

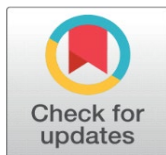
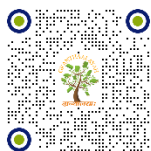
STUDIES ON THE POLLEN MORPHOLOGY OF SOME WEEDY FLORA OF NIZAMABAD DISTRICT OF TELANGANA STATE, INDIA

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ABSTRACT

The present work is aimed to study the pollen morphology of weed plants by light microscopy (LM). Polleniferous material of eight weed plants viz., *Mimosa pudica*, *Cleome viscosa*, *Tribulus terrestris*, *Lantana camara*, *Commelina benghalensis*, *Ziziphus mauritiana*, *Cardiospermum halicacabum* and *Datura stramonium* were collected from in and around agricultural lands of Nizamabad district, Telangana, India during 2022-2023. The pollen features viz., shape, apertures and the sporoderm pattern was studied. The pollen grains studied showed spheroidal, sub-prolate, eu-oblate, oblate-spheroidal, oblate to per oblate shape. The apertural diversity include tricolporate, triporate, pantoporate and monosulcate condition. The Exine ornamentation is indicated by psilate in three species, striate in two, reticulate in another two species and one species possess microechinate pattern. The diversity in pollen features are helpful in the identification of the taxa at various levels. This study highlights the some of the common weed pollen morphological features useful to distinguish the species of weeds.

Keywords: Pollen Grains, Weedy Flora, Light Microscope, Pollen Morphology, Nizamabad District, Telangana

1. INTRODUCTION

Weeds are the unwanted plants competing with crops and effect their yield. They hamper the development of the crops and greatly diminish the harvest. Weeds are more effective at absorbing plant nutrients than crop plants and grow more vigorously in drought conditions. They decrease the efficiency of inputs, disrupt farming methods, lower crop quality, and also serve as hosts for various crop pests

and diseases. Weeds thrive in arid areas due to their ability to withstand drought, quick growth from a vegetative stage to flowering, self-fertilization, and continuous seed production [Murthy & Prathiba \(1995\)](#). Some weeds also produce harmful substances that hinder crop growth. In traditional farming methods, weeds are manually pulled from fields using hands or tools like hoes. Another key approach to managing weed growth is intercropping between main crop rows. However, the increased use of chemical pesticides over the past fifty years, aimed at controlling weed growth among other issues, has led to numerous negative impacts on human health and the environment. The rise of herbicide-resistant weed populations is a significant concern in this context. For a successful weed management strategy that includes control, eradication, and prevention, it's crucial to accurately identify weeds based on their phenology, dispersal methods, distribution, and growth habits. Various characteristics are utilized in identifying plant taxa. Pollen characteristics are particularly useful for solving complex issues related to the interrelationships among different taxa and assessing their status within the classification, especially concerning their families, subfamilies, tribes, genera, species, and subspecies. A pollen study is an effective tool for identifying different species and taxa within their respective families. The unique characteristics of pollen are often described as a plant's "fingerprint." This method is applicable to all flowering plants. Each species has distinct pollen features, making pollen studies beneficial for taxonomic research and resolving issues related to the identity and authenticity of plant species. This study focuses on the pollen morphology of eight weed species collected from the Nizamabad district of Telangana State, with the goal of documenting pollen features that aid in the identification of these weed species.

2. MATERIALS AND METHODS

Fresh flowers from eight different weed species were gathered during their flowering phase between the years 2022 and 2023 from the Nizamabad district in Telangana, India. The selected weed species include *Mimosa pudica*, *Cleome viscosa*, *Tribulus terrestris*, *Lantana camara*, *Commelina benghalensis*, *Ziziphus mauritiana*, *Cardiospermum halicacabum*, and *Datura stramonium*.

3. METHODOLOGY

To make the pollen slides from the polleniferous material (anthers) Erdman's acetolysis method, 1960 was followed. The anthers from the collected weed plants were carefully transferred to a test tube containing 70% ethanol using forceps. The anthers were crushed using a glass rod and the suspension was filtered through a fine brass mesh. After centrifugation, the sediment was further processed by mixing it with 5ml of glacial acetic acid and then centrifuging again. Next, the resulting pollen sediment was treated with acetolysis solution, which is a combination of 9 parts acetic anhydride to 1 part Concentrated Sulphuric acid. The slides prepared were then mounted in 50% glycerol. The slides containing the prepared pollen were examined under a light microscope (LM) to observe their morphological features. The characteristics of the pollen were analyzed using established reference literature, including works by [Erdtman \(1952\)](#), [Erdtman \(1960\)](#), [Erdtman \(1971\)](#), [Erdtman \(1978\)](#), [Moore & Webb \(1978\)](#), [Punt et al. \(2007\)](#), [Usma et al. \(2022\)](#), [Jafari & Ghanbarian \(2007\)](#), [Pullaiah & Rao \(1995\)](#), [Sharma \(1978\)](#), [Tadulingam \(1955\)](#), [Gamble & Fischer \(1915 - 1936\)](#), C.E.C. Fischer. Photomicrography of the pollen was performed using an Olympus trinocular microscope equipped with a Sony digital camera.

4. RESULTS







Pollen characterization of eight types of weeds, namely *Mimosa pudica*, *Cleome viscosa*, *Tribulus terrestris*, *Lantana camara*, *Commelina benghalensis*, *Ziziphus mauritiana*, *Cardiospermum halicacabum*, and *Datura stramonium*, which are referable to families such as Mimosaceae, Cleomaceae, Zygophyllaceae, Verbinaceae, Commelinaceae, Rhamnaceae, Sapindaceae, and Solanaceae, were conducted to observe the pollen features. The pollen grains displayed a range of morphological characters. The specific pollen features observed are given below.

S. No.	Pollen Type & Family	Size, Shape and Symmetry	Apertures	Pollen Surface ornamentation
1	<i>Mimosa pudica</i> Linn. (Mimosaceae)	8-12µm in diameter pollen grains in tetrahedral tetrads; spheroidal; radially symmetrical.	Individual grains provided with 4-5 pores.	Exine 1µm thick, tectate, surface psilate.
2	<i>Cleome viscosa</i> Linn. (Cleomaceae)	Pollen grains are in monads, 24-26 µm, Amb sub spheroidal, 29-35 × 24-26 µm, sub prolate, isopolar, radial symmetry.	Tri-colporate, colpi narrowly elliptic, tips acute, margin incrassate, ora la-longate.	Exine 2.4 µm thick, subtectate, exine ornamentation striate-reticulate.
3	<i>Tribulus terrestris</i> Linn. (Zygophyllaceae)	Pollen grains are in monads, 55-59 µm spheroidal, isopolar, radially symmetrical.	Pantoporate, pores numerous, 30 or more, placed in the lumina of the reticulum, there being one pore, 1.8 – 2.25 µm in diameter.	Exine is 6.5 µm thick, prominently sub tectate, surface reticulate, pila of two types, narrow and broad, lumina polygonal and more or less of same size.
4	<i>Lantana camara</i> Linn. (Verbenaceae)	Pollen grains are in monads, 36 µm. amb more or less triangular, 37X39 µm oblate-spheroidal, isopolar, Radial Symmetry.	Tri-colporate, colpi long, Ora distinct, la-longate.	Exine 2.7 µm, thick, Tectate, Ornamentation psilate.
5	<i>Commelina benghalensis</i> Linn. (Commelinaceae)	Pollen grains are in monads, 16.5 µm, amb circular, 13.5-17 × 16-17 µm, euoblate, monosulcate, heteropolar, bilateral symmetry	Monosulcate, Colpi elliptic, 21-24 µm long, 6.25 – 9.25 µm wide, margins ill- defined and jagged	Exine 1-1.5 µm thick, surface microechinate, echinae arranged in definite parallel lines on exine surface.
6	<i>Zizyphus mauritiana</i> Lam. (Rhamnaceae)	Pollen grains are in monads, 24 µm, Amb rounded triangular, 24-28 X 20-24µm, subprolate, isopolar, radially symmetrical.	3- zonocolporate, colpi tapering, margins thick, ora la-longate.	Exine 1.5 µm thick, tectate, sexine thinner than nexine, surface psilate, to locally granular.
7	<i>Cardiospermum halicacabum</i> Linn. (Sapindaceae)	Pollen grains are in monads, 52-57 µm, amb triangular with straight sides and protruding pores at the angles, 26-30 × 47-56 µm, oblate or peroblate, irregular symmetry, one polar area bulging the other more or less flattened	Triporate, pores 9 µm in diameter, proximal side of the grain is provided with a distinct triradiate scar in the centre, the branches of which can be traced as faint lines right up to the pores.	Exine 2.5 µm thick, sub-tectate, surface coarsely reticulate, lumina 2-3 µm across.
8	<i>Datura stramonium</i> Linn. (Solanaceae)	Pollen grains are in monads, 52 µm, Amb circular, 57-65 × 41-47 µm, Prolate, isopolar, radially symmetrical.	Trizonocolporate, colpi faint, linear, 14.5 µm long, 1.5 µm wide towards equator, tips acute.	Exine 1.5 µm thick, tectate, exine ornamentation striate – reticulate, columellae distinct

5. DISCUSSION

The Nizamabad district, located in Telangana state, comprises an agricultural expanse of approximately 2,02,587 hectares, where major crops include paddy, maize, turmeric, mangoes, pulses, soybeans, sunflowers, and onions. Pollen studies of the locally found weeds in these agricultural or cultivated areas plays an important role in identifying these unwanted plants. An analysis of pollen from various weed species collected during 2022-2023 from Nizamabad district in Telangana revealed a wide range of characteristics. Palynological analysis of eight weed plants viz., *Mimosa pudica*, *Cleome viscosa*, *Tribulus terrestris*, *Lantana camara*, *Commelina benghalensis*, *Ziziphus mauritiana*, *Cardiospermum halicacabum* and *Datura stramonium* belonging to eight families was carried out. Pollen types studied showed variations in their morphological features. All the grains are in monads except *Mimosa pudica* in which the pollen grains are in tetrads and the amb ranged from spheroidal, sub- spheroidal and rounded- triangular. The overall shape of the pollen ranged from prolate to oblate-spheroidal to oblate to peroblate. The apertural pattern varied in the taxa studied and is indicated by tricolporate condition in *Cleome viscosa*, *Lantana camara*, *Ziziphus mauritiana* and *Datura stramonium*, triporate in *Cardiospermum helicacabum* and *Mimosa pudica*, pantoporate in *Tribulus terrestris* and monosulcate in *Commelina benghalensis*. [Antonio-Domingues et al. \(2018\)](#) studied the pollen of *Mimosa pudica* from Brazil and reported tetrad, triporate and psilate pollen characters. [Naimat et al. \(2012\)](#) highlighted the pollen characters of *Ziziphus mauritiana* as tricolporate and often Psilate exine. The exine ornamentation diversity in the present study is exhibited by Psilate in *Mimosa pudica*, *Lantana camara* and *Ziziphus mauritiana*, Striate-reticulate in *Datura stramonium*, *Cleome viscosa*, Reticulate in *Tribulus terrestris*, *Cardiospermum helicacabum* and Microechinate pattern in *Commelina benghalensis*. [Plate 1](#) and [Plate 2](#) represents the photomicrographs of the pollen types studied.

Plate 1

Plate 1 Showing Photomicrographs of the Pollen Types of Weedy Flora			
S. No	Weed plant	Pollen P. V	Pollen E. V
1			
	<i>Mimosa pudica</i>	<i>Mimosa pudica P. V</i>	<i>Mimosa pudica E. V</i>
2			
	<i>Cleome viscosa</i>	<i>Cleome viscosa P. V</i>	<i>Cleome viscosa E. V</i>

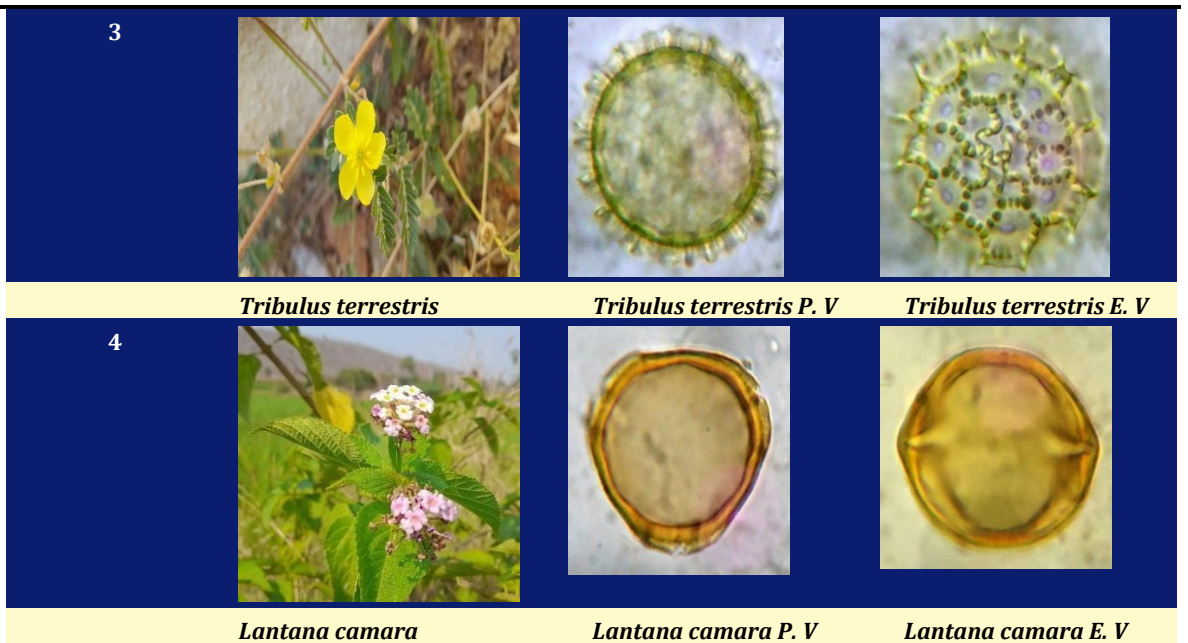


Plate 2

Plate 2 Showing Photomicrographs of the Pollen Types of Weedy Flora.





Datura stramonium

Datura stramonium P.V

Datura stramonium E.V

AUTHORS' CONTRIBUTION

Conceptualization, design, data analysis and interpretation of results (PC); Sample collection and pollen slide preparation (NKG). Photomicrography (MC).

CONFLICT OF INTERESTS

None.

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