, tetracolpate or tetracolporate pollen in *Tridax procumbens*, but in the present investigation pollen of *Tridax procumbens* reveals only tricolporate type of aperture.

CONCLUSION

In Conclusion, It was found that, the morphological variation in size, shape, surface structure and surface pattern occurs in all studied acetolysed and unacetolysed pollen grain. SEM was found to be vital instrument in studying pollen characters at higher magnification. SEM based pollen character are found to be useful in identification and discrimination of taxonomically related genera and species.

Conflicts of interest: The authors stated that no conflicts of interest.

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