

Pollen morphology of medicinal plants from Manchippa Reserve Forest, Nizamabad district, Telangana State, India.

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ABSTRACT

Palynological studies were carried out in 15 medicinal plants used by tribal Lambadas, Kayastha (Mathura) lambadas of Manchippa Reserve Forest. The 15 plant species are used by the tribal inhabitants to cure various diseases. These plants belong to 12 families viz. Balanitaceae, Bignoniaceae, Bombacaceae, Boraginaceae, Caesalpinaceae, Capparidaceae, Euphorbiaceae, Fabaceae, Lecythidiaceae, Menispermaceae, Moraceae and Rutaceae. The pollen characters studied are size, shape, aperture and ornamentation types. The pollen morphology shows diversity which will help in identification of taxa and is useful in taxonomy and Palynological studies of Nizamabad district in future.

Key words : Palynology, medicinal plants, lambadas, taxonomy.

INTRODUCTION

Nizamabad district situated in northern part of the Telangana state, lies between 18° 05' and 19° of northern latitudes and 77° 40' and 78° 37' of the eastern longitudes and bounded by Kamareddy district in south, Jagityal district in east, Nirmal district in north and Nanded district of Maharashtra in the west. Nizamabad district is situated in the table land of Deccan plateau. This region is mostly of plains with isolated peaks. Godavari river flows through the district makes Godavari basin the northern boundary. The type of forest is Tropical dry deciduous (Champion and Seth). Nizamabad district has two forest divisions, Nizamabad Division and Armoor division. Nizamabad division is divided into four forest ranges i.e. Nizamabad north, Nizamabad south, Varni range and Indalwai ranges. Manchippa Reserve forest comes under Nizamabad south range of Nizamabad Forest Division. This Reserve Forest is distributed in 16,213.96 hectares of area covers more than 23 villages. The tribal people especially Mathura lambadas residing in Amrabad and Mathura nagar thanda have rich knowledge about medicinal plants and their ethnomedicinal values to cure various ailments and diseases.

METHODOLOGY

Present work was carried out during the period of 2017 – 2018, pollen material was collected from 15 medicinal plants of reserve forest and identified the diversity of pollen morphology. The pollen material was processed and permanent pollen slides were prepared by Erdtman's method (1960). The pollen material was studied under a trinocular research microscope and noted the pollen characters (plates 1 and 2). The methodology followed for the preparation of Herbarium, as described by Jain and Rao (1977), and the Herbarium with Voucher numbers were deposited at Department of Botany, Nizam college (A), Osmania University, Hyderabad. Table 1.

OBSERVATIONS

Pollen morphology of 15 medicinal plant species from Manchippa Reserve Forest was carried out during the year 2017 – 2018. The plant species are *Aegle marmelos*, *Balanites roxburghii*, *Bauhenia racemosa*, *Bombax ceiba*, *Bridelia montana*, *Butea superba*, *Capparis grandis*, *Careya arborea*, *Cassia absus*, *Cissampelos pareira*, *Cordia dichotoma*, *Dolichandrone falcate*, *Ehretia laevis*, *Maerua oblongifolia* and *Streblus asper*. These plant species belongs to the families Rutaceae, Balanitaceae, Caesalpinaceae, Bombacaceae, Euphorbiaceae, Fabaceae, Capparidaceae, Lecythidiaceae, Menispermaceae, Boraginaceae, Bignoniaceae and Moraceae. The diversity of pollen morphological characters i.e shape, size, aperture type and ornamentation was recorded in Table 2. The plant materials such as root, bark, stem, leaves, flower, seeds, gum, fruits and whole plant is used by the lambadas and Mathura lambadas to cure different diseases like Jaundice, purgative, antipyretic, anti ulcer, anti diabetes, anti oxidant, anti cancer, anti microbial, fever, stomach ache, skin infections, urinary calculi, epilepsy, demulcent, malaria, syphilis, dysentery, diarrhoea, vermifuge, laxative, astringent, skin sores, eye diseases, swellings, wounds, abortifacient and anti spasmodic.

Table 1. 15 Medicinal plants with voucher number and flowering season from Manchippa Reserve Forest, Nizamabad district.

Sl.no	Plant name	Family	Voucher no	Flowering season
1.	<i>Aegle marmelos</i> (L) Correa	Rataceae	179	April - May
2.	<i>Balanites roxburghii</i> Planch	Balanitaceae	170	Mar - June
3.	<i>Bauhenia racemosa</i> L	Caesalpinaceae	181	Feb - Mar
4.	<i>Bombax ceiba</i> L	Bombacaceae	159	Feb - may
5.	<i>Bridelia montana</i> Willd	Euphorbiaceae	189	Feb - May
6.	<i>Butea superba</i> Roxb	Fabaceae	155	Feb - June
7.	<i>Capparis grandis</i> L	Capparidaceae	175	April - June
8.	<i>Careya arborea</i> Roxb	Lecythediaceae	167	Mar - Aug
9.	<i>Cassia absus</i> L	Caesalpinaceae	202	Nov - Mar
10.	<i>Cissampelos pareira</i> L	Menispermaceae	196	Nov - April
11.	<i>Cordia dichotoma</i> G.Frost	Boraginaceae	162	Feb - April
12.	<i>Dolichandrone falcate</i> Seem	Bignoniaceae	033	April - Jan
13.	<i>Ehretia laevis</i> Roxb	Boraginaceae	164	Feb - May
14.	<i>Maerua oblongifolia</i> (Forsk.)A.Rich	Capparidaceae	172	Jan - June
15.	<i>Streblus asper</i> Lour	Moraceae	169	Jan - Sept

Table 2. Pollen morphology of Medicinal plants of Manchippa Reserve Forest, Nizamabad.

Sl.no	Plant name	Size	Shape	Aperture type	Ornamentation
1	<i>Aegle marmelos</i> (L) Correa	20.04 μm	Prolate spheroidal	Tetrazonocolporate	Psilate
2	<i>Balanites roxburghii</i> Planch	20.23 μm	spheroidal	Trizonocolporate	rugulate
3	<i>Bauhenia racemosa</i> L	24.91 μm	Prolate	Trizonocolporate	reticulate
4	<i>Bombax ceiba</i> L	64.50 μm	Euoblate	Trizonocolporate	reticulate
5	<i>Bridelia montana</i> Willd	21.95 μm	prolate	Trizonocolporate	reticulate
6	<i>Butea superba</i> Roxb	33.19 μm	spheroidal	Trizonocolporate	reticulate
7	<i>Capparis grandis</i> L	15.17 μm	prolate	Trizonocolporate	reticulate
8	<i>Careya arborea</i> Roxb	39.27 μm	Oblate spheroidal	Trizonopseudosyncolpate	psilate
9	<i>Cassia absus</i> L	40.39 μm	prolate	Trizonocolporate	faintly reticulate
10	<i>Cissampelos pareira</i> L	14.54 μm	Prolate spheroidal	Trizonocolporoidate	reticulate
11	<i>Cordia dichotoma</i> G.Forster	23.10 μm	Prolate	Trizonocolporate	microechinate-scabrate
12	<i>Dolichandrone falcata</i> Seem	33.99 μm	spheroidal	Tetrazonocolporate	psilate
13	<i>Ehretia laevis</i> Roxb	22.34 μm	Oblate spheroidal	Trizonocolporate	psilate
14	<i>Maerua oblongifolia</i> (Forsk.)A.Rich	27.43 μm	Prolate spheroidal	Trizonocolporate	psilate
15	<i>Streblus asper</i> Lour	15.25 μm	spheroidal	Tetraporate	psilate

Pollen morphological Characters

01. *Aegle marmelos* (L) Correa

Family : Rutaceae

Pollen size - Polar axis 20.04 μm , Equatorial axis 19.23 μm , pollen shape prolate spheroidal, polar outline triangular, equatorial outline elliptical, aperture tetrazonocolporate, vestibulate. Colpi narrowly oblong, exine 2.6 μm thick and ornamentation psilate.

02. *Balanites roxburghii* Planch.

Family : Balanitaceae

Pollen size - Polar axis 20.23 μm , E.axis 20.06 μm , shape spheroidal, 3 and 6 aperturate, tricolporate and 6 rugorate.

03. *Bauhinia racemosa* L

Family : Caesalpinaceae

Pollen Size - Polar axis 24.91 μm , E.axis 16.34 μm , shape prolate, polar outline circular, equatorial outline circular, aperture trizonocolporate, colpi narrowly elliptical, exine 1.2 μm thick and sculpturing reticulate.

04. *Bombax ceiba* Linn

Family : Bombacaceae

Pollen size - Polar axis 34.23 μm , E.axis 64.5 μm , shape Euoblate, polar outline triangular, equatorial outline elliptical, aperture trizonocolporate, colpi narrowly elliptical, sides tapering towards the poles, exine 2.8 μm in thickness and sculpturing reticulate.

05. *Bridelia Montana* Willd**Family : Euphorbiaceae**

Pollen size - Polar axis 21.95 μm , E.axis 16.69 μm , shape prolate, trizonocolporate, exine 1.97 μm in thickness and ornamentation reticulate.

06. *Butea superba* Roxb**Family : Fabaceae**

Pollen size - Polar axis 31.99 μm , E.axis 33.19 μm , shape spheroidal, aperture trizonocolporate, exine 1.88 μm in thickness and sculpturing reticulate.

07. *Capparis grandis* L.f**Family : Capparidaceae**

Pollen size - Polar axis 15.17 μm , E.axis 9.97 μm , shape prolate, trizonocolporate, exine 1.39 μm in thickness, sculpturing reticulate.

08. *Careya arborea* Roxb**Family : Lecythediaceae**

Pollen size - Polar axis 39.27 μm , E.axis 40.69 μm , shape oblate spheroidal, polar outline triangular, equatorial outline transversely elliptical, trizonopseudosyncolpate, syncolpia operculate, exine 1.96 μm and sculpturing psilate.

09. *Cassia absus* L**Family : Caesalpinaceae**

Pollen size - Polar axis 40.39 μm , E.axis 24.16 μm , shape prolate, aperture tricolporate, exine 2.1 μm thick and sculpturing faintly reticulate.

10. *Cissampelos pareira* L**Family : Menispermaceae**

Pollen size - Polar axis 15.12 μm , Equatorial axis 14.54 μm , shape prolatespheroidal, polar outline triangular, equatorial outline elliptic, aperture trizonocolporoidate, exine 1.83 μm thick and sculpturing reticulate.

11. *Cordia dichotoma* G.Forster**Family : Boraginaceae**

Pollen size - P. axis 23.10 μm , E.axis 12.42 μm , shape prolate, polar outline triangular, equatorial outline elliptic. Aperture trizonocolporate, colpi elliptic, exine 1.79 μm and sculpturing microechinate scabrate.

12. *Dolichandrone falcata* (DC)**Family : Bignoniaceae**

Pollen size - 33.99 μm , isopolar, radially symmetrical, shape spheroidal, aperture tetracolporate, exine 1.3 μm , nexine thicker than sexine and sculpturing psilate.

13. *Ehretia laevis* Roxb**Family : Boraginaceae**

Pollen size - P.axis 22.34 μm , E.axis 2.74 μm , shape oblatespheroidal, polar outline triangular, equatorial outline elliptic, aperture trizonocolporate, colpi linear, colpi alternating with pseudocolpi, exine 0.97 μm thick and sculpturing psilate.

14. *Maerua oblongifolia* (Forsk.)A.Rich**Family : Capparidaceae**

Pollen size P.axis 27.43 μm , E.axis 23.22 μm , shape prolate spheroidal, aperture trizonocolporate and sculpturing psilate

15. *Sterblus asper* Lour**Family : Moraceae**

Pollen size - 15.25 μm , shape spheroidal, aperture tetraporate, exine 0.75 μm - 1 μm and sculpturing psilate

Results and Discussion

The 15 medicinal plants collected from Manchippa Reserve Forest shows diversity in pollen morphological characters of size, shape, aperture type and ornamentation. According to size *Cissampelos pareira* grains are recorded as smallest grains with 14.54 μm and largest grains recorded as grains of *Bombax ceiba* with 64.50 μm , rest of the 13 grains size falls in between 14.54 μm to 64.50 μm . Regarding shape spheroidal, prolate, prolate spheroidal, euoblate, and oblatespheroidal types were recorded. Shape of the grains were deduced by P.A/ E.D ratio multiplying with 100. Pollen grains of *Balanites roxburghii*, *Butea superba*, *Dolichandrone falcate* and *Streblus asper* are of showing spheroidal shape. Prolate grains recorded in *Bauhenia racemosa*, *Bridelia montana*, *Capparis grandis*, *Cassia absus* and *Cordia dichotoma*. Prolate spheroidal grains were recorded in *Aegle marmelos*, *Cissampelos pareira* and *Maerua oblongifolia*. Euoblate shape was shown by *Bombax ceiba* and oblatespheroidal shape was recorded in *Careya arborea* and *Ehretia laevis*.

Based on apertural type only one species *Streblus asper* showing simple type of aperture i.e. tetraporate, all other 14 grains are having compound apertures. 10 pollen grains are of trizonocolporate type, *Aegle marmelos* and *Dolichandrone falcata* shows tetrazonocolporate type, *Careya arborea* shows trizonopseudosyncolpate and *Cissampelos pareira* shows trizonocolporoidate. Regarding ornamentation psilate, reticulate, faintly reticulate, rugulate and microechinate scabrate types were recorded. Psilate type of ornamentation was observed in *Aegle marmelos*, *Careya arborea*, *Dolichandrone falcate*, *Ehretia laevis*, *Maerua oblongifolia* and *Streblus asper*. Reticulate ornamentation in *Bauhenia racemosa*, *Bombax ceiba*, *Bridelia montana*, *Butea superba*, *Capparis grandis* and *Cissampelos pareira*. Faintly reticulate ornamentation was noticed in *Cassia absus*, micro echinate – scabrate type was observed in *Cordia dichotoma* and regulate ornamentation observed in *Balanites roxburghii*. The diverse morphological characters of pollen grains gives clue of the significance of palynology in separation of taxa.

Pollen key

- 1 . Grains with simple apertures (tetraporate) _____ *Streblus asper*
- 1 . Grains with compound apertures
- 2 . Tetrazonocolporate grains
- 3 . Spheroidal shape _____ *Dolichandrone falcata*
- 3 . Prolate spheroidal shape _____ *Aegle marmelos*
- 2 . Trizonocolporate grains
- 4 . Grains psilate
- 5 . Grains size > 30 μm _____ *Careya arborea*
- 5 . Grains size < 30 μm
- 6 . Oblate spheroidal _____ *Ehretia laevis*
- 6 . Prolate spheroidal _____ *Maerua oblongifolia*
- 4 . Grains ornamented
- 7 . Micro echinate grains _____ *Cordia dichotoma*

7 . Reticulate grains

8 . Size > 50 µm _____ *Bombax ceiba*

8 . Size < 50 µm

9 . Spheroidal grains

10 . Size > 30 µm _____ *Butea monosperma*

10 . Size < 30 µm _____ *Balanites roxburghii*

9 . Prolate grains

11 . Faintly reticulate _____ *Cassia absus*

11 . Other than faintly reticulate

12 . Size < 15 µm _____ *Cissampelos pareira*

12 . Size > 15 µm

13 . Exine thickness > 1.5 µm _____ *Bridelia montana*

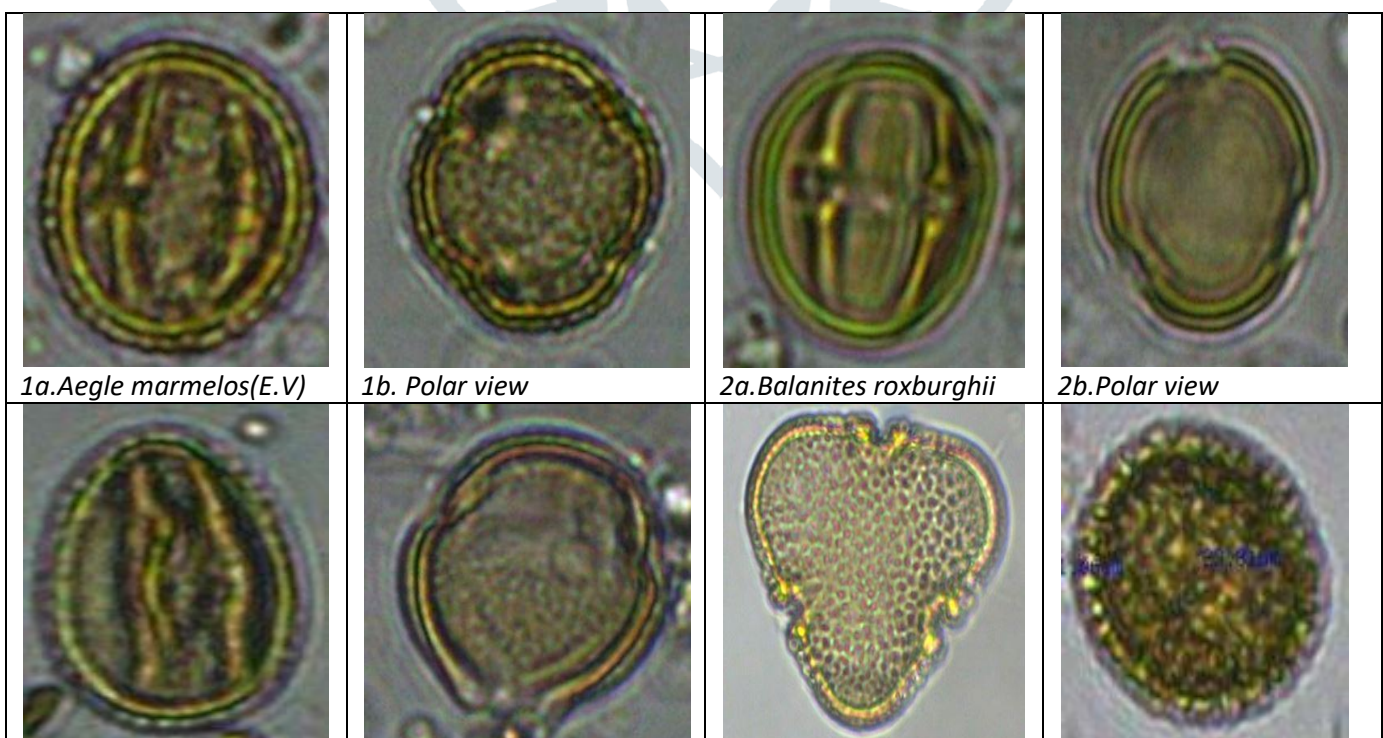
13 . Exine thickness < 1.5 µm

14 . Grains size 24.91 µm _____ *Bauhenia racemosa*

14 . Grains size 15.17 µm _____ *Capparis grandis*

Pollen photomicrographs of 15 plant species from Manchippa Reserve Forest, Nizamabad.

Plate : 1




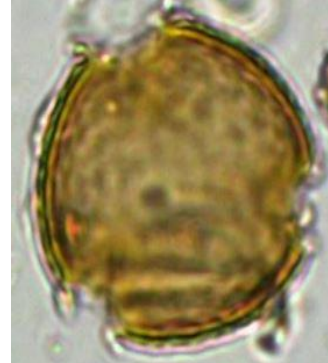

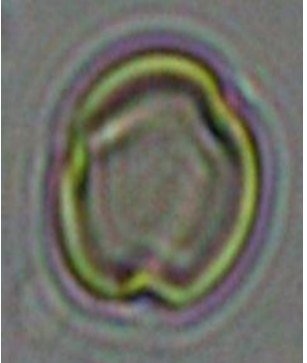
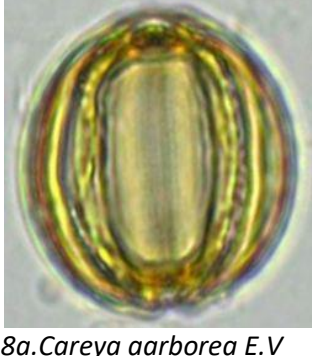



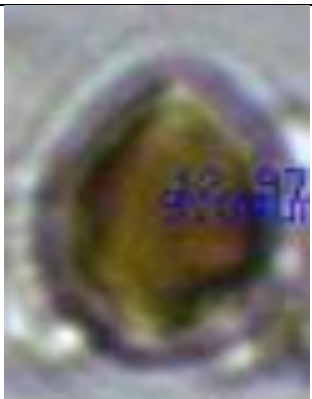

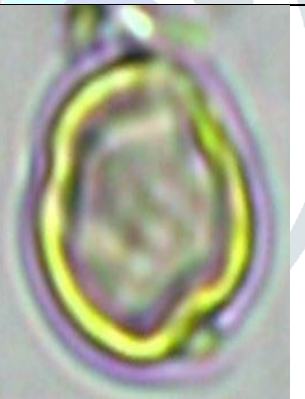



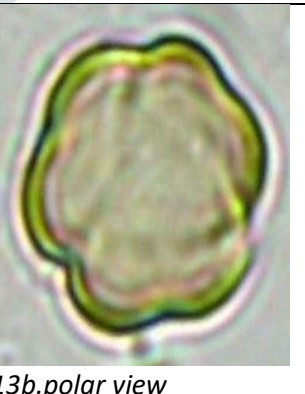

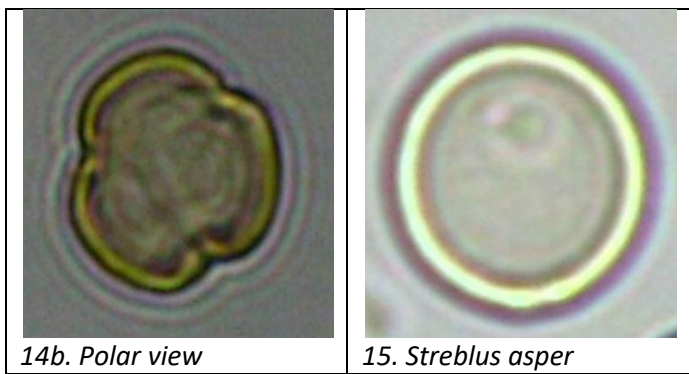
3a. <i>Bauhenia racemosa</i>	3b. Polar view	4. <i>Bombax ceiba</i> P.V.	5. <i>Bridelia montana</i>
			
6a. <i>Butea superba</i> E.V.	6b. Polar view	7a. <i>Capparis grandis</i> E.V	7b. Polar view
			
8a. <i>Careya aarborea</i> E.V	8b. Polar view	9a. <i>Cassia absus</i> E.V.	9b. Polar view

Plate : 2

			
10. <i>Cissampelos pareira</i>	11a. <i>Cordia dichotoma</i> E.V.	11b. Polar View	12a. <i>Dolichandrone falcate</i> E.V.
			
12b. Polar view	13a. <i>Ehretia laevis</i> E.V	13b. polar view	14a. <i>Maerua oblongifolia</i>



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