

Pollen morphology of Mimosoideae family from Manchippa Reserve Forest, Nizamabad district, Telangana state.

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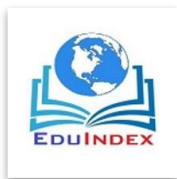
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ABSTRACT

Pollen morphological studies were carried out in 23 plant species of Mimosoideae family from Manchippa Reserve Forest, Nizamabad district. The pollen characters studied are type of pollen units, size, shape, aperture and ornamentation types. Spheroidal, prolate spheroidal, euprolate, sub prolate, oblate and oblate spheroidal type shapes of the pollen grains are recorded. Aperture types noticed are inaperturate and trizonocolporate. Ornamentations found are psilate, microreticulate, granulate, verrucate, foveolate, punctuate - foveolate. Individual monad grain size and shape of polyads helps in the identification of species. External morphology of this family shows diversity in habit such as herbs, shrubs and trees. Bipinnately compound leaves, armed and unarmed plants. Inflorescence 2 or 3 coloured or concolourous. Flowers are in racemose spikes and globose heads, stamens are definite and indefinite. Pods curved/ spirally twisted or straight. The pollen morphology of Mimosoideae also shows diversity in type of grains, size, shape, apertures and ornamentation which aids in the identification of taxa and useful in taxonomy and Palynological studies of Nizamabad district in future.

Key words : Palynology, Manchippa reserve forest, mimisoideae.

INTRODUCTION



Pollen grains are coarse to powdery material produced by flowering plants are the natural markers that does not decay due to the resistant organic walled substance sporopollenin. Pollen can be used to determine pollination mechanisms, foraging resources, migration routes and source zones of insects and other pollinators. Thus specific information can be obtained from pollen studies.

Nizamabad district situated in northern part of the Telangana state, lies between $18^{\circ} 05'$ and 19° of northern latitudes and $77^{\circ} 40'$ and $78^{\circ} 37'$ 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. 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 have two forest divisions, Nizamabad Division and Armour division. Manchippa Reserve forest comes under Nizamabad south range of Nizamabad Forest Division. This Reserve Forest is distributed in 16,213.96 hectares (162 km^2) of area covers more than 23 villages. The present work aimed at studying the pollen morphology of 23 taxa of Mimosoideae family, highlighting the characters of diagnostic importance in taxonomy and to serve as a reference pollen guide for future reference.

MATERIALS and METHODOLOGY

Present work was carried out during the period of 2018, pollen material was collected from 23 plants of Mimosoideae family from Manchippa 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 binocular research microscope LABOMED Lx 500, and noted the pollen characters (plates 1&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.

RESULTS

Anthers from unopened flower buds of 23 Plant species from Mimosoideae were collected and pollen slides were prepared by means of Acetolysis technique prescribed by G.Erdtmann (1960). The pollen slides were observed under binocular research microscope. The pollen characters observed are noticed in the Table 1.

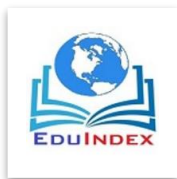
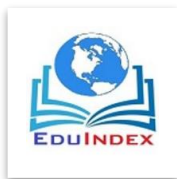


Table 1. Pollen morphology of 23 species of Mimosoideae from Manchippa Reserve Forest.

Sl. no	Name of the plant	Pollen units	Size P.A.	Size E.A.	P/E x 100	shape	aperture	ornamentation
1	Mimosoideae Acacia auriculiformis A.Cunn. ex Benth.	Polyad	38.81 μm	38.32 μm	1.02	spheroidal	inaperturate	psilate
2	Acacia cambagei R.T.Baker	polyad	42.13 μm	41.32 μm	1	spheroidal	inaperturate	psilate
3	Acacia catechu (Linn f.) Willd.	Polyad	37.42 μm	38.32 μm	1	spheroidal	inaperturate	psilate
4	Acacia chundra Willd	polyad	40.53 μm	41.32 μm	1	spheroidal	inaperturate	psilate
5	Acacia farinosa Lindl.	Polyad	51.73 μm	52.32 μm	1	spheroidal	inaperturate	micro reticulate
6	Acacia holosericea A.Cunn. ex G.Don	polyad	57.40 μm	56.32 μm	1.02	spheroidal	inaperturate	psilate
7	Acacia leucocephala Willd	Polyad	41.51 μm	40.32 μm	1.03	spheroidal	inaperturate	granulate



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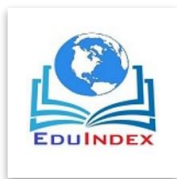
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8	Acacia nilotica (L.) Willd. ex Delile	polyad	135.1 1 μ m	128.3 2 μ m	1.05	spheroidal	inaperturate	granulate
9	Adenantha pavonina L.	Polyad	85.76 μ m	84.32 μ m	1	spheroidal	inaperturate	psilate
10	Albizia amara (Roxb.) B.Boivin	polyad	73.32 μ m	66.76 μ m	1.09	prolate spheroidal	inaperturate	psilate
11	Albizia lebbeck (L.) Benth.	Polyad	66.31 μ m	68.32 μ m	0.97	spheroidal	inaperturate	psilate
12	Albizia odoratissima (L.f.) Benth.	polyad	87.82 μ m	88.12 μ m	1	spheroidal	inaperturate	psilate
13	Albizia procera (Roxb.) Benth.	Polyad	74.68 μ m	72.32 μ m	1.03	spheroidal	inaperturate	psilate
14	Albizia saman (Jacq.) Merr.	polyad	99.05 μ m	100.3 8 μ m	0.94	oblate spheroidal	inaperturate	psilate
15	Dichrostachys cinerea (L.) Wight & Arn.	tetrad	43.65 μ m	43.19 μ m	1.01	sub prolate	inaperturate	verrucate
16	Leucaena leucocephala (Lam.) de Wit	monad	58.32 μ m	42.86 μ m	1.36	euprolate	trizonocolpor ate	punctuate - foveolate
17	Mimosa hamata Willd.	octad	11.30	12.03	1	circular	inaperturate	foveolate



			μm	μm				
18	Mimosa pudica L.	tetrad	43.65 μm	42.32 μm	1.02	spheroidal	inaperturate	verrucate
19	Parkia biglandulosa Wight & Arn	polyad	96.05 μm	98.02 μm	0.97	spheroidal	inaperturate	verrucate
20	Pithecellobium dulce (Roxb.) Benth.	polyad	77.62 μm	78.32 μm	1	spheroidal	inaperturate	psilate
21	Prosopis cineraria (L.) Druce	monad	34.69 μm	27.99 μm	1.23	subprolate	trizonocolpor ate	microreticul ate
22	Prosopis juliflora (Sw.) DC.	monad	32.79 μm	23.58 μm	1.39	euprolate	trizonocolpor ate	psilate
23	Senegalia torta (Roxb.) Maslin, Seigler & Ebinger	polyad	85.50 μm	84.32 μm	1	spheroidal	inaperturate	psilate

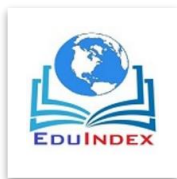
Pollen key was prepared for the identification of 23 species of Mimosoideae from Manchippa reserve forest, Nizamabad district.

Family : Mimosoideae

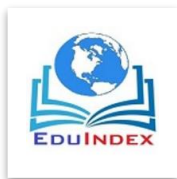
Key

1a .Pollen grains are monads

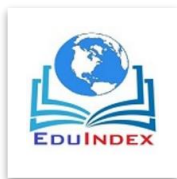
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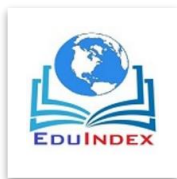
- 2a. Grains subprolate shaped, microreticulate -----*Prosopis cineraria*
- 2b. Grains euprolate shaped -----3
- 3a. ornamentation psilate ----- *Prosopis juliflora*
- 3b. ornamentation punctate – foveolate -----*Leucaena leucocephala*
- 1b. Pollen grains are polyads -----4**
- 4a. Polyads < 16 monads -----5**
- 5a. Polyads with 8 monads -----*Mimosa hamata*
- 5b. Polyads with 4 monads (tetrads) -----6
- 6a. Subprolate shaped and verrucate ornamentation -----*Dichrostachys cinerea*
- 6b. Spheroidal shape, verrucate ----- *Mimosa pudica*
- 4b. Polyads with 16 / > 16 monads -----7**
- 7a. Polyads with 32 monads -----*Albizia saman*
- 7b. Polyads with 16 monads -----8
- 8a. Ornamentation psilate -----9**
- 9a. size < 50 μ m -----10



- 10a. monad shape squarish -----11
- 11a. monad size 15.34 μm ----- *Acacia auriculiformis*
- 11b. monad size 18.22 μm -----*Acacia chundra*
- 10b. monad shape squarish – rectangular -----12
- 12a. monad size 12.22 μm -----*Acacia catechu*
- 12b. monad size 14.73 μm ----- *Acacia cambagei*
- 9b. size > 50 μm** -----13
- 13a. grains prolate spheroidal in shape ----- *Albizia amara*
- 13b. grains spheroidal in shape -----14
- 14a. monads squarish in shape ----- *Acacia holosericea*
- 14b. monads rectangular/ squarish rectangular in shape -----15
- 15a. monad squarish rectangular shape, 31.24 μm in size
-----*Adenantha pavonina*
- 15b. monads rectangular shape -----16
- 16a. monads size < 20 μm -----17



- 17a. exine 1.5 μm in thickness ----*Pithecellobium dulce*
- 17b. exine 2.5 μm in thickness ----*Senegalia torta*
- 16b. monads size > 20 μm ----18
- 18a. exine > 2.5 μm thick ---- *Albizia odoratissima*
- 18b. exine < 2.5 μm thick ----19
- 19a. exine 2.34 μm thick ----*Albizia lebbeck*
- 19b. exine 2.4 μm thick ---- *Albizia procera*
- 8b. Ornamentation other than psilate** ---- 20
- 20a. size > 100 μm ---- *Acacia nilotica*
- 20b. Size < 100 μm ---- 21
- 21a. ornamentation verrucate ---- *Parkia biglandulosa*
- 21b. Ornamentation other than verrucate ----22
- 22a. Ornamentation granulate ---- *Acacia leucocephloea*
- 22b. Ornamentation microreticulate ---- *Acacia farinosa*



DISCUSSION

Mimosoideae family is well established and wide spread due to highly effective reproductive system, capable of producing enormous number of viable seeds (Panicker and Sreedevi, 2004).

Eurypalynous condition was observed in Mimosoideae family, with diversity in the type of grains. The pollen grains in this family occurs as monads, tetrads, octads and polyads. Monad grains with trizonocolporate and punctuate – foveolate ornamentation in *Leucaena leucocephala*, microreticulate in *Prosopis cineraria* and psilate ornamentation in *P. juliflora*.

Tetrads with inaperturate and verrucate ornamentation in *Dichrostachys cinerea* and *Mimosa pudica*. Octad grains with inaperturate and foveolate ornamentation in *Mimosa hamata*.

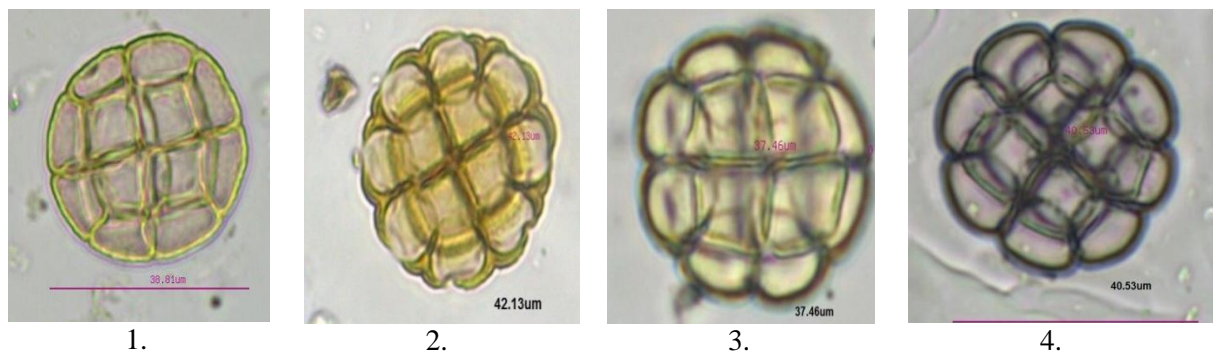
Polyads with inaperturate and psilate ornamentation was found in *Acacia auriculiformis*. *A. cambagei*, *A. catechu*, *A. chundra*, *A. holosericea*, *Adenantha pavonina*, *Albizia amara*, *A. lebbeck*, *A. odoratissima*, *A. procera*, *A. saman* and *Senegalia torta* (syn. *Acacia torta*). *Parkia biglandulosa* shows inaperturate and verrucose ornamentation.

Related to the arrangement of grains, Panicker K.T.C. (2004) informed that on the base of evolution monad type grains are primitive, while the grains with polyad arrangement are most advanced. On the base of studies by Elias T.S. et.al (1981) the evolutionary pattern of pollen grains through monads to tetrads to polyads which coincided with the development of bird and bat pollinated flowers. This work infers species showing monad arrangement evolved first, followed by polyad grains. In his study Paal et.al (1993a) found that taxa having tricolporate

pollen are advanced, where as taxa with polyad / colpate type pollen shows primitive status in the evolutionary scale. Tricolpate pollen is the main and basic type found in most eudicots while other aperture types usch as penta, hexacolpate, porate, colporate and pororate are regarded as derived among eudicots (Walker and Doyle, 1975).

The diverse morphological characters of pollen grains gives clue of the significance of palynology in separation of taxa. Palynological characters specially the exine sculpturing serves an aid in delimitation of taxa for identification and classification at species and generic level of family Leguminosae.

Plate : 1 Mimosoideae





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6.



7.



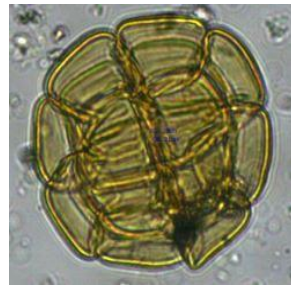
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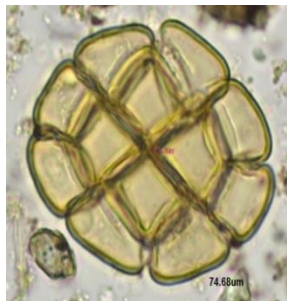
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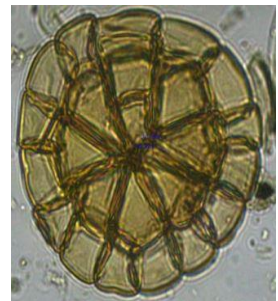
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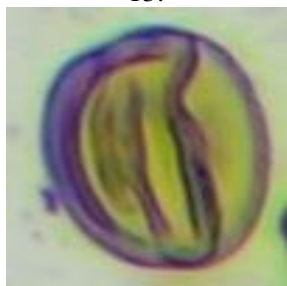
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15a



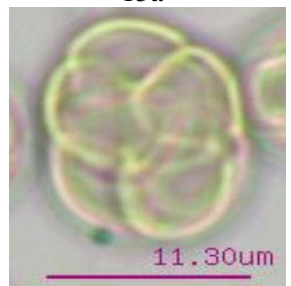
15b.



16a.



16b.



17.



18.

1. *Acacia auriculiformis*
 5. *Acacia farinosa*

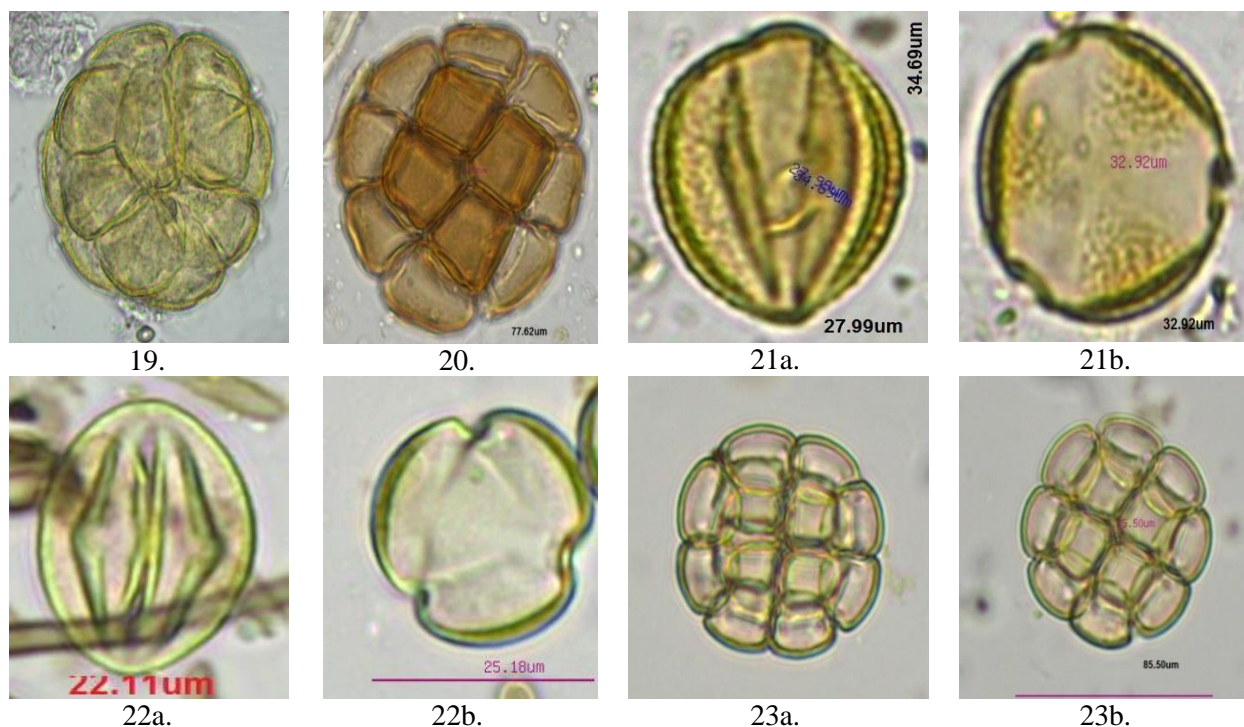
2. *Acacia campbagei*
 6. *Acacia holoserica*

3. *Acacia catechu*
 7. *Acacia leucophloea*

4. *Acacia chundra*
 8. *Acacia nilotica*

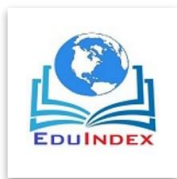
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|---|--------------------------|---------------------------------------|---------------------------------|
| 9. <i>Adenantha pavonina</i> | 10. <i>Albizia amara</i> | 11. <i>Albizia lebbek</i> | 12. <i>Albizia odoratissima</i> |
| 13. <i>Albizia procera leucocephala</i> | 14. <i>Albizia saman</i> | 15a,b. <i>Dichrostachys cineraria</i> | 16a,b. <i>Leucaena</i> |
| | 17. <i>Mimosa hamata</i> | 18. <i>Mimosa pudica</i> | |

Plate : 2



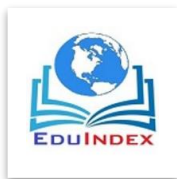
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| 19. <i>Parkia biglandulosa</i> | 20. <i>Pithecellobium dulce</i> | 21a,b <i>Prosopis cineraria</i> |
| 22a,b <i>Prosopis julifera</i> | 23a,b <i>Senegalia torta</i> | |

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