How to Cite:
Kumar, Y., Ramakrishna, H., & Devender, R. (2022). Tricolporate pollen of caesalpiniaceae medicinal plants at Kotla Vijaya Bhaskara Reddy botanical garden in Cyberabad, Telangana. *International Journal of Health Sciences*, *6*(S6), 10038–10046. https://doi.org/10.53730/ijhs.v6nS6.12598

Tricolporate pollen of caesalpiniaceae medicinal plants at Kotla Vijaya Bhaskara Reddy botanical garden in Cyberabad, Telangana

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***Abstract*---**This paper presents the study of a tricolporate pollen morphology of 08 Caesalpiniaceae medicinal plant taxa viz. *Bauhinia purpurea* L., *Caesalpinia pulcherrima* (L.) SW.,*Cassia fistula* L., *Delonix regia* (Hook.) Raf., *Peltophorum pterocarpum* (DC.) K.Heyne., *Senna auriculata L., S. sophera* (L.), Roxb. and *Tamarindus indica* L. The flower buds of these plants were collected from blocked category of Cyberabad area i.e. Kotla Vijaya Bhaskara Reddy Botanical Garden. By using Erdtman's (1960) acetolysis technique, the collected flower buds were processed. The result of the study showed that Caesalpiniaceae tricolporate pollen grains have diversity in their pollen morphological characters like Polarity, Symmetry, Shape, Aperture and Sporoderm. The observations of this study will be useful for authentic identification of the taxa of Caesalpiniaceae.

***Keywords*---**Tricolporate, Kotla Vijayabhaskararareddy, botanical garden, caesalpiniaceae.

Introduction

Cyberabad is a technological hub with a radius of 52.48 km spreading approximately around 15,000 acres area, located in Hyderabad District, Telangana, India. Cyberabad is all about IT hub, IT companies and MNCs. Kotla

Vijaya Bhaskara Reddy Botanical Garden is located in the Cyberabad. It is situated in between latitude 17° 27' 58.9392"and longitude: 78° 20' 17. 9232". Caesalpiniaceae family contains a number of medicinal plants. The aperture is the dominant character for identification of the pollen taxa. An aperture,a germpore, is the dominant charavter for identification of pollen taxa. Caesalpiniaceae pollen grains are having diversified apertural characters viz., Inaperturate, colpate, porate and colporate. Most of the Caesalpiniaceae pollen grains are tricolporate which may be useful as a taxonomic tool for identification of palynotaxa.

Methodology

In this study, 08 medicinal plants flower buds of the Caesalpiniaceae were collected from blocked category i.e. Kotla Vijaya Bhaskara Reddy Botanical Garden of Cyberabad during 2021 to 2022. The collected flower buds were processed by means of Erdtman's (1960) acetolysis technique to recover the pollen. The morphological characters of pollen were studied under Olympus trinocular research microscope. The pollen slides were preserved in Palaeobotany-Palynology research lab, University college of Science, Saifabad, Osmania University, Hyderabad

Observation

The author studied 8 medicinal plants of Ceasalpiniaceae which are having various medicinal properties viz., *Bauhinia purpurea* L., *Caesalpinia pulcherrima* (L.) SW., *Cassia fistula* L., *Delonix regia* (Hook.) Raf. *Peltophorum pterocarpum* (DC.) K.Heyne., *Senna auriculata L., Senna sophera* (L.) Roxb. and *Tamarindus indica* L. are collected from Kotla Vijaya Bhaskara Reddy Botanical Garden. These pollen were studied and recorded the diversity of pollen morphological characters.

***Bauhinia purpurea* L.**

Bark : Anti- diabetic, Fibrolytic, Anti-Obesity
Root : Antimalarial, Anti-fungal, Anti bacterium, Anticancer
Leaves : Antimicrobial, Amelioration of Hyperthyroidism, Antiseptic, Anti-inflammatory Antipyretic activity and Anti-Ulcer

Pollen Morphology

Aperture : Tricolporate, colpi broad,blunt ends, ora lalongate.
Polarity : Isopolar
Polar view (Amb) : Triangular 45-50µm
Shape : Prolate- spheroidal
Size : Polar Axis 59-65 µm. Equatorial Axis 64-69 µm.
Symmetry : Bilateral
Exine stratification : 2- 2.8 µm thick, sexine 1-1.5µm thick, nexine 1-1.3µm thick.
Ornamentation : Striate-reticulate.

***Caesaipinia pulcherrima* (L.) SW**
Medicinal uses

Root: Used in the treatment of diarrhoea and miscarriage
Leaves: Miscarriage, stimulates menstrual flow, reduces fever and used to treat in stomach-aches

Pollen Morphology

Aperture : Tricolporate, elongated colpi with acute tips, lalongate ora.
Polarity : Isopolar
Polar view (Amb) : Round 52.3µm.
Shape : Spheroidal
Size : Polar Axis - 68-70 µm, Equatorial Axis- 68.8-70.5µm.
Symmetry : Radial
Sporoderm stratification : 3.2 µm thick, sexine and nexine almost equal
Ornamentation : Reticulate

***Cassia fisula* L.**
Medicinal uses

Stem, Leaves, Flower : Antioxidant
Stem bark : Anti-inflammtory, Anti diabetic
Leaves : Wound Healing, Anti- Ulcer
Legume : Hypolipidemic activity
Seeds : Anticancer activity, Anti fertility

Pollen Morphology

Aperture : Tricolporate.
Polarity : Isopolar
Polar view (Amb) : triangular, 29. µm
Shape : Prolate- spheroidal
Size : Polar Axis - 27-30µm, Equatorial Axis - 24-27 µm
Symmetry : Radial
Exine stratification : 1.5-2.5 µm thick, both the sexine and nexine are similar in thickness.
Ornamentation : Reticulate.

Delonix regia (Hook.) Raf.

Bark : reduce fever, laxative, flatulence, emetic, CNS depressant, preventing periodic returns of disease and used in the treatment of anemia and fever
Flowers : Gynecological disorders destroy parasitic worms, reduce fever, inflammation, diarrhoea
Leaves : Anti-diabetic, body pain gastric problems, respiratory infection and rheumatic joints pain
Root : Gastric problems

Pollen Morphology

Aperture : Tricolporate, elongated colpi with blunt ends, ora faint more or less
Polarity : Isopolar
Polar view (Amb) : Round 50-54 µm.
Shape : Oblate- spheroidal
Size : polar Axis 53-54 µm, Equatorial Axis 57-60 µm
Symmetry : Bilateral
Exine stratification : 5.2µm thick, sexine 3 µm thick, nexine 2 µm thick, sexine thicker than nexine.
Ornamentation : Reticulate

Peltophorum Pterocarpum (DC.) K.Heyne

Medicinal uses

Bark : Used as in reduce joint pains, and swelling and as a lotion for eye troubles, contusion, muscular pains and reduce pains after birth. It is also used for gargles and tooth powders
Leaflets and buds: Used as Fungicides
Flowers : Used as Bacteriocides and anti-inflammatory effect

Pollen Morphology

Aperture : Tricolporate, elongated colpi with acute tips, lalongate.
Polarity : Isopolar
Polar view (Amb) : Round 45-47.5µm.
Shape : Sub-prolate
Size : Polar Axis 48-50 um,Equatorial Axis 39-41µm.
Symmetry : Bilateral
Sporoderm stratification : 4µm thick, sexine thicker than nexine.
Ornamentation : Reticulate, muri 4.5µm, polygonal

***Senna auriculata* L.**
Medicinal uses

Flowers : These are used to cure urinary discharges, ejaculations during sleep, anti-diabetic and throat irritation.
Bark : These are used to address the dermatology issues.
Leaf extract : Its nature is to protect the liver related problems that occur due to the consumption of alcohol, protects from alcohol induced oxidative stress and also softens the skin tone.
Seeds : They are used to control the inflammation of an eye or conjunctiva.
Roots : They are used to treat the skin diseases and pulmonary problems.
Fruits : They are used to treat for anthelmintic parasites

Pollen Morphology

Aperture : Trizonocolporate.
Polarity : Isopolar
Polar view (Amb) : Triangular 26-28µm.
Shape : Prolate
Size : Polar Axis 37.2µm, Equatorial Axis 25.3µm.
Symmetry : Bilateral
Exine stratification : 1.4µm thick, both the sexine and nexine are similar in their thickness.
Ornamentation : Reticulate.

***Senna sophera (*L.) Roxb**

Medicinal uses

Bark : Used in pulmonary diseases
Leaves, root : Asthma, bronchitis, bloating, Gonorrhea

Morphology

Aperture : Tricolporate
Polarity : Isopolar
Polar view (Amb) : Triangular 45-46µm.
Shape : Prolate
Size : Polar Axis 24-25 µm, Equatorial Axis 41-42µm.
Symmetry : Bilateral
Exine stratification : Exine 1.8µm thick, both the sexine and nexine are similar in their thickness.
Ornamentation : Granular

Tamarindus indica L.

Flower : Microbial infections
Fruit pulp : Cold, Fever Laxtive scury
Leaf : Hypotension, Respiratory disorders
Bark : Jaundice, pain
Seeds : Antidiabetic, pepticulcers.

Pollen Morphology

Aperture : Tricolporate.
Polarity : Isopolar
Polar view (Amb) : 42µm
Shape : Oblate -spheroidal
Size : Polar Axis 33.8µm, Equatorial Axis 43.8µm.
Symmetry : Radial
Sporoderm stratification : Exine 1.5µm thick, both the sexine and nexine are similar in their thickness.
Ornamentation : Striate.

Table 1
Diversified pollen characters

S.no	Palynotaxa	Symmetry	Size	Shape	Sporoderm	Medicinal use
1	*Bauhinia purpurea* L.	Bilateral	PA:59-65 µm.EA: 64-69µm.	Prolate-spheroidal	Striate-reticulate	Anti-diabetic, anti-obesity,antimicrobial
2	*Caesaipinia pulcherrima* (L.) SW.	Radial	PA: 68-70 µm. EA-68.8-70.5µm.	Spheroidal	Reticulate	Miscarriage,stimulates Menstrual flow., reduce fever
3	*Cassia fisula* L	Radial	PA:29.8µm. EA: 26.9µm	Prolate-spheroidal	Reticulate	Antiondant activity Anti-inflammtory , Anti-diabetic, Wound Healing, Anti- Ulcer Hypo-lipidemic activity Anti-cancer, Anti-fertility
4	*Delonix regia* (Hook.) Raf.	Bilateral	PA:53-554µm. EA:57-60µm	Oblate-Spheroidal	Reticulate	Reduce fever, laxative, flatulence, emetic, CNS depressant, preventing periodic returns of disease and used in the treatment of anemia and fever
5	*Peltophorum Pterocarpum* (DC.) K.Heyne	Bilateral	PA:48-50µm. EA:39-41µm	Sub-Prolate	Reticulate	Reduce joint pains, swelling and as a lotion for eye troubles, contusion, muscular pains and reduce pains after birth. It is also used for gargles and tooth powders, Anti-microbial activity
6	*Senna auriculata* L.	Bilateral	PA:37.2µm. EA: 25.3µm	Prolate	Reticulate	To cure the liver related problems; protects from alcohol induced oxidative stress and also softens the skin tone.
7	*S.sophera*(L.) Roxb	Bilateral	PA:24µm EA:4µm	Prolate	Granular	Used in Pulmonary diseases, bloating,

						gonorrhoea
8	*Tamarindus indica* L.,	Radial	PA:33.8µm. EA: 43.8µm	Oblate-Spheroidal	Striate	Microbial infections Laxative, scurvy Hypo-tension, Respiratory, Anti-diabetic,peptic ulcers.

Discussion

The diversified pollen characters viz., symmetry, shape, aperture and sporoderm are useful for authentic identification of taxa. The 08 taxa belong to Caesalpiniaceae have common tricolporate pollen characters but variation in the other characters (Table-1 & Plate-1). These tricolporate pollen exhibit variation in the position of aperture i.e trizonocolporate, tricolporate. *Cassia auriculata* L. is a trizonocolporate, remaining 7 plants are colporate. These recorded taxa show diversity in symmetry, shape and ornamentation. Radial symmetric polynotaxa are *Caesalpinia pulcherrima* (L.) SW., *Cassia fistula* L., *Tamarindus indica* L., and Bilaterally symmetric are *Bauhinia purpurea* L., *Delonix regia* (Hook.) Raf., *Peltophorum pterocarpum* (DC.) K.Heyne., *Senna auriculata* L., and *S. sophera* (L.) Roxb.,Prolate-spheroidal shape taxa are *Bauhinia purpurea* L,, *Cassia fistula* L., and *Caesalpinia pulcherrima* (L.) whereas Oblate-spheroidal is in *Delonix regia* (Hook.), *Tamarindus indica* L., Prolate shape is in *Senna auriculata, S. sophera* (L.) Roxb., Sub-prolate in, *Peltophorum pterocarpum* (DC.) K.Heyne. Spheroidal is in *Caesalpinia pulcherrima* (L.). Reticulate ornamentation is recorded in *Delonix regia* (Hook.) Raf., *Peltophorum pterocarpum* (DC.) K.Heyne., *Senna auriculata* L., *Caesalpinia pulcherrima* (L.) SW, *Cassia fistula* L. Straitae reticulate was recorded in *Bauhinia purpurea* L, Striate ornamentation was recorded in *Tamarindus indica* L., and granular was present in *Senna sophera* (L.).

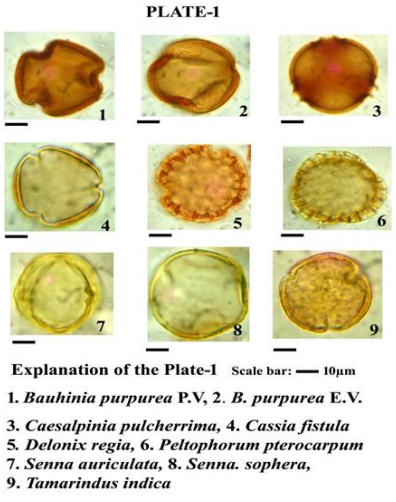

Plate 1. Tricolporate pollen of Caesalpiniaceae

All the 8 taxa are useful for medicinal purpose to cure various diseases. These taxa were earlier recorded in various honey samples of Adilabad, Medak, Nizamabad and Mahabubnagar districts of Telangana State,Visakhapatnam district of Andhra Pradesh and Howrah district of West Bengal (Swathi and Ramakrishna 2012, 2013; Chaya and Varma 2008; Ramakrishna and Bushan 2004; Devender et.al., 2016, 2017; Devender and Ramakrishna 2013; Chakraborty and Saha 2019) and spider webs of Hyderabad and Warangal districts of Telangana (Vijayabhaskar Reddy et.al., 2004 and Seetharam et.al., 2015)

Acknowledgement

We are grateful to the Principal and Head Department of Botany, U.C.S, Saifabad O.U. for providing lab facilities and Head and Board of Studies Chairperson of department of Botany, O.U.

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