

PALYNOLOGICAL STUDIES OF SOME MEDICINAL PLANTS

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The present paper deals with the pollen morphology of medicinal plants of 47 families. The major families, i.e., Solanaceae comprising 8 plant species, Euphorbiaceae 6, Fabaceae 5 and other families have less than 5 species each. The shape of pollen grain varies from triangular to spherical, subspherical to elliptical. Size of the pollen ranges from $14 \times 16 \mu$ in *Abrus precatorius* L. to $176 \times 176 \mu$ in *Ipomoea nil* (L.) Roth. All the major types of pollen apertures were observed, i.e., inaperturate (*Elettaria cardamomum*), pantoporate (*Achyranthus aspera*), 4-zonoporate (*Achras zapota*), monoporate (*Saccharum spontaneum*), 3,4-zonocolporate (*Aegle marmelos*), monocolpate (*Aloe barbedensis*). All the major types of ornamentation were observed, i.e. psilate (*Acalypha indica*), baculate (*Plumbago zeylanica*), spinate (*Ipomoea aquatica*), striate (*Datura metal*), gammate (*Bauhinia variegata*), reticulate (*Bombax malabaricum*) and tectate (*Barleria prionitis*) thickness of sexime varies 1.5μ in *Acalypha indica* L. to 25μ in *Barleria cuspidata* Heyne ex Ness.

Keywords : Baculate; Euphorbiaceae; Fabaceae; Gemmate; Pantoporate; Solanaceae; Striate.

The city of Jaipur is situated in the western part of India, between $75-77^{\circ}$ longitudes and $26-28^{\circ}$ latitudes in the north eastern part of Rajasthan. It is bisected lengthwise by 76° E and across its width by 27° latitudes. The city has comparatively dry climatic conditions.

Pollen morphology of some Indian medicinal plants was studied by Nair¹. No studies have been done on the pollen morphology of medicinal plants from Jaipur region. These plants are used by local people as well as by recognized practitioner of Jaipur region especially by Ayurvedic and Homoeopathic doctors. Some Allopathic medicines are also prepared from these plants.

Pollen materials were collected in two consecutive years from 1991-93 from number of localities in and around Jaipur; 86 plant species found to be medicinally important.

Plants were collected from different topographic areas viz. hills, plains, reservoirs, rivulets, fields and from gardens. Of these 86 plant species 50 were wild and 36 species were cultivated. Out of total plants species, 28 species comprised of trees, 15 of shrubs, 40 species of herbs and 3 species of climbers. Herbarium sheets were maintained. Pollen material were fixed in FAA. Slides from fresh materials as well as from acetolyzed grains were prepared, following Erdtman².

For measurements an average of 10-20 pollen grains have been taken into account.

Jaipur city is rich in medicinal plants. It was observed that 1/7 plant species of total Angiospermic plant species were found to be of medicinal value.

Plants were selected from different habitats i.e. *Aegle marmelos*, *Barleria prionitis*, *Cassia fistula*, *Cordia gharaf*, *Wrightia tinctoria* from hills. *Achyranthus aspera*, *Boerhavia diffusa*, *Calotropis procera*, *Cleome viscosa*, *Saccharum spontaneum* etc., were found in sandy plains. *Ipomoea aquatica*, *Limnophila indica*, *Nelumbo nucifera* and *Nymphoides cristatum* were collected from fresh water habitats. *Bacopa monnieri* and *Eclipta prostrata* were observed on wet places. *Avena sativa*, *Coriander sativum* and *Trachyspermum ammi* etc. were common in fields.

Generally herbs and shrubs flower during rainy season viz., *Abutilon indicum*, *Euphorbia hirta*, *Ocimum basilicum*, *Withania somnifera* etc. Flowering period of trees lie during the months of April to June e.g. *Butea monosperma*, *Azadirachta indica*, *Mangifera indica*, *Terminalia bellirica* etc.

Observation

Pollen slides of all the species were observed

Table 1. List of plants - Important Palynological Character, Part used, Medicinal properties and Phenology.

S. NO.	NAME OF PLANT	FAMILY	W/C	TYPE OF POLLEN	POLLEN SIZE	WALL	ORNAMENTATION	DRUG OBTAINED FROM	MEDICINAL PROPERTIES AND THEIR USES IN	FLOWER IN PERIOD
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	<i>Abrus precatorius</i> Linn.	Fabaceae	W	3-Zonocolporate	14x16 μ	1.5 μ	Obscure	Roots leaves, seeds	Cold, Fever, Sciatica & Paralysis	Aug-Oct.
2.	<i>Abutilon indicum</i> (Linn.) Sw.	Malvaceae	W	Pantoporate	107x107 μ	2.5 μ	Spinate	Leaves	Gonorrhoea, Ulcer, in bladder	Aug-Oct.
3.	<i>Acalypha indica</i> Linn.	Euphorbiaceae	W	3-Zonocolporate	14x16 μ	1.5 μ	Psilate	Whole Plant	Bronchitis, Asthma, Pneumonia	July-Oct.
4.	<i>Achras zapota</i> Linn.	Sapotaceae	C	4-Zonoporate	50x61 μ	1.5 μ	Obscure	Fruit whole	Biliousness, diuretic, diarrhoea	March- May-
5.	<i>Achyranthes aspera</i> Linn.	Amaranthaceae	W	Pantoporate	21x23 μ	1.5 μ	Obscure	Whole Plant	Diuretic, diarrhoea, and dysentery	Sept- May-
6.	<i>Adhatoda vasica</i> Nees.	Acanthaceae	W	2-Zonocolporate	56x58 μ	4 μ	Retipilate	Leaves	Expectorant	July-Feb.
7.	<i>Aegle marmelos</i> (Linn.) Correa	Rutaceae	W	3,4-Zonocolporate	35x35 μ	2 μ	Retipilate	Ripe Fruit	Chronia, diarrhoea and dysentery	May- June-
8.	<i>Allium cepa</i> Linn.	Liliaceae	C	Monocolpate	27x45 μ	1.5 μ	Psilate	Bulb	Jaundice, Splenic enlargement	Jan.- April
9.	<i>Aloe barbadensis</i> Mill	Liliaceae	W	Monocolpate	42x65 μ	2.0 μ	Reticulate	Leaves	Gonorrhoea, Piles and Jaundice	Feb.- March-
10.	<i>Althaea rosea</i> (L.) Cav.	Malvaceae	C	Pantoporate	165x165 μ	6 μ	Spinate	Flowers	Rheumatism, dysentery etc	Dec- March
11.	<i>Avena sativa</i> Linn.	Poaceae	C	Monoporate	69x96 μ	1.5 μ	Psilate	Seed	Nerve tonic, stimulating and laxative	Jan.- March-
12.	<i>Azadirachta indica</i> A.Juss.	Meliaceae	W	4,5-Zonoporate	67x77 μ	1.5 μ	Obscure	Bark, Leaves, Roots	Fever, Skin diseases	March- May-
13.	<i>Bacopa monnieri</i> (Linn.) Pennell	Scrophulariaceae	W	3-Zonocolporate	27x36 μ	1.5 μ	Obscure	Whole Plant	Nervous disorders, Constipation & Bronchitis	Aug- Sept.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
14.	<i>Barleria cuspidata</i> Heyne ex Nees	Acanthaceae	W	3-Zonoporate	119x119µ	25µ	Tectate	Leaves	Cough and inflammation	Dec.
15.	<i>Barleria prionitis</i> Linn.	Acanthaceae	W	3-Zonoporate	104x104µ	16µ	Tectate	Bark, Leaves	Cough, Toothache and Dropsy	Jan. Sept.
16.	<i>Bauhinia variegata</i> Linn.	Caesalpinaceae	C	3-Zonocolporate	68x112µ	4µ	Gemmate	Bark, Root	Ulcer, Syphilis	Dec. Feb.
17.	<i>Boerhaavia diffusa</i> Linn.	Nyctaginaceae	W	Pantoporate	100x100µ	1.5µ	Psilate with Spinulate	Roots, Leaves & Seeds	Leptosy and tumors	April
18.	<i>Bombax ceiba</i> Linn	Bombacaceae	C	3-Zonocolporate	42x54µ	1.5µ	Reticulate	Roots Fruits	Jaundice, gonorrhoea appetizer, Tonic	Nov.- March
19.	<i>Bryophyllum pinnatum</i> kurz.	Crassulaceae	C	3-Zonocolporate	23x38µ	1.5µ	Psilate	Flowers Leaf Juice	Snake bite, diarrhoea and dysentery	Feb.- April
20.	<i>Butea monosperma</i> (Lamk.) Taub.	Fabaceae	W	3-Zonocolporate	50x61µ	2µ	Obscure	Seeds, root	Cholera	Jan.- May
21.	<i>Calotropis procera</i> (Ait.) R.Br. (willd) Dryand. ex W.Ait	Asclepiadaceae	W	Inaperturate	47x62µ	1.5µ	Psilate	Leaves	Roundworms, snakebite, B.P.	March- April
22.	<i>Carissa carendas</i> Linn.	Apocynaceae	C	3-Zonocolporate	39x46µ	2.5µ	Obscure	Fruit	Dropsy and in enlargement of abdominal viscera	Oct.- Feb.
23.	<i>Cassia fistula</i> Linn.	Caesalpinaceae	W	3-Zonocolporate	31x46µ	1.5µ	Psilate	Fruit Pulp, Lvs	Antisporbic	March- June
24.	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae	C	3-Zonocolporate	88x100µ	1.5µ	Psilate	Root	As laxative	April- June
25.	<i>Citrus limon</i> (Linn.) Burm. f.	Rutaceae	C	3,4,5-Zonocolporate	42x68µ	2.5µ	Reticulate	Fruit	As sedative & Tranquillising, hypertension	Oct.- Dec.
26.	<i>Cleome gynandra</i> Linn	Capparidaceae	W	3-Zonocolporate	20x28µ	1.5µ	Psilate	Seed, Lvs	Rheumatism, dysentery cold & diarrhoea	Feb.- May
27.	<i>Cordia dichotoma</i> Forst.f.	Boraginaceae	W	3-Zonocolporate	15x19µ	1.5µ	Psilate	Leaf & fruit	Fever, rheumatism	July- Sept.
									Ulcers, fevers and stomachache	Feb.- April

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
28.	<i>Coriandrum sativum</i> Linn.	Apiaceae	C	3-Zonocolporate	18x39 μ	2.5 μ	Obscure	Leaf & fruit	Flatulent colic and stomachache	Dec- March
29.	<i>Datura metal</i> Linn.	Solanaceae	W	3-Zonocolporate	56x65 μ	1.5 μ	Striate	Leaves & Seed	Bronchitis	Aug- Oct.
30.	<i>Datura stramonium</i> Linn.	Solanaceae	W	3-Zonocolporate	65x69 μ	1.5 μ	Striate	Leaves & Seed	Bronchitis, ophthalmology	Oct- Feb.
31.	<i>Eclipta prostrata</i> (L.) Linn.	Asteraceae	W	3-Zonocolporate	31x33 μ	2 μ	Spinulate	Seed oil	Hair tonic	Oct- Dec.
32.	<i>Elettaria cardamomum</i> Maton	Zingiberaceae	C	Inaperturate	108x123 μ	1.5 μ	Spinulate	Dried Fruits	Flatulence, overbulness of Stomach	March- May
33.	<i>Emblca officinalis</i> Gaertn.	Euphorbiaceae	C	4-Zonocolporate	23x25 μ	1.5 μ	Retipilate	Fresh/Dried fruits	Indigestion, Anaemia Jaundice etc.	Feb- April
34.	<i>Ephedra foliata</i> Boiss & Kotschy ex Boiss.	Gnetaceae	C	Inaperturate	19x27 μ	1.5 μ	Striate	Seed Bark leaf	Rheumatism, cough etc.	Dec- Feb.
35.	<i>Euphorbia hirta</i> Linn.	Euphorbiaceae	W	3-Zonocolporate	21x28 μ	1.5 μ	Faintly reticulate	Entire Plant	Cough, asthma, Gonorrhoea etc.	Aug- Oct.
36.	<i>Euphorbia nerifolia</i> Linn.	Euphorbiaceae	W	3-Zonocolporate	34x38 to 57x80 μ	2.5 μ	Retipilate	Stem Juice	Earache & Asthma	May- April
37.	<i>Foeniculum vulgare</i> Mill.	Apiaceae	C	3-Zonocolporate	21x34 μ	2 μ	Psilate	Fruit	Eye disease, Fever, Wounds & Dysentary etc.	Dec- Feb.
38.	<i>Helianthus annuus</i> Linn.	Asteraceae	C	3-Zonocolporate	46x54 μ	2.5 μ	Spinate	Flowers	Pulmonary ailments	Dec- April
39.	<i>Ipomoea aquatica</i> Forsk.	Convolvulaceae	W	Pantoporate	107x107 μ	4 μ	Spinate	Juice of whole plant	Purgative & Purefies blood	Oct- Feb.
40.	<i>Ipomoea nil</i> (L.) Roth.	Convolvulaceae	W	Pantoporate	176x176 μ	6 μ	Spinate	Dried Seed	Purgative	Sept- Feb.
41.	<i>Lawsonia inermis</i> Linn.	Lythraceae	C	3-Zonocolporate	22x25 μ	1.5 μ	Psilate	Leaves Bark	Skin disease, headache	July- Sept.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
42.	<i>Limnophila indica</i> (Linn) Druce	Scrophulariaceae	W	3-Zonocolporate	23x27μ	1.5μ	Obscure	Seed	Dysentery & Elephantiasis	Dec-Feb.
43.	<i>Mangifera indica</i> Linn.	Anacardiaceae	C	3-Zonocolporate	27x34μ	3μ	Reticulate	Fruits & Seed	Asthma and Haemorrhoea	Feb.-April
44.	<i>Melia azedarach</i> Linn.	Meliaceae	W	4-Zonocolporate	61x65μ	1.5μ	Obscure	Leaf bark	Worms in children, diuretic rheumatism	April-May
45.	<i>Momordica charantia</i> Linn	Cucurbitaceae	C	3-Zonocolporate	60x81μ	3μ	Reticulate	Fruit	Jaundice, Blood Purifier, leprosy	Aug-Oct.
46.	<i>Morus alba</i> Linn.	Moraceae	C	3-Zonocolporate	18x21μ	1.5μ	Psilate	Fruit Lvs, fls	Fever & Soar throat	Jan-Feb.
47.	<i>Musa paradisiaca</i> Linn.	Musaceae	C	Monocolpate	60x90μ	1.5μ	Psilate	Fruit	Dysentary, diarrhoea, piles, liver diseases & as a Cardiac tonic	March-May
48.	<i>Nelumbo nucifera</i> Gaertn.	Nelumbonaceae	W	3-Zonocolporate	84x88μ	4μ	Granulate	Rhizome Powder & Flower	Piles, Liver diseases & as a Cardiac tonic	Aug-Oct.
49.	<i>Nicotiana tabacum</i> Linn.	Solanaceae	C	3-Zonocolporate	34x42μ	1.5μ	Psilate	Leaves	Rheumatism and skin disease	Dec.
50.	<i>Nymphoides cristatum</i> (Roxb.) O. Ktze	Gentianaceae	W	3-Zonocolporate	27x37μ	1.5μ	Obscure	Fruit & Seed	Jaundice and fever	Feb.
51.	<i>Ocimum basilicum</i> Linn.	Lamiaceae	W	8-Zonocolpate	69x84μ	4μ	Reticulate	Whole Plant	Fever, Cough, Piles etc.	Dec-Feb.
52.	<i>Ocimum canum</i> Sims.	Lamiaceae	W	6, 8-Zonocolpate	58x63μ	3μ	Reticulate	Seeds	Fever, Cough, Piles etc.	July-Oct.
53.	<i>Ocimum sanctum</i> Linn.	Lamiaceae	C	6-Zonocolpate	38x42μ	3μ	Reticulate	Leaves & Seeds	Bronchitis, earache etc.	Oct.-Nov.
54.	<i>Papaver somniferum</i> Linn.	Papaveraceae	C	3-Zonocolporate	25x38μ	1.5μ	Foveolate	Unripe Capsule	Cystitis, menorrhagia etc.	April-Dec.
55.	<i>Petalium murex</i> Linn.	Pedaliaceae	W	6, 7-Zonocolporate	67x90μ	2μ	Obscure	Whole Plant	Disorders of Urinary Systems	April-Aug.
56.	<i>Phoenix sylvestris</i> (L) Roxb.	Arecaceae	W	Monocolpate	25x31μ	1.5μ	Psilate	Fruit	Asthma and cough	Oct.-Jan.-March

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
57.	<i>Plumbago zeylanica</i> Linn.	Plumbaginaceae	W	3-Zonocolporate	80x92 μ	4 μ	Baculate	Root	Rheumatism, Leprosy, Dysentry & diarrhoea	Sept.- Oct.
58.	<i>Polygonum glabrum</i> Willd.	Polygonaceae	W	Pantoporate	69x76 μ	4 μ	Reticulate	Leaves	Colic pain	Aug. Sept.
59.	<i>Pongamia glabra</i> Vent.	Fabaceae	C	3-Zonocolporate	31x34 μ	1.5 μ	Foveolate	Seeds	Skin diseases	March- April
60.	<i>Psidium guajava</i> Linn.	Myrtaceae	C	3-Zonocolporate	18x23 μ	1.5 μ	Psilate	Bark, Root & Leaves	Diarrhoea and cholera	Feb.- July
61.	<i>Pulicaria crispa</i> Sch.- Bip.	Asteraceae	W	3-Zonocolporate	31x35 μ	2 μ	Spinulate	Leaves	Headache	Oct.- Feb.
62.	<i>Putranjiva roxburghii</i> Wall	Euphorbiaceae	C	3-Zonocolporate	34x38 μ	3 μ	Obscure	Leaves	Cold & Fever	March- May
63.	<i>Ricinus communis</i> Linn.	Euphorbiaceae	W	3-Zonocolporate	34x42 μ	1.5 μ	Psilate	Leaves Seeds	Purgative in ornaments, on burn	Dec.- April
64.	<i>Saccharum spontaneum</i> Linn.	Poaceae	W	Monoporate	57x57 μ	1.5 μ	Psilate	Roots	Stone in urinary tract and blood purifier	-
65.	<i>Santalum album</i> Linn.	Santalaceae	C	3-Zonoporate	28x32 μ	1.5 μ	Foveolate	Oil of Heart wood	Cystitis, gonorrhoea Cough etc.	Feb.- April
66.	<i>Saraca indica</i> Linn.	Caesalpinaceae	C	3-Zonocolporate	54x73 μ	1.5 μ	Obscure	Bark	Uterine disorders, menorrhagia & leucorrhoea	Feb.- April
67.	<i>Sida cordifolia</i> Linn.	Malvaceae	W	Pantoporate	110x110 μ	3 μ	Spinate	Entire Plant	Leucorrhoea, nervous diseases	Aug.- Sept.
68.	<i>Solanum melongena</i> Linn.	Solanaceae	C	3-Zonocolporate	31x36 μ	1.5 μ	Psilate	Whole Plant	Syphilis, wound, Cough etc.	July- Oct.
69.	<i>Solanum nigrum</i> Linn.	Solanaceae	W	3-Zonocolporate	29x34 μ	1.5 μ	Psilate	Whole Plant	Dysentary, Fevers, Asthma & Skin disease	Oct.- Feb.
70.	<i>Solanum surattense</i> Burm.f.	Solanaceae	W	3-Zonocolporate	33x34 μ	1.5 μ	Psilate	Dried root	Cough & Asthma	Aug.- Sept.
71.	<i>Solanum tuberosum</i> Linn.	Solanaceae	C	3-Zonocolporate	31x35 μ	1.5 μ	Obscure	Tubers	Pimples & Burns	Nov.- Feb.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
72.	<i>Syzygium cumini</i> (Linn) Skeels.	Myrtaceae	C	3-Zonocolporate	20x22 μ	1.5 μ	Psilate	Bark Fruits & Seed	Bronchitis, Ulcer & diabetes etc.	Feb.- June
73.	<i>Tamarindus indica</i> Linn.	Fabaceae	C	3-Zonocolporate	46x46 μ	1.5 μ	Obscure	Fruit pulp	As laxative	June- Aug.
74.	<i>Terminalia bellirica</i> (Roxb.)	Combretaceae	C	3-Zonocolporate	27x31 μ	1.5 μ	Psilate	Dry Fruit	Indigestion, Diarrhoea, eyes (one Constituent of Triphala)	April- June
75.	<i>Tinospora cordifolia</i> (Willd.) Hook P & Th.	Menispermaceae	W	3-Zonocolporate	23x27 μ	2 μ	Reticulate	Stem with Bark, root	Bonefracture, malaria fever	April- May
76.	<i>Trachyspermum ammi</i> . (Linn) sprague	Apiaceae	C	3-Zonocolporate	16x35 μ	1.5 μ	Psilate	Fruit	Dyspepsia, indigestion & diarrhoea	Feb.- April
77.	<i>Trianthema portulacastrum</i> Linn.	Aizoaceae	W	3-Zonocolporate	50x50 μ	1.5 μ	Obscure	Leaves whole plant	Dropsy, diuretic & promote urination	Aug.- Sept.
78.	<i>Tribulus terrestris</i> Linn.	Zygophyllaceae	W	Pantoporate	61x61 μ	4.5 μ	Reticulate	Fruit, root	Urinary complaints, asthma	May- Aug.
79.	<i>Trigonella foenumgraecum</i> Linn.	Fabaceae	C	3-Zonocolporate	38x50 μ	1.5 μ	Reticulate	Seeds, Lvs, root	Rheumatism, diuretic, Baldness	Oct.- Dec.
80.	<i>Vitex negundo</i> Linn.	Verbenaceae	W	3-Zonocolporate	19x22 μ	1.5 μ	Obscure	Leaves & Seed	Rheumatism, headache & Leech bite	Aug.- Sept.
81.	<i>Vites vinifera</i> Linn.	Vitaceae	C	3-Zonocolporate	31x35 μ	1.5 μ	Psilate	Fruit	Cough, hoarseness, laxative	Feb.- April
82.	<i>Viola tricolor</i> Linn.	Violaceae	C	4,5-Zonoporate	96x104 μ	4.5 μ	Obscure	Root	dysentery and Skin diseases	Dec.- April
83.	<i>Withania somnifera</i> Dunal	Solanaceae	W	3-Zonocolporate	30x34 μ	1.5 μ	Psilate	Dried root	Rheumatism, diuretic	July- Jan.
84.	<i>Wrightia tinctoria</i> R. Br.	Apocynaceae	W	3, 4-Zonoporate	42x46 μ	1.5 μ	Obscure	Bark, Leaves & Seeds	Fever toothache	April- May
85.	<i>Xanthium strumarium</i> Linn.	Asteraceae	W	3-Zonocolporate	32x38 μ	3 μ	Reticulate	Flowers	Toothache	Oct.- Dec.
86.	<i>Zizyphus nummularia</i> (Burm. f.) Wt. et. Am.	Rhamnaceae	W	3-Zonocolporate	27x31 μ	1.5 μ	Psilate	Fruit	Blood Purifiers	Aug.- Sept.

W = Wild; C = Cultivated.

under light microscope. Important palynological characters, drug yielding plant parts, medicinal properties and phenology were observed and recorded in Table-1.

Pollen morphology of medicinal plants of 47 families has been studied. The major families i.e., Solanaceae comprising 8 plant species, Euphorbiaceae 6, Fabaceae 5 and other families have less than 5 species each.

The shape of pollen grain varies from triangular to spherical, subspherical to elliptical. Size of pollen ranges from 14x16 μ in *Abrus precatorius* L. to 176x176 μ in *Ipomoea nil* (L.) Roth. All the major types of pollen apertures were observed, i.e., inaperturate (*Elettaria cardamomum*), pantoporate (*Achyranthus aspera*), 4-zonoporate (*Achras zapota*), monoporate (*Saccharum*

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References

1. Nair P K K 1961, *J. Sc. Indus Res.* 20 45
2. Erdtman G 1952, *Pollen morphology and plant taxonomy of Angiosperms* Chronica Botanica Waltham Mass.