Indian Journal of Biological Sciences, 18 : 26 – 34, 2012

STUDIES IN THE POLLEN MORPHOLOGY OF SOME MEMBERS OF ACANTHACEAE IN PASCHIM MEDINIPUR DISTRICT, WEST BENGAL

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ABSTRACT The Acanthaceae is a large pantropical family of about 229 genera and nearly 3450 species. About 70 genera and 340 species have been reported from India. It represents a typical eurypalynous family showing a broad range of pollen morphotypes. Palynological observations were carried out of 14 species collected from various localities of Midnapore area of Paschim Medinipur District, West Bengal with the aim of improving knowledge of the palynology in this family. A significant number of species are also very potential bee plants and those are medicinally important too. Pollen morphological studies of the family are therefore very significant to identify the pollen grains present in honey samples and pollen pellets collected by honeybees.

Key words: Acanthaceae, Morphology, Pollen grains

INTRODUCTION

The ability to identify plants from their pollen has enabled botanists and ecologists to reconstruct past assemblages of plants and identify periods of environmental change (e.g., Fægri and Iversen 1989; Moore et al. 1991). Morphological characteristics of pollen grains also can be useful in studies of plant systematics because many pollen traits are influenced by the strong selective forces involved in various reproductive processes, including pollination, dispersal, and germination (e.g., Erdtman 1952; Moore et al. 1991; Nowicke and Skvarla 1979).

Lindau (1895) first used pollen variability for the recognition of taxonomic groups. Palynological studies of Acanthaceae with contorted corollas have evidenced the limits and the inadequacy of Lindau's system (Scotland, 1991; 1992a; 1992b; 1993). Further, pollen morphological studies of the family have also been done by other workers (Raj, 1961; Immelman, 1989; El Ghazali, 1993; Maeiotti Lippi and Rossi, 1999). The usefulness of pollen morphology as an interpretative key for a natural classification is now debated (Blackmore & Barnes, 1991; Nilsson & Praglowsky, 1992). However, palynological characters are considered a good, if not exclusive tool for the definition of a taxonomic group and a description of the pollen is considered quite necessary in the diagnosis of new species (Nilsson & Praglowsky, 1992).

The district Paschim Medinipur is

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situated in the south-western side of West Bengal (WB). It is bounded by Bankura and Purulia Districts of WB in the north, Mayurbhanj and Balasore Districts of Orissa in the south, Hooghly and Purba Medinipur Districts of WB in the east and Singhbhum District of Jharkhand and Purulia District of WB in the West. The district lies between 21°47' - 23°N latitude and between 86°40' - 87°52'E longitude. The climate is tropical and land surface is characterized by hard rock uplands, lateritic covered area, flat alluvial and deltaic plains. This area is covered predominantly with Sal (*Shorea robusta*). The forest type is tropical dry-deciduous type. The usual associates of Sal in this region are *Bombax ceiba*, *Madhuca latifolia*, *Pterocarpus marsupium*, *Schleichera oliosa, Terminalia arjuna, Terminalia belerica,* etc. Plantation mostly includes *Eucalyptus globulus*, Akashmoni (*Acacia auriculiformis*) and Kaju (*Anacardium occidentale*). Besides, a large number of herbs and shrubs are found in the district including the members of Acanthaceae.

Acanthaceae is a large pantropical family consisting of nearly 250 genera and 2500 species (Mabberley, 1987). The four main centers of distribution are Central America, Brazil, Africa and Indo-Malaysia. The members of this family are mainly distributed in tropics. About 70 genera and 340 species have been reported from India. Prain (1903) reported 32 genera and 81 species from West Bengal. About 14 species belonging to 11 genera of Acanthaceae have been collected from different parts of Paschim Medinipur District.

The study was aimed at improving the general knowledge of the palynology in this family and to contribute towards the constitution of a regional pollen flora of the country, which has received very little attention in this, field of research. In addition to this a significant number of species of the family are medicinally important and also act as very potential bee-plants. Pollen morphological studies of the family are therefore very significant to identify the pollen grains present in honey samples and pollen pellets collected by honeybees from those medicinal plants.

MATERIALS AND METHODS

The materials of the present study were freshly collected from the different regions of Paschim Medinipur District of West Bengal (Fig. I). Preparation of herbarium sheets with corresponding polliniferous materials were preserved in FAA (Formalin-Acetic-Alcohol). The specimens were identified by the Taxonomy section of the department of Botany and Forestry, Vidyasagar University. The collected taxa are *Adhatoda vasica, Andrographis paniculata, Barleria cristata, Barleria lupulina, Barleria prionitis, Hemigraphis hirta, Hygrophila schulii, Justicia jendarussa, Nelsonia campestris, Peristrophe bicaliculata, Phlogacanthus thyrsiflorus, Rhinacanthus nasutus and Rungia pectinata.*

Acetolysed preparation of polleniferous material was done using Erdtman's (1960) acetolysis technique. Pollen morphological characters were studied under Leica DML 1000 Bright-Field trinocular microscope. Pollens were described as per standard terminologies (Erdtman, 1952, 1960; Kremp, 1965; Faegri and Iversen, 1975; Walker And Doyle, 1975).

DESCRIPTION OF POLLEN GRAINS

Adhatoda vasica Ness

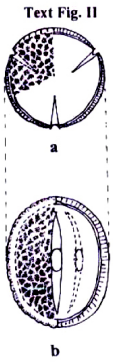
Text Fig. I

Text Fig.I : a. Polar view b. Equatorial view of *Adhatoda vasica*

Pollen grains radially symmetrical, prolate, amb circular, P X E = 44.5μm X 28μm, tetrazonocolporate, colpi faint, extending up to 2/3rd of the meridian, narrowly elliptic, ends sub-acute, colpal margin associated with exinal thickening, colpi length 36μm, endoaperture distinct, lalongate, exine 3μm thick, sexine tegillate, slightly thicker than nexine, surface reticulate, muri moderately developed.

Andrographis paniculata Ness

Text Fig. II



Text Fig.II : a. Polar view b. Equatorial view of *Adhatoda paniculata*

Pollen grains radially symmetrical, prolate spheroidal, amb circular, P X E = 43μm X 36μm, trizonocolporate, colpi linear, colpi length 31.5μm, crassimerginate, endoaperture lolongate, exine 2.5μm thick, sexine distinctly tegillate, thicker than nexine, surface reticulate, homobrocate.

Barleria cristata Linn

Text Fig. III

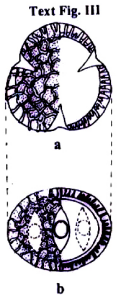
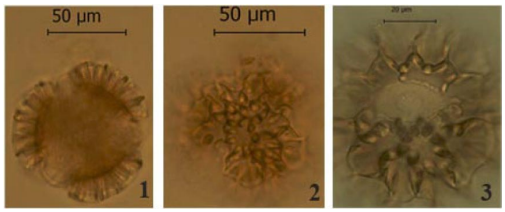


Plate-1



Text Fig.III : a. Polar view b. Equatorial view of *Barleria cristata*

Plate -1 (Fig 1,2 & 3 : *Barleria cristata*)

Pollen grains radially symmetrical, oblate-spheroidal, amb circular, P X E = 83.5μm X 97.5μm, trizonocolporate, colpi elliptic, length 60μm and width 16μm, endoaperture circular, exine 13μm thick, sexine distinctly tegillate, much thicker than nexine, distinct infratectal columellae are present, giving a reticulate look in the surface view.

Barleria lupulina Lindl.

Pollen grains radially symmetrical, oblate-spheroidal, amb circular, P X E = 82.0μm X 96.0μm, trizonocolporate, colpi elliptical, endoaperture circular, sexine tegillate, much thicker than nexine, distinct infratectal columellae are present, showing a reticulate look in the surface view.

***Barleria prionitis* Linn.**

Pollen grains radially symmetrical, oblate-spheroidal, amb circular, P X E = 82.5μm X 96.5μm, trizonocolporate, colpi elliptical, endoaperture circular, sexine tegillate, much thicker than nexine, distinct infratectal columellae is present, exhibiting a reticulate look in the surface view.

***Hemigraphis hirta* T. And.**

Text Fig.IV : a. Polar view b. Equatorial view of *Hemigraphis hirta*

Pollen grains radially symmetrical, oblate, amb oval elliptical, P X E=35.5μm X 63.5μm, polyzonoheterocolporate, colpi linear, colpi length 30μm,tenuimarginate, endoaperture circular, exine 3μm thick, sexine distinctly tegillate, thicker than nexine, surface reticulate.

***Hemigraphis latebrosa* Nees.**

Plate-1

Text Fig.V : a. Polar view b. Equatorial view of *Hemigraphis latebrosa*

Plate -1 (Fig 11 : *Hemigraphis hirta*)

Pollen grains radially symmetrical, sub-prolate, amb circular, P X E = 39 μm X 29 μm, polyzonoheterocolporate, colpi linear, extended from pole to pole, endoaperture lalongate, exine 2μm thick, sexine distinctly tegillate, sexine slightly thicker than nexine, surface finely reticulate.

***Hygrophila schulii* (Buch.-Ham.) M. R. & S. M. Almeida**

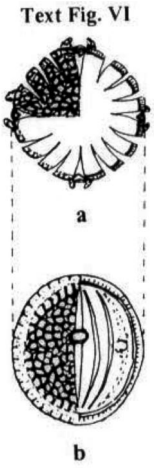
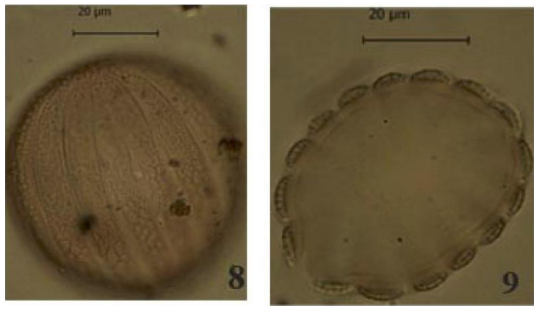


Plate-1



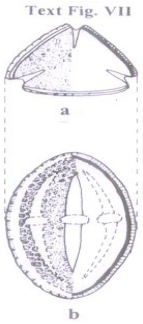
Text Fig.VI : a. Polar view b. Equatorial view of *Hygrophila schulii*

Plate -1 (Fig 8 & 9 : *Hygrophila schulli*)

Pollen grains radially symmetrical, oblate, amb circular, P X E = 63.5μm X 47μm, polyzonoheterocolporate, with four colporate apertures, rest are pseudocolpi, colpi extending almost up to poles, gradually

tapering to acuminate tips, colpi length 55.8μm, endoaperture distinct, circular to slightly oval lolongately, exine 3μ thick, sexine distinctly tegillate, thicker than nexine, surface reticulate, muri moderately develop, lumina polygonal.

***Justicia gendarussa* Linn. f.**

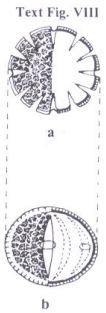


Text Fig.VII : a. Polar view b. Equatorial view of *Justicia gendarussa*

Plate -1 (Fig 4 & 5 : *Justicia gendarussa*)

Pollen grains radially symmetrical, prolate, amb sub-triangular, P X E = 40.5μm X 33.5μm, trizonocolporate, colpi narrowly elliptic, colpi length 30μm, tenuimarginate, endoaperture lalongate, exine 3μm thick, sexine distinctly tegillate, thicker than nexine, surface finely reticulate.

***Nelsonia campestris* R. Br.**



Text Fig.VIII : a. Polar view b. Equatorial view of *Nelsonia campestris*

Pollen grains radially symmetrical, oblate-spheroidal, amb circular, P X E = 32 μm X 35.5μm, polyzonoheterocolporate, colpi elliptic with acute ends, endoaperture circular, exine 3μm thick, sexine distinctly tegillate, thicker than nexine, surface reticulate, lumina polygonal, homobrocate.

***Peristrophe bicaliculata*Nees.**

Plate – 1

Text Fig. IX : a. Polar view b. Equatorial view of *Peristrophe bicaliculata*

Plate -1 (Fig 6 & 7 : *Peristrophe bicaliculata*)

Pollen grains radially symmetrical, prolate, amb circular, P X E = 30.5μm X 35.5μm, trizonocolporate, colpi narrowly elliptic, extending almost upto the poles, ends acute, colpal margin associated with exinal thickening, colpi length 26μm, endoaperture distinct, lalongate, exine 3μm thick, sexine distinctly tegillate, much thicker than nexine, surface reticulate, muri moderately develop, lumina polygonal.

***Phlogacanthus thyrsiflorus* (L.) Kurz**

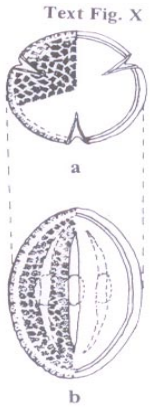
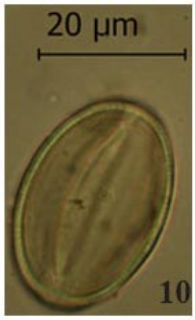


Plate – 1



Text Fig. X : a. Polar view b. Equatorial view of *Phlogacanthus thyrsiformis*

Plate -1 (Fig 10 : *Phlogacanthus thyrsiflorus*)

Pollen grains radially symmetrical, prolate, amb circular, P X E=35μm X 25μm, trizonocolporate, colpi narrowly elliptic, extending almost up to the pole, with acuminate tips, colpal margin associated with exinal thickening, endoaperture distinct, circular to oval lolongately, exine 3μm thick, sexine distinctly tegillate, slightly thicker than nexine, surface faintly reticulate.

Rhinacanthus nasutus

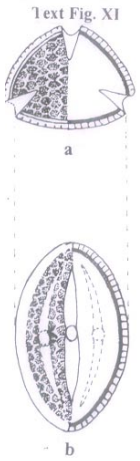


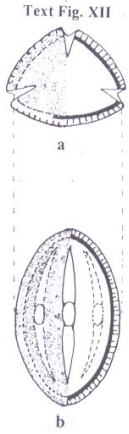
Plate – 1

Text Fig. XI : a. Polar view b. Equatorial view of *Rhinacanthus nasuta*

Plate -1 (Fig 12 : *Rhinacanthus nasutus*)

Pollen grains radially symmetrical, prolate, amb subtriangular, P X E = 50μm X 68 μm, trizonocolporate, colpi linear, colpi length 36μm, crassimarginate, endoaperture circular, exine 3.5μm thick, sexine distinctly tegillate, much thicker than nexine, surface reticulate, homobrocate.

***Rungia pectinata* (L.) Nees**



Text Fig. XII : a. Polar view b. Equatorial view of *Rungia pectinata*

Pollen grains radially symmetrical, sub-prolate, amb subtriangular, P X E=18.5μm X 12μm, trizonocolporate, colpi thin, colpi length 13μm, narrowly elliptic, endoaperture lolongate, exine 2μm thick, sexine distinctly tegillate, slightly thicker than nexine, surface very faintly reticulate.

DISCUSSION

Pollen morphologically Acantheceae as a whole is eurypalynous family. Among the collected taxa 9 shows trizonocolporate type, 4 shows polyzonoheterocolporate type and one exhibits tetrazonocolporate type of pollen grains. Taxa showing trizonocolporate grains are *Andrographis, Barleria, Justicia, Peristrophe, Phlogacanthus, Rhinacanthus* and *Rungia*. Two species of *Hemigraphis, Hygrophila* and *Nelsonia* show polyzonoheterocolporate type of pollen grains. Tetrazonocolporate type of pollen grain is found in *Adhatoda*. All the taxa

investigated presently are characterized by more or less radially symmetrical, oblate to prolate type of pollen grains. Endoaperture of the taxa varies from lalongate-circular to lolongate type. The colpal margin of *Adhatoda, Peristrophe* and *Phlogacanthus* are associated with exinal thickening. Structurally the exines of 14 species are crassinexinous with clearly discernible tegillate organization and the exine surface of the grains varies from faintly reticulate to reticulate type. *Barleria* shows distinct infratectal collumelae giving a reticulate surface.

Besides, *Adhatoda, Andrographis, Barleria, Justicia, Hemigraphis* and *Hygrophila* are medicinally important bee plants. Therefore, to know the foraging habit of a bee species identification of the taxa in the honey sample and pollen loads could be possible through pollen morphological data.

ACKNOWLEDGEMENTS

The present work is partly supported by UGC as SAP, Department of Botany and Forestry, VU. The authors are thankful to Mr. R. K. Bhakat, Associate Professor, Department of Botany and Forestry, VU for identifying the plant specimens.

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