

Pollen diversity of some important medicinal plants used in traditional system of medicine from Telangana region of South India.

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ABSTRACT

Medicinal plants play a major role in traditional system of medicine and they form a large group of economically important plants that provide the basic raw material for indigenous pharmaceuticals. Identification of the authentic original medicinal plants is utmost important for the preparation of genuine crude/raw drugs. Pollen morphology is one of the important tool for the taxonomic studies and helps in the identification of medicinal plants. Pollen characterization of five medicinal/drug yielding plants viz., *Carum copticum*, *Coriandrum sativum*, *Ricinus cummunis*, *Syzygium cumini*, and *Citrus limon* collected from Telangana region of South India during 2021 – 2022 was carried out by using Light Microscope (LM). The different species of palynotaxa showed great morphological diversity. The pollen grains showed variations in size, shape, apertural pattern and sporoderm ornamentation. The apertural pattern include tricolporate and tetracolporate forms which are of compound type. Pollen of *Carum copticum*, *Coriandrum sativum*, *Ricinus communis*, and *Syzygium cumini*, are tricolporate and *Citrus limon* showed tetracolporate apertural type. The exine ornamentation diversity is indicated by reticulate, psilate, and microreticulate pattern. The plants studied in the present work were known for their medicinal use in traditional system of medicine.

Key words: Pollen morphology; medicinal plants; crude/raw drugs; Ayurvedic medicine; Telangana state; South India.

Introduction

India has a wealth of medicinal plants and more than 7000 plants in the Indian subcontinent are used for medicinal purposes, but only about 1200 to 1500 have been added to the official ayurvedic pharmacopoeia in more than 3000 years. Traditional Indian medicine or Ayurveda is becoming more popular in developing countries because it works well for many long-term illnesses. Medicinal plants play a major role in traditional system of medicine and they form a large group of economically important plants that provide the basic raw material for indigenous pharmaceuticals. Identification of the authentic original medicinal plants is very important criteria in the preparation and formulation of genuine crude/raw drugs. Pollen morphology studies find a significant application in taxonomy and helps in the precise identification of medicinal plants. The present work deals with the pollen characterization of five important medicinal/drug yielding plants of Telangana region of South India with a view to study the pollen morphology viz., size, shape, apertural patten, sporoderm ornamentation etc. The variations in pollen morphological characters are like fingerprints and are useful in identification of the medicinal plants up to the species level.

Material and method

Polleniferous material of five medicinal/drug yielding plants viz. *Carum copticum*, *Coriandrum sativum*, *Ricinus communis*, *Syzygium cumini*, and *Citrus limon* were collected from Telangana region of south India during 2021-2022 and pollen slides were prepared by using Erdtman's acetolysis technique (1960). The anthers of the medicinal plants were picked with the help of forceps in to a test tube containing 70% alcohol. With help of a glass rod the anthers were crushed and the suspension was filtered through a brass mesh. The filtrate is centrifuged to get the pollen sediment to which 5ml. of glacial acetic acid is added and centrifuged. Later the pollen sediment was subjected to Erdtman's acetolysis technique (1960) and treated with acetolysis mixture prepared by using 9 parts of acetic anhydride and 1 part of conc. H₂SO₄. Three slides were prepared for each pollen type and mounting is done in 50% glycerin. The prepared pollen slides were scanned under Light Microscope (LM) and morphological characters were studied by using standard literature (Erdtman, G. 1952, 1897, Moore, P.D and Webb, J.A. 1978, Punt et al., 2007). Photomicrographs of the pollen types were carried out by using Olympus trinocular microscope attached with a Sony digital camera.

Results

Pollen analysis of five medicinal plants viz., *Carum copticum*, *Coriandrum sativum*, *Ricinus communis*, *Syzygium cumini*, and *Citrus limon* belonging to four families were carried out to study the pollen morphological characters. Pollen grains showed diversity in morphological characters in size, shape, symmetry, apertural pattern and sporoderm ornamentation. The detailed pollen morphological characters of the medicinal plants studied include

***Carum copticum* Benth.**

Pollen grains are in monads, 16 – 20 µm; amb seen only occasionally, rounded, triangular, 27-29X 11-14 µm, perprolate, radially symmetrical. Apertural pattern tricolporate, colpi long, ends tapering, ora circular to lalongate. Exine 1.6µm at poles and 2.5µm at the equatorial region, subtectate, surface very finely reticulate.

2. *Coriandrum sativum* Linn.

Pollen grains are in monads, 23-28µm; amb seen only occasionally rounded triangular, 35-38X15-16 µm, perprolate constricted at the equator; radially symmetrical. Apertural pattern tricolporate, colpi long, narrow, ora circular. Exine 1.5 – 2µm thick at poles and 2.5-3.5 µm thick at equator, subtectate, surface finely reticulate.

3. *Syzygium cumini* (Linn) Skeels.

Pollen grains are in monads, 16-18 µm; amb triangular to rarely quadrangular, sides slightly concave 10.5-12X17-20µm oblate, radially symmetrical. Apertural pattern tricolporate, rarely tetracolporate, syncolpate, parasyncolpate, ora lalongate. Exine 1.25µm, thick, tectate surface granular to Psilate.

4. *Ricinus communis* Linn.

Pollen grains are in monads, 31-35µm; amb triangular to sub triangular 29-31X32-35µm sub oblate, radially symmetrical. Apertural pattern tricolporate, colpi ends pointed, ora lalongate. Exine 1.5µm thick, tectate surface finely reticulate, homobrochate.

5. *Citrus limon* (Linn.) Burm.

Pollen grains are in monads, 27-29µm; amb squarish 26-30X25-27µm prolate – spheroidal, radially symmetrical. Apertural pattern tetracolporate, colpi, linear, tips acute, ora lalongate. Exine 2µm thick, subtectate, surface reticulate, heterobrochate, meshes smaller near the apertural regions and larger elsewhere, lumina hexa to pentagonal or irregular, psilate, muri simple to locally duplibaculate.

Discussion

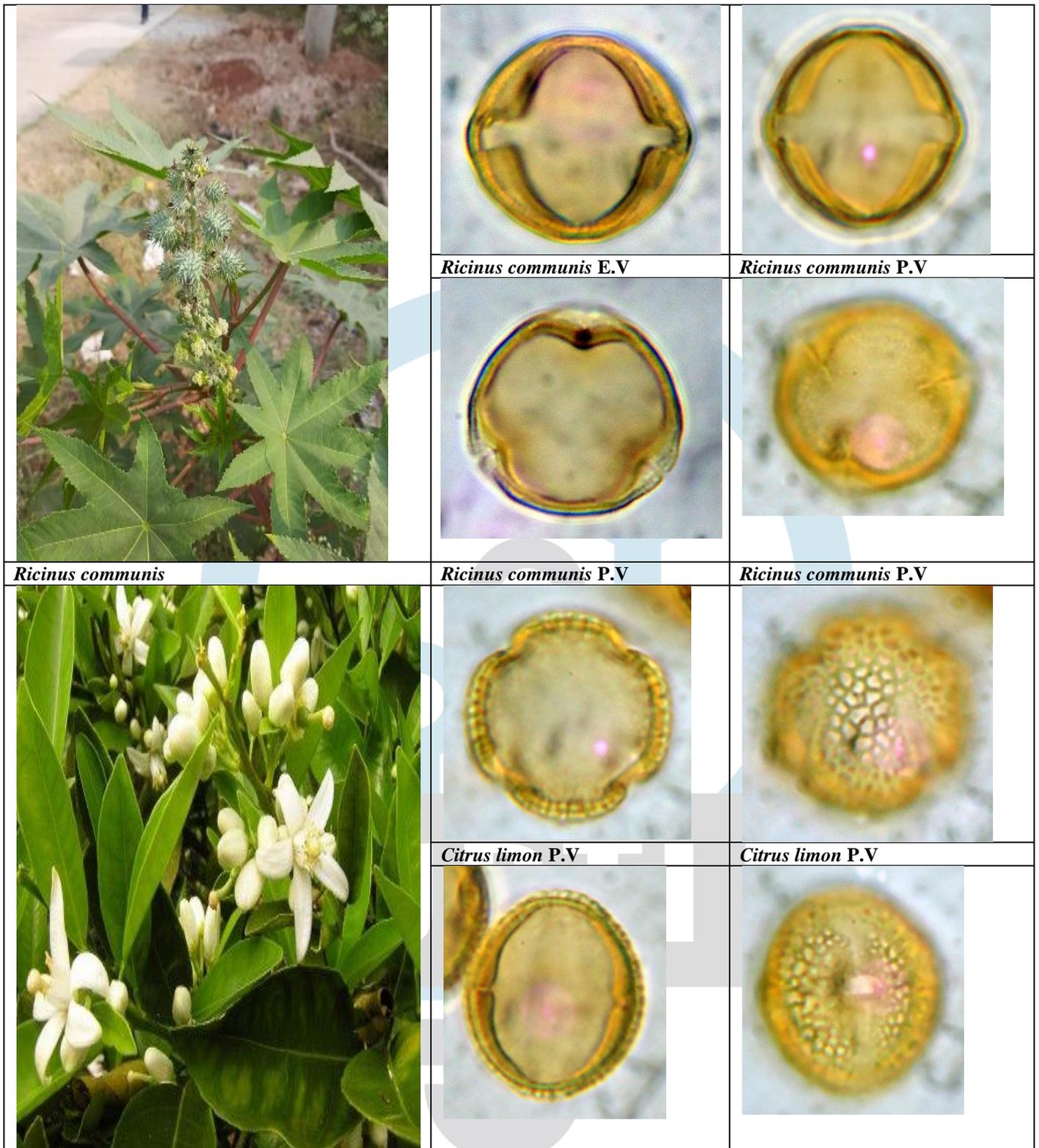
Pollen morphology studies of five medicinal plants revealed diverse morphological characters which are of taxonomical importance. Shape of pollen grains varies from Per-prolate (*Carum copticum*, *Coriandrum sativum*), Prolate-spheroidal (*Citrus limon*), Oblate (*Syzygium cumini*) and Sub-oblate (*Ricinus cumini*) types. The apertural diversity is indicated by tricolporate in *Carum copticum*, *Coriandrum sativum*, *Ricinus communis*, tricolporate and parasyncolpate in *Syzygium cumini* and tetracolporate in *Citrus limon*. The sporoderm thickness values from 1.25 µm to 2 µm thick and exine is of tectate and sub-tectate type. Exine ornamentation diversity include finely reticulate, psilate and reticulate pattern. Photomicrographs of the pollen types of medicinal plants studied are shown in plate-1. The plants studied were known for their medicinal uses in traditional system of medicine. They are used to cure various illness in Ayurvedic system of medicine (Mradu Gupta and Shaw 2009). Table -1 shows the medicinal value of the plants studied. The pollen morphological characters of the medicinal plants studied are useful in the identification of medicinal plants up to the species level as proper authentic identification is utmost important in the preparation of genuine crude/raw drugs and these studies gain importance in Pharmacognosy.

Table 1- Medicinal uses of the plants studied in the present work

S. No	Name of the plant	Local Name	Family	Habit	Plant part used	Medicinal use
1.	<i>Carum copticum</i> Benth.	Vamu / Ajwain	Apiaceae	Herb	seeds	Copticum has been used for bloating, fatigue, diarrhea, abdominal tumors, abdominal pain.
2.	<i>Coriandrum sativum</i> Linn.	Dhaniyalu, Kothimeer	Apiaceae	Herb	Leaf, fruits	Fruit decoction is used to stomach pain, constipation and diabetes.
3.	<i>Syzygium cumini</i> (Linn) Skeels.	Neredu	Myrtaceae	Tree	Bark, fruits, seeds	Hemorrhage, burning sensation, polyuria, diabetes mellitus and alleviating vata.
4.	<i>Ricinus communis</i> Linn.	Aamudam/c astor	Euphorbiaceae	Shrub	Roots, seeds	Skin diseases, worm infection, blood disorders, poisoning, and aphrodisiac.
5.	<i>Citrus limon</i> (Linn.) Burm.	Nimma	Rutaceae	Shrub	Fruits, juice, peel	Anorexia, distaste, liver disorders, vomiting, constipation, cough, dyspnea and worm infestation.

Plate -1, Pollen photomicrographs of the medicinal plants studied.

		
<p><i>Carum copticum</i></p>	<p><i>Carum copticum</i> E.V</p>	<p><i>Carum copticum</i> P.V</p>
		
<p><i>Coriandrum sativum</i></p>	<p><i>Coriandrum sativum</i> E.V</p>	<p><i>Coriandrum sativum</i> P.V</p>
		
<p><i>Syzygium cumini</i></p>	<p><i>Syzygium cumini</i> E.V</p>	<p><i>Syzygium cumini</i> P.V</p>



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