POLLEN MORPHOLOGY

SYSTEMATIC DESCRIPTION OF DOMINANT POLLEN TYPES OF JALPAIGURI TOWN

The terminology and main morphological concepts of the pollen grains are based on Wodehouse (1935), Erdtman (1952), Erdtman (1969), Chanda (1963, 1965) and Faegri and Iversen (1975).

Pollen grain diagnoses of 108 dominant plant species originating from dicotyledons and monocotyledons have been accounted below. The alphabetic arrangement of all the species have been done for the sake of convenience irrespective of their systematic position. Some of the pollen photographs has been provided in Plates I, II and III.

ACANTHACEAE :

Justicia diffusa :

3-colporate, prolate, PA × ED ±22.5 × 16.0 μm, L/B of colpi ± 13.5 × 1.5 μm, ora lalongate. Exine 13.5 x 1.5 μm, ora lalongate. Exine ± 4.0 μm thick, sexine ± 2.2 μm thick, reticulate, heterobrochate, reticulation finer in the polar region and coarser in the equatorial zone.

Nelsonia canescens :

3-colporate, prolate-spheroidal, PA×ED ± 34.4 × 32.0 μm, L/B of colpi ± 22.0 × 1.5 μm, ora lolongate with alternating pseudocolpi. Exine 3.0 μm thick, sexine ± 1.5 μm thick, reticulate.

Rungia pectinata :

3-colporate, prolate, PA×ED ± 31.0 × 20.0 μm, L/B of colpi ± 26.0/2.0 μm, ora lalongate, Exine 3.0 μm thick, reticulate :

AMARANTHACEAE :

Achyranthes aspera :

Pantoporate, spheroidal, diameter of grain ± 18 μm, No. of pores ± 26, interporal distance ± 2.5 μm, L/B of Pores ± 3.0 x 2.5 μm. Exine ± 2.5 μm thick, punctitegillate with supratectal processes.

Achyranthes bidentatus :

Pantoporate with about 28-30 pores, spheroidal with average diam. ± 26.0 μm, interporal distance ± 6.5 μm. Exine 1.5 μm thick, sexine 1.0 mμ thick, punctitegillate to microreticulate beset with supratectal processes.

Amaranthus spinosus :

Pantoparate, spheroidal, diameter of grain ± 18.5 μm, No. of pores ± 22, interporal distance ± 4.0 μm. Exine ± 2.5 μm thick, sexine ± 1.5μm thick, punctitegillate with supratectal processes.

Deeringia amaranthoides :

Pantoporate with about 14 prores, spheroidal, average diam ± 18.3 μm, pores circular, diam of pore 1.5 μm, interporal distance, ± 3.5 μm. Exine 1.4 μm thick, tectate, sexine 0.7 μm thick, punctitegillate with fine supratectal processes.

ANACARDIACEAE :

Mangifera indica :

3-colporate, subprolate, PA×ED ± 27.0 × 22.5 μm, L/B of colpi ± 19.5 × 1.5 μm, ora lolongate. Exine ± 1.5 μm thick, sexine ± 8.0 μm thick, striato-reticulate.

ANNONACEAE :

Annona reticulata :

Grains in tetragonal tetrad, heteropolar, monosulcoidate, oblate, longest and broadest axies of the tetrad ± 65.0 × 56.0 μm, rarely solitary, solitary grains elliptical in polar view; PA×ED ± 27.0 × 44.0 μm, length of sulcus ±31.5 μm. Exine ± 2.5 μm thick, tectate, sexine as thick as nexine, punctitegillate.

Polyalthia longifolia. :

Inaperturate (often in tetrad), spheroidal, diameter of grains ± 38.5 μm, apolar. Exine ± 2.0 μm thick, tectate, sexine ± 1.5 μm thick, beset with blunt echinate process.

APIACEAE :

Coriandrum sativum :

3-colporate, perprolate, PA×ED ± 24.2 × 13.8 μm, L x B of colpi ± 28.0 × 1.4 μm. Ora circular. Exine ± 3.3 μm thick, sexine ± 2.2 μm thick, finely reticulate.

Seseli indicum :

3-colporate, perprolate, PA×ED ± 24.5 × 10.6 μm, L/B of colpi ± 17.8 × 0.3 μm. Ora circular. Exine ± 2.1 μm thick, sexine ± 1.4 μm thick, reticulate.

APOCYNACEAE :

Alstonia scholaris :

3-colporate, spheroidal, diameter of grains ± 37.0 μm, colpi short broad; ora lolongate. Exine ± 1.4 μm thick, sexine slightly thicker than nexine, psilate.

Holarrhena pubescens. :

3-porate (occasionally 4-5 porate), spheroidal, diameter of grains ± 32.0 μm, pores circular, diameter of pores ± 4.0 μm. Exine ± 1.5 μm thick, sexine as thick as nexine with obscure pattern.

Nerium indicum :

4-5 porate, spheroidal, diameter of grains ± 39.5 μm, pores circular, diameter of pores ± 4.5 μm. Exine ± 1.8 μm thick, sexine as thick as nexine, finely reticulate.

Plumeria rubra :

3-colporate, prolate-spheroidal, PA×ED ± 21.0 × 20.5 μm, L/B of colpi ± 20.0 × 2.0 μm, ora lalongate. Exine ± 2.8 μm thick, sexine ± 2.0 μm thick with obscure pattern.

Thevetia peruviana :

3-colporate, subprolate, PA×ED ± 24.0 × 20.5 μm, L/B of colpi ± 16.0 × 3.5μm, ora circular. Exine ± 2.0 μm thick, sexine as thick as nexine with obscure pattern.

Ichnocarpus frutescens :

3-colporate, oblate-spheroidal, PA×ED ± 42.0 × 45.0 μm, L/B of colpi ± 39.0/2.2 μm, ora lolongate. Exine 3.5 μm thick, sexine 2.0 μm thick, reticulate.

ARECACEAE :

Areca catechu :

1-sulcate, oblate, boat shaped, PA×ED×EB ± 28.0 5 μm × 40.0 μm × 35.0 μm. L/B of sulcus ± 34.5 × 3.5 μm. Exine ± 2.5 μm thick; sexine 1.5 μm thick, reticulate.

Borassus flabellifer :

1-sulcate, oblate, PA×ED×EB ± 37.7×63.0 × 29.7 μm, L/B of sulcus ± 20.8 × 6.2 μm. Exine ± 3.6 μm thick, sexine ± 2.6 μm thick, verrucate

Cocos nucifera :

1-sulcate, oblate, PA×ED×EB ± 25.0 × 41.6 × 33.2 μm., L/B of sulcus ± 29.1×1.5 μm. Exine ± 2.28 μm thick, sexine slightly thicker than nexine, reticulate.

ASCLEPIADACEAE :

Calotropis gigantea :

Polyad in the form of pollinia, length of the translator arm ± 140.0 µm, L/B of pollinium ± 1080.0 x 430.0 µm.

ASTERACEAE :

Ageratum conyzoides :

3-colporate, subprolate, PA×ED ± 22.5 × 18.0 µm, L/B of colpi ± 17.5 × 2.0µm, ora circular. Exine ± 2.8 µm thick, sexine ± 2.0 µm thick, echinate, L/B of spines ± 2.1 x 1.7 µm

Blumea lacera :

3-colporate, prolate-spheroidal, PA×ED ± 28.0 × 26.0 µm, L/B of colpi ± 16.0 × 3.5 µm, ora circular. Exine ± 5.0 µm thick, sexine ± 3.5 µm thick echinate, L/B of spines ± 3.0 × 2.5 µm.

Artemisia vulgaris :

3-colporate, oblate-spheroidal, PA×ED±21.0 × 22.5 µm. L/B of colpi ± 16.5 × 2.5µm. Ora lalongate. Exine ±3.0µm thick, gradually thinner towards aperture, sexine ±2.0 µm thick, spinulose.

Eclipta prostrata :

3-colporate, spheroidal, diameter of grain ± 24.0 µm, ora lalongate. Exine ±2.5 µm thick, echinate, L/B of spines ± 2.5 × 2.0 µm.

Vernonia cinerea :

3-colporate, prolate-spheroidal, PA×ED ± 34.0 × 32.0 µm, L/B of colpi ± 12.0 × 3.5 µm, ora lalongate. Exine ± 3.0 µm thick, sexine ± 2.2 µm thick, echinate, L/B of spines ± 3.0 × 2.0 µm.

Xanthium strumarium :

3-colporate, prolate-spheroidal, PA×ED ± 25.0 x 24.0 µm, L/B of colpi ± 17.5 × 2.0 µm, ora lalongate. Exine ± 5.5 µm thick, sexine ± 5.5 µm thick, sexine ± 4.2 µm thick, spinulose.

BIGNONIACEAE :

Tabebuia argentea :

3-colpate, prolate, PA×ED ± 44.0 × 32.5 µm, L/B of colpi ± 40.0 × 2.5 µm. Exine ± 2.0 µm thick, sexine ± 1.5 µm thick, reticulate.

BOMBACACEAE :

Bombax ceiba :

3-colporate, oblate, PA×ED ± 34.5 × 62.5 μm, L/B of colpi ± 32.0 × 6.0 μm. Exine ± 2.0 μm thick, sexine ± 1.5 μm thick, reticulate, heterobrochate, reticulation finer in the equatorial region except apertural area, coarser in the polar region and apertural zone and intectate.

BORAGINACEAE :

Heliotropium indicum :

3-colporate, prolate, PA×ED ± 45.0 × 30.0 μm; L/B of colpi ± 15.0 × 2.0 μm; ora lalongat. Exine ± 1.5 μm thick, sexine ± 0.8 μm thick, reticulate.

Cyanoglossum lanceolatum :

3-colporate, prolate, dumb-bell-shaped, PA ± 8.5 μm, ED ± 5.0 μm at the broadest region and 3.0 μm at the constricted part. Ora lalongate. Exine ± 1.25 μm thick with obscure pattern. Sexine and nexine can not be differentiated.

CANNABINACEAE :

Cannabis sativa :

3-porate, sub-oblate, PA×ED ± 22.7 × 28.0 μm. Diam of pore ± 2.1 μm. Exine ± 2.1 μm thick, sexine ± 1.68 μm thick, scabrate.

CAPPARIDACEAE :

Capparis zeylanica :

3-colporate, subprolate, PA×ED ± 28.0 × 22.0 μm, L/B of colpi ± 20.0 × 1.5 μm, ora lalongate. Exine ± 1.8 μm thick, sexine ± 1.0 μm thick, reticulate.

Crataeva nurvala

3-colporate, prolate, PA×ED ± 30.0μm × 20.0 μm, L/B of colpi ± 15.0μm × 3.0μm. Ora lalongate. Exine 2.5 μm thick, sexine 1.5 μm thick, reticulate.

CARICACEAE :

Carica papaya :

3-colporate, spheroidal, diameter of grains ± 25.5 μm, colpi and ora are very difficult to measure. Exine ± 2.0 μm thick with obscure pattern, sexine and nexine are not clearly differentiated.

CASUARINACEAE :

Casuarina equisetifolia :

3-pororate, suboblate, PA×ED ± 26.5 × 33.0 μm, pores circular, aspidote, ora circular, vestibulum ± 4.5 μm. Exine ± 2.0 μm thick, sexine as thick as nexine.

CHENOPODIACEAE :

Chenopodium album :

Pantoporate, spheroidal, diameter of grains ± 2.8 μm, No. of pores ± 60. Exine ± 2.0 μm thick, sexine ± 1.2 μm thick, scabrate.

Chenopodium ambrosoides :

Pantoporate with 70-75 pores, spheroidal, average diam. ± 25.0 μm, diam. of pores 2.0 μm. Exine 2.5μm thick, sexine 2.0 μm thick, punctitegillate with fine supratectal processes.

COCHLOSPERMACEAE :

Cochlospermum religiosum :

3-colporate, prolate, PA×ED ± 24.0 × 16.0 μm, L/B of colpi ± 18.0 × 40 μm. Ora lalongate. Exine ± 1.5 μm thick, sexine ± 1.0 μm thick, punctitegillate.

COMBRETACEAE :

Terminalia arjuna :

3-colporate, PA×ED ± 21.0 × 18.0 μm, L/B of colpi ± 18.0 × 4.0 μm, ora lalongate. Exine ± 1.5 μm thick with obscure pattern.

CONVOLVULACEAE :

Ipomoea carnea :

Pantoporate, spheroidal, diameter of grain ± 70.0 μm, No. of pores ± 50, diameter of pores ± 6.0 μm, annulus and operculum present. Exine ± 15.0 μm thick, sexine ± 14.0 μm thick, two types of processes are found, long spines with swollen base and constricted blunt tip, small spines present densely surrounding the large spines, finely reticulate.

CYPERACEAE :

Cyperus rotundus :

Inaperturate with 3-4 aperturoid areas, pear shaped, PA×ED ± 30.0 × 22.5 μm, grain subspheroidal in polar view, one aperturoid area at the broader end and rest in

lateral position. Exine ± 1.2 μm thick, sexine ± 0.6 μm thick, beset with very fine processes.

Killinga brevifolia :

Inaperturate with 3-4 faintly delimited apertural areas, prolate-spheroidal, PA×ED ± 20.0 × 18.0 μm. Exine ± 1.2 μm thick, sexine ± 0.7 μm thick with obscure pattern.

EHRETIACEAE :

Ehretia serrata :

3-colporate, prolate – spheroidal, PA×ED ± 22.0μm × 18.5μm. L/B of colpi ±20.0 μm × 3.0 μm. Ora lalongate. Exine 2.5μm thick, Sexine finely reticulate, reticulation coarser towards aperture.

EUPHORBIACEAE :

Croton bonplandianum :

Inaperturate, spheroidal, diameter of grain ± 35.0 μm, Exine ± 2.8 μm thick, sexine ± 2.0 μm, bacula club-shaped showing distinct crotonoid pattern.

Euphorbia hirta :

3-colporate, prolate, PA×ED ± 28.0 × 17.0 μm, L/B of colpi ± 20.0 × 2.0 μm, ora lalongate. Exine ± 2.0 μm thick, sexine same as nexine, reticulate.

Drypetes roxburghii :

3-colporate, prolate-spheroidal, PA×ED ± 30.0 × 28.5 μm, L/B of colpi ± 29.0 × 1.5 μm, ora lalongate, Exine ± 2.0 μm thick, with obscure pattern.

Trewia polycarpa :

3-colporate, oblate-spheroidal, PA×ED ± 27.0 × 28.5 μm, L/B of colpi ± 7.0 × 1.0 μm, ora lalongate. Exine ± 1.2 μm thick, sexine as thick as nexine with obscure pattern.

FABACEAE (including Papilionaceae, Caesalpiniaceae & Mimosaceae):

Acacia auriculoformis :

Polyads, 16 celled, more or less spheroidal, individual cells of polyad subglobose in periphery and square in center, 12.0 × 9.0 μm, aperture not discernible. Exine ± 1.0 μm thick, granulate, sexine and nexine not distinguishable.

Albizia lebbek :

Polyads, 16 celled, spheroidal, diameter of polyad ± 73.0 μm, monads loosely fitted, aperture not distinguished. Exine ± 2.5 μm thick, sexine thicker than nexine, faintly granulate.

Bauhinia variegata :

3-colporate, prolate spheroidal, PA×ED ± 51.0 × 50 μm, L/B of colpi ± 40.0× 5.5 μm. Exine ± 3.5 μm thick, sexine, ± 2.5 μm thick, finely granulate.

Butea monosperma :

3-colporate, oblate-spheroidal, PA×ED ± 41.0 × 46.0 μm, L/B of colpi ± 20.5 × 2.0 μm, ora lalongate. Exine ± 2.0 μm thick, sexine as thick as nexine with obscure pattern.

Caesalpinia pulcherrima :

3-colporate, spheroidal, diameter of grain ± 49.0 μm, L/B of colpi ± 40.0 × 7.0 μm. Exine ± 6.0 μm thick, sexine as thick as nexine, reticulate, heterobrochate.

Cassia fistula :

3-colporate, prolate, PA×ED ± 34.5 × 22.5 μm, L/B of colpi ± 22.5 × 2.0 μm, ora lalongate, Exine ± 1.5 μm thick, sexine ± 1.0 μm thick, finely reticulate.

C. siamea :

3-colporate, subprolate, PA×ED ± 45.0 × 35.0 μm, L/B of colpi ± 40.0 × 2.0 μm thick, ora round to lolongate. Exine ± 3.0 μm thick, finely reticulate.

C. sophera :

3-colporate, subprolate, PA×ED ± 53.0 × 40.0 μm, L/B of colpi ± 40.0 × 2.0 μm, margo present, ora lolongate. Exine ± 2.5 μm thick, Sexine ± 1.5 μm thick, scabrate.

Dalbergia sissoo :

3-colporate, prolate, PA×ED ± 27.0 × 21.0 μm. L/B of colpi ± 21.5 × 2.5μm. Ora lalongate. Exine 3.0 μm thick. Sexine with obscure pattern.

Erythrina variegata :

3-porate, suboblate PA×ED ± 24.0 × 37.0 μm, pores circular. Exine ± 2.5 μm thick, sexine as thick as nexine, reticulate, heterobrochate.

Pongamia pinnata :

3-colporate, oblate-spheroidal, PA×ED ± 30.0 × 31.5 μm, L/B of colpi ± 20.0 × 3.0 μm, ora circular. Exine ± 2.5 μm thick, sexine ± 1.5 μm thick, reticulate.

Peltophorum pterocarpum :

3-colpate, prolate spheroidal, PA×ED ± 58.3 × 51.3 μm, L/B of Colpi ± 43.8 × 6.4 μm. Exine ± 5.3 μm thick, sexine ± 4.6 μm thick, duplibaculate, reticulate, heterobrochate.

Pithecellobium dulce :

Polyads, 16-celled, more or less spheroidal, individual cells of polyad mostly globose, about 20.0μm in diam. Aperture not discernible. Exine. ± 1.5μm thick, psilate.

Sesbania grandiflora :

3-colporate, prolate, PA×ED ± 48.0 × 32.0 μm, L/B of colpi ± 40.0 × 4.0 μm, ora lolongate to spheroidal. Exine ± 4.0 μm thick, sexine ± 1.5 μm thick, reticulate, heterobrochate.

Tamarindus indica :

3-colporate, oblate-spheroidal, PA×ED ± 30.0 × 35.0 μm; L/B of colpi ± 28.5 × 3.0 μm, ora lalongate. Exine ± 3.0 μm thick, sexine ± 2.0 μm thick, striato-reticulate.

LAMIACEAE :

Anisomeles indica :

3-colpate, prolate, PA×ED ± 42.0 × 32.0 μm, L/B of colpi ± 35.0 × 2.0 μm. Exine ± 1.8 μm thick, sexine ± 1.0 μm thick psilate.

Ocimum sanctum

6-colpate, suboblate, PA×ED ± 30.0 × 38.0 μm, L/B of colpi ± 17.0 × 9.0 μm. Exine ± 4.0 μm thick, reticulate, simplibaculate, heterobrochate, bacula dimophic, larger knob headed bacula united at apex form the muri of larger lumina, smaller bacula occupying the central part of luminal floor.

LYTHRACEAE :

Lagerstroemia thorelii :

3-colporate, prolate-spheroidal, PA×ED ± 35.0 × 31.5 μm, L/B of colpi ± 29.0 × 2.0μm, ora circular. Exine ± 1.5 μm thick, punctitegillate.

MALVACEAE :

Hibiscus rosa-sinensis :

Pantoporate, spheroidal, diameter of grain ± 140.0 μm, No. of pores ± 32 in each side. Exine ± 12.0 μm thick, sexine ± 11.0 μm thick, echinate, large spines and very small spinules present.

Malva verticillata :

Pantoporate with about 35 pores, spheroidal, average diam ± 90.0 μm, diam of pore ± 5.0 μm. Exine. ± 10.0 μm thick, sexine 8.0 μm thick crassisexinous, echinate, length of spines 15.0 μm, breadth at the base 10.0 μm.

Sida rhombifolia :

Pantoporate with about 20 pores, spheroidal, average diam ± 75.0 μm, pores circular, diam of pores 3.5 μm. Exine. ± 4.0 μm thick, sexine ± 3.0 μm thick, echinate, length of spine 6.0 μm, breadth at the base 3.5 μm.

MARTYNIACEAE :

Martynia annua :

Polycolpate, spheroidal, diameter of grain ± 85.0 μm, colpi arranged in the form of penyagon, L/B of colpi ± 14.0 × 1.0 μm. Exine ± 3.0 μm thick, sexine ± 2.0 μm thick, sexine as thick as nexine with obscure pattern.

MELIACEAE :

Azadirachta indica :

4-colporate, prolate-spheroidal, PA×ED ± 40.0 × 38.0μm. L/B of Colpi ± 35.0 × 3.5 μm, ora circular. Exine ± 3.5 μm thick. Sexine 1.5 μm thick, obscure pattern.

Swietenia mahagoni :

4-colporate, subprolate, PA×ED ± 28.0 × 23.0 μm, L/B of colpi ± 22.0 × 1.5 μm, ora circular. Exine ± 1.5 μm thick, sexine ± 1.0 μm thick, punctitegillate.

MORACEAE :

Ficus hispida :

3-porate, oblate-spheroidal, PA×ED ± 25.0 x 27.0 μm, circular pores. Exine ± 2.5 μm thick, sexine ± 1.5 μm thick, reticulate.

MORINGACEAE :

Moringa oleifera :

3-colporate, subprolate, PA×ED ± 42.0 × 33.0 μm, L/B of colpi ± 26.0 × 3.0 μm, ora lalongate. Exine ± 3.0 μm thick, sexine 2.0 μm thick with obscure pattern.

MYRTACEAE :

Eucalyptus globulosus :

3-colporate, oblate, PA×ED ± 16.3 × 24.0 μm, parasyncolpate, L/B of colpi ± 16.0 × 1.0 μm, ora circular. Exine ± 1.0 μm thick, sexine as thick as nexine with obscure pattern.

Psidium guajava :

3-colporate, oblate, traingular in polar view, PA×ED ± 18.0 × 26.5 μm, L/B of colpi ± 5.0 × 3.5 μm, ora lalongate, Exine ± 1.5 μm thick, sexine ± 1.0 μm thick, punctitegillate.

NYCTAGINACEAE :

Mirabilis jalapa :

Pantoporate, spheroidal, diameter of grain ± 120.0 μm, No. of pores ± 68, annulus and extra annular ring present. Exine ± 4.0 μm thick, sexine ± 3.0 μm thick, echinate, reticulate.

POACEAE :

Cynodon dactylon :

1-porate (ulcerate), spheroidal, diameter of grain ± 22.0 μm, pores circular, diameter of pore ± 2.0 μm, annulus present ± 1.2 μm thick. Exine ± 1.2 μm thick, psilate, sexine and nexine not clearly differentiable.

Digitaria sanguinalis :

1-porate, spheroidal, diameter of grain ± 30.0 μm, diameter of pore ± 2.5 μm, annulus ± 2.0 μm thick. Exine ± 2.0 μm thick, psilate.

Imperata cylindrica :

1-porate, spheroidal, diameter of grain ± 30 μm, annulus present. Exine ± 1.5 μm thick, psilate.

Oryza sativa :

1-porate, spheroidal, diameter of grain ± 56.0 μm, diameter of pore ± 3.5 μm. Exine ± 2.5 μm thick, scabrate.

Saccharum spontaneum :

1-porate, spheroidal, diameter of grain ± 42.0 μm, diameter of pore ± 2.8 μm. Exine ± 2.5 μm thick, sexine with scabrate processes.

POLYGONACEAE :

Persicaria hydropiper :

Pantoporate, spheroidal, diameter grain ± 50.0 μm, No. of pores ± 10, apertures are surrounded by larger duplibaculate becula. Exine ± 7.0 μm thick, sexine ± 6.0 μm thick, intectate, heterobrochate, larger one with globose and always duplibaculate, smaller bacula rod shaped.

Rumex dentatus :

3-colpate, prolate-spheroidal, PA×ED ± 28. 0 × 26.0 μm, L/B of colpi ± 24.0 × 3.5 μm, Exine ± 20 μm thick, sexine as thick as nexine.

PORTULACACEAE :

Portulaca oleracea :

Polycolpate, spheroidal, diameter of grain ± 78.0 μm. No. of colpi ± 15, colpi arranged in the form of pentagon. Exine ± 9.0 μm thick, sexine ± 1.5 μm thick, reticulate, spinules are present on the muri.

RHAMNACEAE :

Zizyphus mauritiana :

3-colporate, suboblate, PA×ED ± 24.0 × 30.0 μm, L/B of colpi ± 20.0 × 2.5μm, ora lalongate. Exine ± 2.0 μm thick, sexine ± 1.2 μm thick with obscure pattern.

RUBIACEAE :

Anthocephalus chinensis :

3-colporate. oblate, PA×ED ± 10.0 × 13.5 μm, L/B of colpi ± 8.0 × 1.5 μm, ora circular. Exine ± 1.0 μm thick, sexine ± 1.2 μm thick, punctitegillate.

Ixora coccinea :

3-colporate, prolate, PA×ED ± 23.0 × 17.0 μm, L/B of colpi ± 20.0 × 3.5 μm, ora lolongate. Exine ± 2.0 μm thick, sexine ± 1.5 μm thick, finely reticulate.

RUTACEAE :

Aegle marmelos :

4-colporate, prolate-spheroidal, PA×ED ± 15.0 × 10.0 μm, L/B of colpi ± 12.0 × 1.5 μm, ora lalongate. Exine ± 1.5 μm thick, sexine ± 1.0 μm thick, reticulate.

Glycosmis pentaphylla :

3-colporate, prolate, PA×ED ± 25.0 × 17.5 μm, L/B of colpi ± 17.7 × 2.5 μm, ora lalongate. Exine ± 2.0 μm thick, sexine as thick as nexine, finely reticulate.

SCROPHULARIACEAE :

Lindernia crustacea :

3-colporate, prolate-spheroidal, PA×ED ± 25.0 × 23.5 μm, L/B of colpi ± 16.0 × 2.35 μm, ora not distinct. Exine ± 3.0 μm thick, sexine ± 1.5 μm thick, finely reticulate.

Scoparia dulcis :

3-colporate, prolate, PA×ED ± 18.0 × 11.0 μm, L/B of colpi ± 13.0 × 1.0 μm. Exine ± 1.2 μm thick, sexine ± 0.7 μm thick, psilate.

SOLANACEAE :

Cestrum nocturnum :

3-colporate, subprolate, PA×ED ± 30.0 × 3.5 μm, ora lalongate. Exine ± 1.8 μm thick, sexine ± 1.0 μm thick, psilate.

Datura metel :

3-colporate, oblate-spheroidal, PA×ED ± 47.0 × 48.0 μm, L/B of colpi ± 36.0 × 2.5 μm, ora lalongate. Exine ± 4.0 μm thick, sexine ± 3.0 μm thick, semitectate, striato-reticulate.

Solanum nigrum :

3-colporate, prolate-spheroidal, PA×ED ± 25.0 × 22.0 μm, L/B of colpi ± 20.0 × 3.5 μm, ora lalongate. Exine ± 1.8 μm thick, sexine ± 1.0 μm thick, psilate.

Solanum viarum :

3-colporate, prolate-spheroidal, PA×ED ± 23.5 × 21.0 μm, L/B of colpi ± 16.0/2.0 μm, ora circular. Exine ± 4.0 μm thick, sexine ± 3.0 μm thick, tectate, scabrate.

Solanum torvum :

3-colporate, prolate – spheroidal, PA×ED ± 27.1 × 26.2 μm, L/B of colpi ± 15.5 × 3.5 μm, ora lalongate, Exine ± 0.7 μm thick, sexine and nexine not clearly differentiated, punctitegillate.

STERCULIACEAE :

Pterospermum acerifolium :

3-6 porate, spheroidal, average diam. ± 60.0μm. Pores circular. Exine ± 2.5μm thick, sexine ± 1.5 thick, echinate, spines 3.5μm × 1.5μm..

THEACEAE :

Camellia sinensis :

3-colporate, sub-prolate, PA×ED ± 40.0 × 31.5 μm, L/B of colpi ± 31.5 × 2.5 μm. Ora lolongate. Exine ± 2.5 μm thick, sexine ± 2.0 μm thick, finely reticulate.

TILIACEAE :

Corchorus capsularis :

3-colporate, prolate, PA×ED ± 30.5μm × 25.5μm, L/B of colpi ± 25.5 μm × 2.5 μm. Ora transversally parallel. Exine ± 2.5 μm thick, sexine ± 1.25 μm thick, psilate.

ULMACEAE :

Trema orientalis :

2-3 porate, spheroidal, diam of grain ± 21.3 μm, pore circular. Exine ± 1.04 μm thick, granulate.

URTICACEAE :

Pouzolzia zeylanica :

5-7 porate, spheroidal, diam of grain ± 16.8 μm, pores circular. Exine ± 1.8 μm thick, sexine ± 1.0 μm. thick, psilate.

VERBENACEAE :

Callicarpa arborea :

3-colpate, prolate-spheroidal, PA × ED ± 35.0 × 32.0 μm, L/B of colpi ± 30.0/3.0 μm. Exine ± 2.5 μm thick, intectate, sexine 1.5 μm thick, much thicker at polar regions, reticulate.

Clerodendrum viscosum :

3-colpate, subprolate, PA×ED ± 80.0 × 65.0 μm, L/B of colpi ± 51.0 × 1.0 μm. Exine ± 2.5 μm thick, sexine ± 2.0 μm thick, echinate.

Lantana camara :

3- colporate (often 4, colporate), prolate-spheroidal, PA×ED ± 41.0 × 38.0 μm. L/B of colpi ± 26.0 × 3.6 μm. Ora lalongate. Exine ± 2.0 μm thick, sexine ± 1.2 μm thick, punctitegillate.

Phyla nudiflora :

3- colporate, oblate-spheroidal, PA×ED ± 31.0 × 31.5 μm, L/B of colpi ± 20.0 × 2.6 μm, ora lalongate. Exine ± 3.0 μm thick, sexine ± 2.5 μm thick punctitegillate.

Tectona grandis :

3-colpate, prolate, PA×ED ± 40.0 × 27.5 μm, L/B of colpi ± 32.0 × 2.0 μm, margo present. Exine ± 2.5 μm thick, sexine ± 1.5 μm thick, punctitegillate, supratectal processes perceptible in LO analysis.

Plate- I
Legends of Pollen grains

1. *Zizyphus mauritiana (x 1000)*
2. *Cassia siamea (x 1000)*
3. *Azadirachta indica (x 1000)*
4. *Ocimum sanctum (x 1000)*
5. *Rungia pectinata (x 750)*
6. *Eucalyptus globulosus (x 1000)*
7. *Albizia lebbek (x 750)*
8. *Corchorus capsularis (x 1000)*
9. *Sida rhombifolia (x 500)*
10. *Pterospermum acerifolium (x 1000)*
11. *Justicia diffusa (x 750)*
12. *Anisomeles indica (x 500)*

Plate- II
Legends of Pollen grains

1. *Ageratum conyzoides (x 750)*
2. *Chenopodium album (x 750)*
3. *Casuarina equisetifolia (750)*
4. *Psidium guajava (x 1000)*
5. *Lantana camara (x 750): polar view*
6. *Lantana camara (x 750): equatorial view*
7. *Bombax ceiba (x 500)*

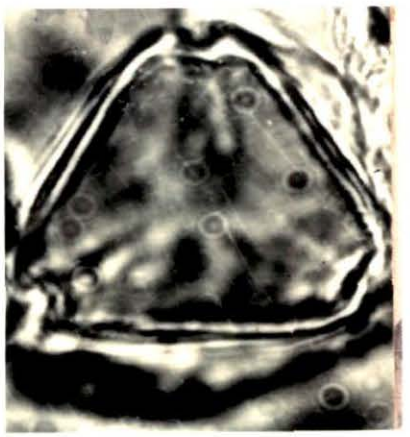
8-9. Vernonia cinerea (x 750)

10. Ipomoea carnea (x 750)
11. Psidium guajava (x 1000)
12. Mirabilis jalapa (x 750)

Plate- III
Scanning Electron Microscopic view of Pollen grains

1. *Ageratum conyzoides*
2. *Bombax ceiba*
3. *Coriandrum sativum*
4. *Nelsonia campestris*
5. *Acacia Auriculoformis*
6. *Chenopodium album*

Plate I



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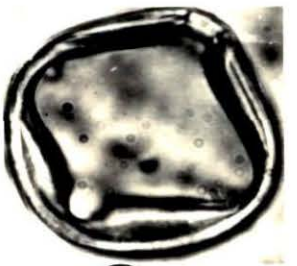

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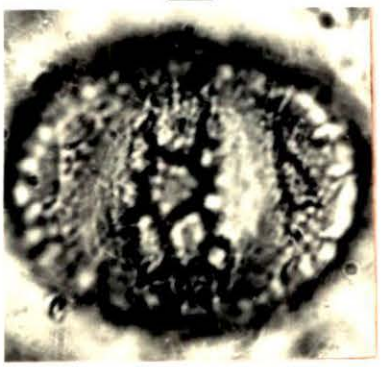

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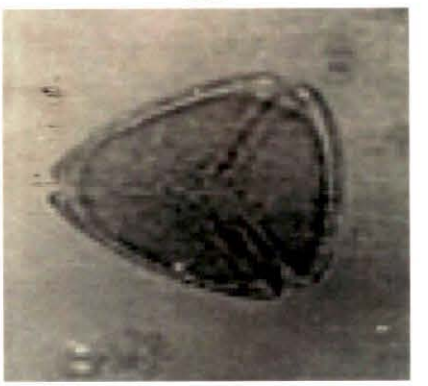

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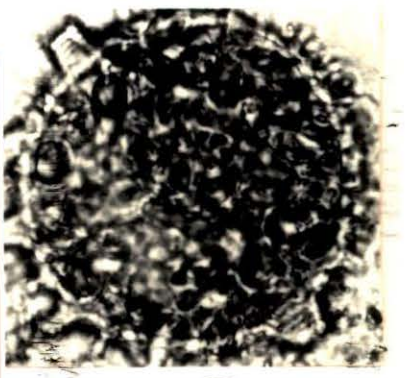

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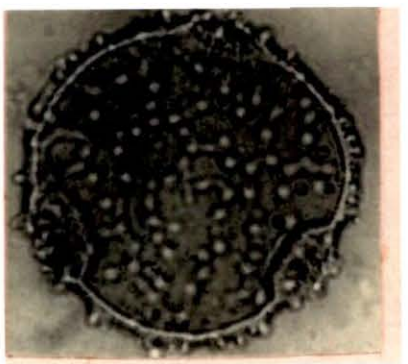

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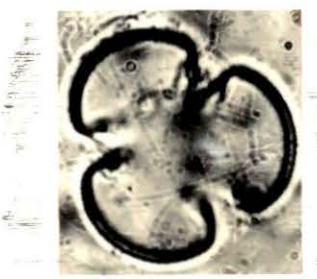

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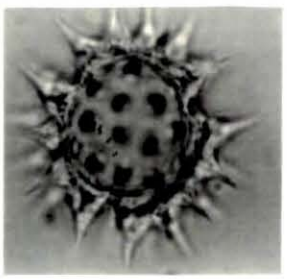
Plate-II



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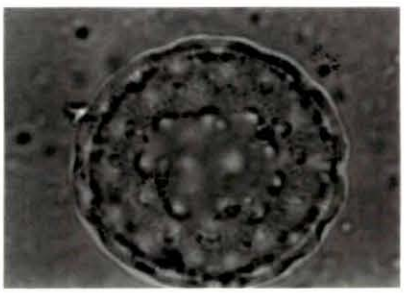

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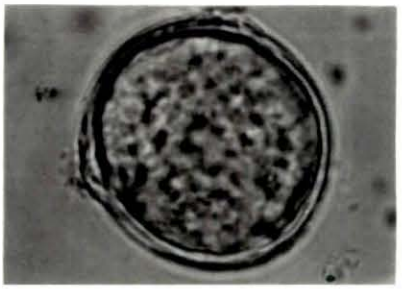

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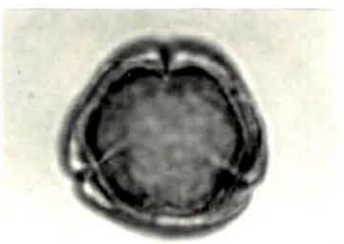

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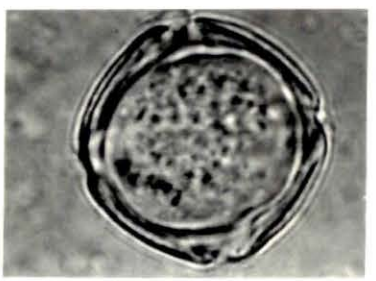

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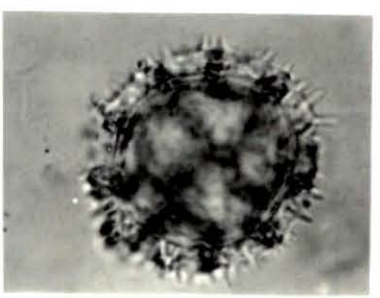

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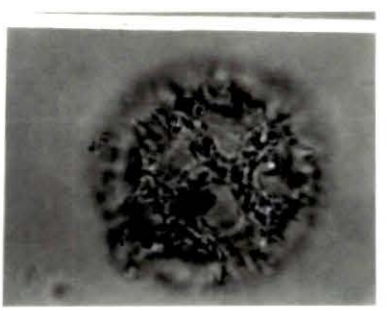

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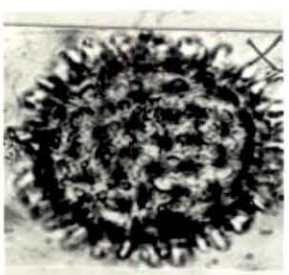

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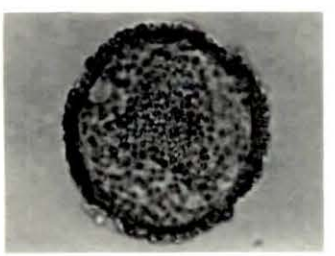

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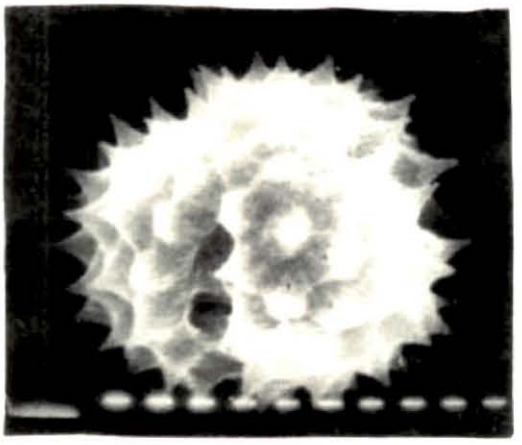
Plate III



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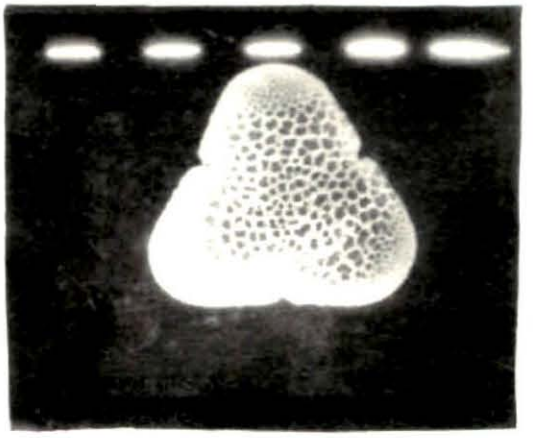

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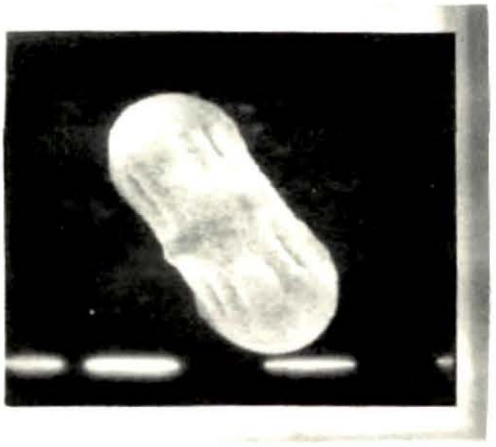

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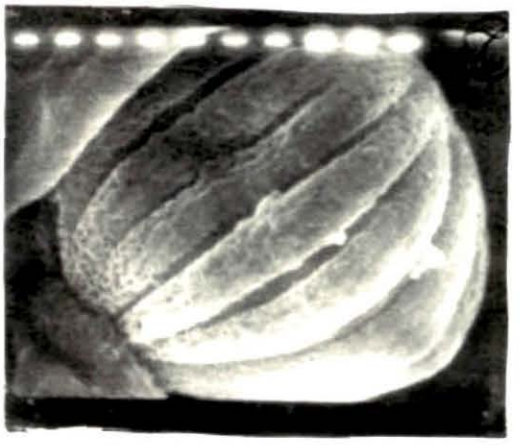

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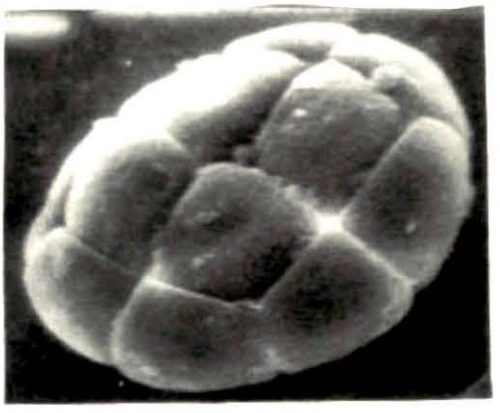

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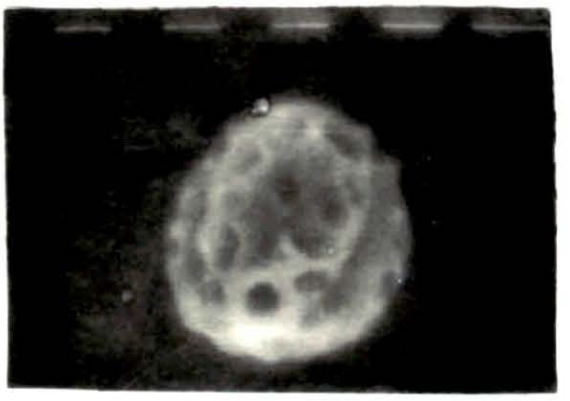

6

POLLEN KEY

MASTERY KEY

A. Grains Single					
B. Aperture absent (or indistinct)			...	Inaperturate	(1)
BB. Aperture present					
C. Apertures simple					
D.	With 1 sulci	...	...	1-Sulcate	(2)
DD.	With pores	Porate			
	1-pore	...	...	1-Porate	(3)
	2-5-pore	...	...	2-5-Porate	(4)
	Pores many	...	...	Pantoporate	(5)
DDD.	With colpi	Colpate			
	3-colpi	...	...	3-Colpate	(6)
	6-colpi	...	...	6-Colpate	(7)
	Colpi many	...	...	Polycolpate	(8),
CC. Apertures compound					
D.	Ora in pore	Porate			
	3-pore	...		3-Porate	(9)
DD.	Ora in colpi	Colporate			
	3-colpi	...	...	3-Colporate	(10)
	4-5-colpi	...	...	4-5 Colporate	(11)
AA. Grains united in group					
B.	Union of 4-grains	...	...	Tetrad	(12)
BB. Union of more than 4-grains		...	...	Polyad	(13)

(1) Inaperturate

Aperture absent		
	Echinate (often tetrad)	*Polyalthia longifolia*
	Pegged (with crotonoid pattern)	*Croton bonplandianum*
With indistinct 3-4 aperturoid areas		
	Subspheroidal	*Kyllinga brevifolia*
	Pear shaped	*Cyperus rotundus*

(2) 1-Sulcate

PA. x ED. x EB.	Exceeding 37.7 × 63.0 × 29.7 μm, Sexine verrucate,	*Borassus flabellifer*
PA. x ED. x EB.	25.0 × 41.6 × 39.2 μm, Sexine reiculate, L/B Sulci 29.1/1.5μm.	*Cocos nucifera*
PA×ED×EB	28.0 × 40.0 × 35.0μm, Sexine reticulate, L/B Sulci 34.5/3.5μm.	*Areca catechu*

(3) - 1 porate

Grains less than 50.0 µm in diameter	*Cynodon dactylon* *Digitaria sanguinalis*, *Imperata cylindrica*, *Saccharum spontaneum* (wild grasses)
Grains more than 50.0 µm in diameter	*Oryza sativa*, (cultivated grass)

(4) - 2 – 5- porate

2-3 porate	
Spheroidal to subspheroidal	
Sexine granulate, 2-3 porate	*Trema orientalis*
Sexine reticulate, 3 porate	*Ficus hispida*
Sexine obscure, 3 porate (rarely 4-5 porate)	*Holarrhena pubescens*
Sexine reticulate, heterobrochate (3 porate)	*Erythrina variegata*
Sub-oblate, Sexine scabrate (3-porate)	*Cannabis sativa*
4-5 porate	
Sexine finely reticulate, pores circular	*Nerium indicum*
5-7 porate	
Spheroidal.	
Sexine psilate,	*Pouzolzia zeylanica*
Sexine echinate	*Pterospermum acerifolium*

(5) Pantoporate

Grains less than 35.0 µm in diam.

Pores less than 30	
Pores ±28-30, interporal distance ± 6.5 µm	*Achyranthes bidentatus*
Pores ±22, interporal distance ± 4.0 µm.	*Amaranthus spinosus*
Pores ±26, interporal distance ± 2.5 µm.	*Achyranthes aspera*,
Pores ±14, interporal distance ± 3.5 µm.	*Deeringia amaranthoides*
Pores ±60, sexine scabrate	*Chenopodium album*
Pores 70-75, punctitegillate with supratectal processes	*Chnopodium ambrosioides*

Grains more than 35.0 µm, less than 100.0 µm

Pores ± 50	*Ipomoea carnea*
Pores ± 35	*Malva verticillata*
Pores ± 20	*Sida rhombifolia*
Pores ± 10	*Persicaria hydropiper*

Grains more than 100.0 µm in diameter

Annulus and extra annular ring present, echinate, reticulate, (No. of pores 68)	*Mirabilis jalapa*
Annulus and extra annular ring absent, echinate with spines and spinules (No. of pores 32)	*Hibiscus rosa-sinensis*

(6) 3-Colpate

Grains prolate-spheroidal

PA 28.0 µm, Sexine as thick as nexine	*Rumex dentatus*
PA 35.0 µm, Sexine thicker at polar region	*Callicarpa arborea*
PA 58.3 µm, Sexine thicker than nexine	*Peltophorum pterocarpum*

Grains sub-prolate to prolate

PA less than 50.0 µm

Punctitegillae	*Tectona grandis*
Reticulate	*Anisomeles indica*
Finely reticulate	*Tabebuia argentea*

PA more than 50 µm

Echinate	*Clerodendrum viscosum*

(7) 6 - Colpate

Simplibaculate, bacula dimorphic, reticulate, heterobrochate	*Ocimum sanctum*

(8) Polycolpate

Colpi in the form of pentagon

Reticulate, spinules present on muri	*Portulaca oleracea*
Reticulate, spinules absent on muri	*Martynia annua*

(9) 3 - pororate

Grains suboblate, aspidote	*Casuarina equisetifolia.*

(10) 3-colporate

Grains oblate

Obscure pattern (with parasyncolpate)	*Eucalyptus globulosus*
Punctitegillate	
Ora lalongate (Triangular in polar view)	*Psidium guajava*
Ora circular	*Anthocephalus chinensis*

Reticulate, heterobrochate (Triangular in polar view)	*Bombax ceiba*
Grains sub-oblate	
Obscure pattern, ora lalongate	*Zizyphus mauritiana*
Grains oblate-spheroidal	
Reticulate	
Ora circular	
PA×ED ± 30;0 × 31.5 µm	*Pongamia pinnata*
Ora lolongate,	
PA×ED 42.0 × 45.0µm	*Ichnocarpus frutescens*
Striato-reticulate	
Ora lalongate	
PA×ED ±30.0 × 33.0µm	*Tamarindus indica*
PA×ED ±47.0 × 48.0µm	*Datura metel*
Punctitegillate	
Ora lalongate	*Phyla nudiflora*
Obscure pattern	
Ora lalongate	
PA×ED ±27.0 × 28.5µm	*Trewia polycarpa*
PA×ED ±41.0 × 46.0µm	*Butea monosperma*
Spinulose,	
PA×ED ±21.0 × 22.5µm	*Artemisia vulgaris*
Grains prolate – Spheroidal	
Punctitegillate	
Ora circular	*Lagerstroemia thorelii*
Ora lalongate	
PA×ED ±41.0 × 38.0µm	*Lantana camara*
PA×ED ±27.1 × 26.2µm	*Solanum torvum*
Finely reticulate	
Ora not distinct	*Lindernia crustacea*
Ora lalongate	*Ehretia serrata*
Reticulate,	
Ora lolongate (with alternating pseudo colpi)	*Nelsonia canescens*
Psilate	
Ora lalongate	*Solanum nigrum*
Obscure pattern	
Ora lalongate	
PA×ED ±21.0 × 20.5µm	*Plumeria rubra*
PA×ED ±30.0 × 28.5µm	*Drypetes roxburghii*

Scabrate	*Solanum viarum*
Echinate	
Ora-circular,	
PA×ED ±28.0 × 26.0 µm	*Blumea lacera*
Ora lalongate	
PA×ED ±34.0 × 30.0µm	*Vernonia cinerea*
Spinulose	
Ora lalongate	*Xanthium strumarium*
Finely granulate	*Bauhinia variegata*
Grains sub-prolate	
Psilate	
Ora lalongate	
PA×ED ±39.0 × 32.0µm	*Cestrum nocturnum*
Obscure pattern	
Ora lalongate	
PA×ED ±21.0 × 18.0µm	*Terminalia arjuna*
PA×ED ±42.0 × 33.0µm	*Moringa oleifera*
Ora circular	*Thevetia peruviana*
Reticulate	
Ora lalongate	
PA×ED ±28.0 × 22.0µm	*Capparis zeylanica*
Finely reticulate	
Ora lolongate	
PA×ED ±40.0 × 31.5µm	*Camellia sinensis*
Ora lalongate	
PA×ED ±45.0 × 35.0µm	*Cassia siamea*
Striato-reticulate	
Ora lolongate	*Mangifera indica*
Scabrate	*Cassia sophera*
Echinate	
Ora circular	*Ageratum conyzoides*
Grains prolate	
Reticulate	
Ora lolongate	*Sesbania grandiflora*
Ora lalongate	
PA×ED ±45.0 × 30.0µm	*Heliotropium indicum*
PA×ED ±31.0 × 20.0µm	*Rungia pectinata*
PA×ED ± 30.0 × 20.0µm	*Crataeva nurvala*
PA×ED ±28.0 × 17.0µm	*Euphorbia hitra*
PA×ED ±22.5 × 16.0µm (hetero brochate)	*Justicia diffusa*

Finely reticulate
Ora lolongate — *Ixora coccinea*
Ora lalongate
PA×ED ±35.0 × 22.5µm — *Cassia fistula*
PA×ED ±25.0 × 17.5µm — *Glycosmis pentaphylla*

Obscure pattern
Ora lalongate
PA×ED ±8.5 × 5.0µm (dumb-bell shaped) — *Cynoglossum lanceolatum*
PA×ED ±27.0 × 21.0µm — *Dalbergia sissoo*

Psilate
Ora not distinct — *Scoparia dulcis*
Ora transverselly parallel — *Chorchorus capsularis*

Punctitegillate
Ora lalongate — *Cochlospermum religiosum*

Grains spheroidal
Reticulate — *Caesalpinia pulcherrima*

Psilate
Ora lalongate — *Alstonia scholaris*

Echinate
Ora lolongate — *Eclipta prostrata*

Obscure pattern
Ora lalongate — *Carica papaya*

Grains perprolate
Finely reticulate
PA×ED ±24.2 × 13.8µm — *Coriandrum sativum*

Reticulate
PA×ED ±24.5 × 10.6µm — *Seseli indicum*

(11) 4-5 colporate

Grains 4-colporate
Ora circular
Obscure pattern — *Azadirachta indica*
Punctitegillate — *Swietenia mahagoni*
Ora lalongage
reticulate — *Aegle marmelos*

(12) Tetrad

Tetragonal tetrad, grains
Monosulcoidate — *Annona reticulata*

(13) Polyad

Grains in group of 16, round shaped	
Granulate	*Acacia auriculoformis*
Faintly granulate	
Monads lossely fitted	*Albizia lebbek*
Psilate	*Pithecellobium dulci*
Grains in form of Pollinia	*Calotropis gigantea*

POLLEN MORPHOLOGICAL STUDY

Results :

Pollen morphological studies of 108 common plant species of Jalpaiguri town were curried out to identify the airborne pollen grains. The terminology, definitions, and other morphological concepts are based on Erdtman (1952,1969), Faegri and Iversen (1975) and Chanda (1963,1965,1966). This study showed a great variety of characteristics which cover almost all the aperturul types, e.g. inapurturate, 1-Sulcate, 1-Porate, 2-5 Porate, Pantoporate, 3-Colpate, 6-Colpate, Polycolpate, 3-Pororate, 3-Colporate, 4-5 Colporate and Polyad. In the present investigation, the identification of airborne pollen grains was done by comparing the pollen types with the reference slides and also consulting the published literatures of Erdtman (1952), Lewis *et. al.* (1984), Gupta *et. al* (1985), Banik *et. al* (1986), Majumder *et. al* (1988).

POLLEN DIAGNOSES

Sl. No.	Pollen Types	Name of the plant species
1.	Inaperturate	*Polyalthia longifolia, Croton bonplandianum, Cyperus rotundus, Kyllinga brevifolia.*
2.	1-Sulcate	*Borassus flabellifer, Cocos nucifera, Areca catechu.*
3.	1-Porate	*Cynodon dactylon, Digitaria sanguinalis, Imperata cylindrica, Saccharum spontaneum* (wild grass), *Oryza sativa,* (cultivated grass).
4.	2-5 Porate 4-5 Porate 5-7 Porate	*Trema orientalis, Cannabis sativa, Ficus hispida, Holarrhena pubescens, Erythrina variegata, Kleinhovia hospita.* *Nerium indicum.* *Pouzolzia zeylanica, Pterospermum acerifolium.*
5.	Pantoporate	*Amaranthus spinosus, Achyranthes aspera, Chenopodium album, Ipomoea carnea, Persicaria hydropiper, Mirabilis jalapa, Hibiscus rosa-sinensis.*
6.	3-Colpate	*Rumex dentatus, Callicarpa arborea, Tectona grandis, Anisomeles indica, Clerodendrum viscosum, Tabebuia argentea.*
7.	6 Colpate	*Ocimum sanctum.*
8.	Polycolpate	*Portulaca oleracea, Martynia annuna*

Contd. ...

Sl. No.	Pollen Types	Name of the plant species
9.	3 Pororate	*Casuarina equisetifolia.*
10.	3 Colporate	*Eucalyptus globulosus, Psidium guajava, Bombax ceiba, Zizyphus mauritiana, Pongamia pinnata, Datura metel, Tamarindus indica, Trewia polycarpa, Butea monosperma, Lagerstroemia thorelii, Lantana camara, Lindernia crustacea, Solanum nigrum, Blumea lacera, Vernonia cinerea, Xanthium strumarium, Bauhinia variegata, Cestrum nocturnum, Dalbergia sissoo, Terminalia arjuna, Moringa oleifera, Cassia siamea, Mangifera indica, Cassia sophera, Ageratum conyzoides, Heliotropium indicum, Euphorbia hirta, Cassia fistula, Glycosmis pentaphylla, Scoparia dulcis, Cochlospermum religiosum, Caesalpinia pulcherrima, Alstonia scholaris, Eclipta prostata, Carica papaya.*
11.	4-5 Colporate	*Azadirachta indica, Swietania mahagoni, Aegle marmelos.*
12.	Tetrad	*Annona reticulata.*
13.	Polyad	*Acacia auriculoformis, Albizzia lebbek, Samania saman.*

Discussions :

In the present investigation pollen diagnoses were made from the pollen morphological studies of 108 plant species. There are many plant families unrelated taxonomically but possess similar type of pollen grains, thus rendering difficulty in identification. This problem is particularly encountered in 3-Colporate pollen grains being the most dominating type. Same difficulty was observed with stenopalynous family like Poaceae. In case of echinate pollen grains of Malvaceae, Convolvulaceae or Pantoporate grains of Amaranthaceae, Chenopodiaceae, the identification of pollen grains upto generic or specific level was very difficult due to morphological similarity of pollen grains. Presence of a large number of 3-Colporate grains is significant, because such grains are considered to be relatively advanced in comparison to other apertural conditions. From this point of view it may be suggested that the flora which have been studied by and large is advanced palynologically irrespective of their individual taxonomical positions. Plant species belonging to Poaceae is widely

distributed and second most dominating family in Jalpaiguri town contribute a large number of pollen grains to the atmosphere. The pollen grains of this family have been grouped under two categories, i.e. wild and cultivated types by having size differences. The grains larger than 50μm have been considered to be originated from cultivated varieties (Firbas, 1937; Hafsten, 1956). But the distinction is found to be arbitrary because this size criteria is not applicable in tropical countries like India and Ethiopia (Guinet, 1966; Bonnefille, 1969; Vishnu Mittre, 1973).

In the present investigation a pollen key has been prepared based on the proposition of Faegri and Iversen (1975) which is found to be helpful in identifying the airborne pollen grains obtained from two years aeropalynological survey of the investigated area.