IJETIR

ISSN (Online) 2583-0554

International Journal of Emerging Technologies and Innovative Research (IJETIR)

Volume 4, Issue 1, January 2024

Impact Factor: 5.731

Palynotaxonomic Investigation of Selected Flowering Plants from Renapur Tehsil

Yadav S.G.

Department of Botany

Shivaji Mahavidyalaya Renapur Dist.Latur M.S.INDIA

Abstract: *During the present study, fifteen different plant genera belonging to nine families were studied; from Renapur tehsil area in the Marathwada region of Maharashtra. Family Asteraceae includes 4 genera viz.Tridax, Parthenium, Helianthus and Carthamus. All shows oval shaped pollens. Family Nyctaginaceae includes two genera viz. Bougainvillea and Mirabilis which shows spheroidal pollens. Family Apocynaceae includes two genera viz. Plumeria and Catharanthus which shows reticulate pollens. Family Poaceae includes two genera viz. Triticum and Zea mays which show normal oval shaped pollens, while, families like Acanathaceae, Malvaceae, Euphorbiaceae, Verbenaceae and Commelianaceae includes one genus each.*

Keywords: Palynology, Taxonomy, Morphology, Renapur tehsil.

I. INTRODUCTION

Palynology, the science of pollen obtained real impetus after the discovery of the microscope. This is logical because the pollen grains are extremely tiny particles comparable to dust particles which cannot be seen by the naked eye. Pollen grain come in an infinite variety of shapes with complex surface ornamentation and occurs on almost every surface in nature. Discovery of microscope by Robert Hooke in 1665 was a landmark in the development of science particularly palynology subsequent improvement in microscopy accelerated the study of pollen grains especially finer structure of pollen wall and its varied ornamentation patterns. The pollen grains are smallest unit of the plants, which contain so many characters of taxonomic & phylogenetic importance. The shape & size of the pollen grains, germinal furrows & the number of germ pores are important taxonomic features, which are taken into consideration in classification of plants. Light microscopic studies give information on the extreme subsurface morphology & not the extreme surface of pollen grains. In recent years the scope of pollen morphology has widened with advent of scanning electron microscopy (SEM) & with regards to unipalynous taxa, particularly the understanding of finer morphology is of fundamental of exine surface & ornamentation pattern of the pollen grains. Now a day's study of pollen is an important area of research. Various pollen morphological features such as symmetry, shape, apertural pattern and exine configuration are very conservative features for the taxonomic assessment of the plant. Moreover, some plants growing in the surroundings cause respiratory troubles or allergy in human beings, the pollen grains of which are responsible for allergy. Pollen are ubiquitous in nature unlike other plant parts they are highly resist to decay they occur buried deep in rocks ground surface water and air indoor and outdoor including the upper atmosphere. Besides this pollen find their way through nasal and oral cavity to the digestive tract of humans and animal causing various degrees of discomfort.

Pollen has the longest geological history as they are well preserved in rock as old as 400 million years. On account of these unique characters pollen and spores are often referred as nature's fingerprint of plants (Bera et. al., 2007: Singh, 2004). Pollen biology encompasses pollen production, their transfer to the stigma or pollination and details of pollen pistil interaction leading to fertilization and seed set. Any break in these sequential events affects seed and fruits set. Pollen biological studies are a prerequisite for any program aimed at optimization and improvement of the yield of crop plant.

Pollination ecology is also a part of pollen biology which involves the study of various aspects dealing with efficient pollination (Chauhan, 2006). Pollen biotechnology is one of the techniques employed to study pollen biology for crop production and improvement. Pollen biotechnology is one of the most challenging areas of plants reproductive biology

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

and plays an important role in crop improvement programs (Perveen, 2006). No survey is carried out with respect to pollen morphological studies from Ramshej Fort, Mhasrul, Nasik, Maharashtra. Therefore this work will be useful for preparation of pollen calendar. By considering immense importance of pollen morphological studies in relation to allergy, present work is undertaken for light microscopic studies of different pollen grains.

II. MATERIAL AND METHODS

a) Collection of pollen grains and identification of plants species

Fresh flowers of different plant species collected early in the morning before anthesis from Udgir in Maharashtra during the period of December 2018 to Janurary 2019. Plants such as Tradescantiaspathacea, plumeria, Bougainvillea, Mirabilis jalapa, Lantana camara, Tridaxprocumbens Hibiscusrosasinesis,Euphorbiahirta,Crossandrainfundibuliformis,Cathranthusroseus,Parthenium,Triticumaestivum, Zea mays, Helianthus annus, Carthamustinctorius were collected and pollen morphology was studied by acetolysis method (Erdtman, 1952).

Preparation of glycerin jelly

Pollen from the known plant is shaken on to a microscope slide or the anthers are placed on a slide and a drop of ether is added to disperse the pollen. Any visible particles that are larger than the pollen grains should be removed. Drops of ether are then carefully run over the pollen from a pipette. This will dissolve any oil in the pollen and carry it to one side where it can wipe off or where the solution can be absorbed by the tissue. Then two drops, one of warmed, stained jelly and another of unstained jelly, are placed on the pollen by means of a glass rod. A cover slip is carefully positioned on top, one edge lowered first to avoid trapping air bubbles. The slide is left on a warm plate for about ten minutes. The jelly should be just sufficient to fill the space under the cover slip Glycerin jelly is prepared by dissolving seven gm. of gelatin in 42ml of cold distilled water. 50ml of glycerin is added, warmed gently and stirred until it is dissolved; 0.5 gm. of phenol is then added to prevent the growth of mould. To prepare the stained glycerin jelly, 0.1 gm. of basic fuchsine is dissolved in 10ml of alcohol (methylated spirit). This stain is then added dropby-drop to the glycerin jelly until a clear pink color is produced. A few hrs. later, when the jelly has finally set, any surplus should be cleaned off with water. The cover slip is then sealed along the edges with clear nail varnish or paraffin wax. Thus treated, the slides will last for many years.

Acetolysis of pollen grains (Erdtman, 1952)

The fresh material consisting of full flowers or anthers were placed in test tube, crushed with glass rod in 70% alcohol and then filtered. The sediment left in the test tube after decantation of alcohol is covered with glacial acetic acid, centrifuged and the sediment covered with fresh acetolysis mixture prepared by mixing 9 parts of acetic anhydride and 1 part of concentrated sulphuric acid, the later being put drop by drop. The tube with the mixture is placed in a hot water bath until the pollen grains become brownish black. The test tube was then cooled and centrifuged and this centrifuged acetolysis mixture was decanted and again centrifuged with glacial acetic acid and then decanted. This procedure was repeated 2-3 times with distilled water. After decanting water, 50% glycerin was added and centrifuged, small quantity of glycerin jelly was placed on warming the slide, gently pollen sample was added from test tube; it was then covered with cover slip, the slide thus was sealed with paraffin wax and then kept for microscopic observation.

Table 1. Plants used for the study

Sr. No.	Common Name	Botanical Name
1.	Coat button.	Tradescantiaspathacea
2.	Chafa	Plumeria
3	Bogainvillea,Paper flower	Bougainvillea
4	Gulabakshi, 4 o'clock plant	Mirabilis jalapa
5	Big sage, Tickberry	Lantana camara
6	Tridax daisy, Jakham Jodi.	Tridaxprocumbens

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

7	China rose, Hawaiian, Hibiscus, Rose, Mallow.	Hibiscus rosa-sinesis
8	Asthama Plant, Cats Hairs	Euphorbia hirta
9	Firecraker flower	Crossandrainfundibuliformis
10	Rose periwinkle or Rosy periwinkle	Cathranthus roseus
11	Congress Grass, White Top Weed	Parthenium hysterophorus
12	Bread Wheat	Triticum aestivum
13	Corn	Zea mays
14	Surajmukhi	Helianthus annus
15	Safflower, Dyer's Saffron	Carthamustinctorius

III. EXPERIMENTAL RESULTS

The present investigation deals with pollen morphological studies of fifteen flowering plants growing at Renapur region in Marathwada region of Maharashtra, during the period of the end of January to first week of February, 2024. Fresh flowers from different plants collected early in the morning before anthesis. Collected pollen grains treated by acetolysis technique and observed under light microscope for pollen morphological studies. The purpose of this survey work was to collect the pollen materials from different plants growing in the field and study of different pollen parameters such as shape, size, colpi and exine ornamentation. Morphology of collected plants are as follows:

1. Tradescatia spathacea

Tradescantia spathacea, the boatlilyor Moses-in-the-cradle, is an herb in the Commelinaceae family first described in 1788. It is native to Belize,Guatemala, and southern Mexico (Chiapas,Tabasco, and the Yucatán Peninsula) but widely cultivated as an ornamental and naturalized in parts of Florida,Texas,Hawaii, and various oceanic islands.

Tradescantiaspathacea has naturalized in Florida and Louisiana and is listed as a Category II invasive exotic species by the Florida Exotic Pest Plant Council. "This means Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become ranked Category I if ecological damage is demonstrated."

Tradescantiaspathacea has fleshy rhizomes and rosettes of waxy lance-shaped leaves. Leaves are dark to metallic green above, with glossy purple underneath. These will reach up foot(0.30 m) long by 3 inches (76 mm) wide. They are very attractive foliage plants that will reach 1 foot (0.30 m) tall. It is grown as ornamental houseplants.

Pollen grains are oblate, elliptic, boat shaped, sulcate and the size is medium (26-50µm.)

2. Plumeria

Plumeria is a genus of flowering plant in the dogbane family Apocynaceae Most species are deciduous shrubs or small trees. The species variously are indigenous to Mexico. Central Americaand the Caribbean, and as far south as Brazil, but are grown as cosmopolitan ornamentalsin warm regions.Common names for plants in the genus vary widely according to region, variety, and whim, but Frangipani or variations on that theme are the most common. Plumeria also is used directly as a common name, especially in horticultural circles.

Plumeria flowers are most fragrant at night in order to lure sphinx moths to pollinate them. The flowers yield no nectar, however, and simply trick their pollinators. The moths inadvertently pollinate them by transferring pollen from flower to flower in their fruitless search for nectar. Insects or human pollination can help create new varieties of plumeria. Plumeria trees from cross pollinated seeds may show characteristics of the mother tree or their flowers might just have a totally new look.

Plumeria species may be propagated easily by cutting leafless stem tips in spring. Cuttings are allowed to dry at the base before planting in well-drained soil. Cuttings are particularly susceptible to rot in moist soil. One optional method to root cuttings is applying rooting hormone to the clean fresh-cut end to enable callusing. Plumeria cuttings could also be propagated by grafting a cutting to an already rooted system. The Plumeria Society of America lists 368 registered cultivars of Plumeria as of 2009

Pollen grains are colporate, spheroidal, circular, prolate and the size is medium(26-50µm).

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

3. Bougainvillea

The first European to describe these plants was Philibert Commerçon, a botanistaccompanying French Navy admiral Louis Antoine de Bougainville during his voyage of circumnavigation of the Earth, and first published by Antoine Laurent de Jussieu in 1789. It is possible that the first European to observe these plants was Jeanne Bar, Commerçon's lover and assistant who was an expert in botany. Because she was not allowed on ship as a woman, she disguised herself as a man in order to make the journey (and thus became the first woman to circumnavigate the globe.

Bougainvillea is a genus of thorny ornamental vines, bushes, or trees. The inflorescence consists of large colourfulsepallike bracts which surround three simple waxy flowers. It is native to South America from Brazil west to Peru and south to southern Argentina. Different authors accept between four and 18 species in the genus. Bougainvillea are also known as buganvilla(Spain), bugambilia (Mexico, Guatemala, Cuba, Philippines), bouganvilla (India), pokokbungakertas (Indonesi, Malaysia), bougenville (Pakistan), Napoleón (Honduras), jahanamiya (Arab World), veranera (Colombia, Nicaragua, El Salvadr, Costa Rica and Panama), trinitaria (Colomba Panama, Puerto Rico, Dominican Republic & Venezuela), Santa Rita (Argentina, Bolivia, and Uruguay), papelillo (Northern Peru), primavera (Brazil), Drillingsblume (triplet flower, Germany), vukamvilia (Greece) or Saron / Saron Par / Sarawn (in Mizoram, India).

The vine species grow anywhere from 1 to 12 m (3 to 40 ft.) tall, scrambling over other plants with their spiky thorns. The thorns are tipped with a black, waxy substance. They are evergreen where rainfall occurs all year, or deciduous if there is a dry season. The leaves are alternate, simple ovate-acuminate, 4–13 cm long and 2–6 cm broad. The actual flower of the plant is small and generally white, but each cluster of three flowers is surrounded by three or six bracts with the bright colours associated with the plant, including pink, magenta, purple, red, orange, white, or yellow. Bougainvillea glabra is sometimes referred to as "paper flower" because the bracts are thin and papery. The fruit is a narrow five-lobed achene.

Bougainvillea are relatively pest-free plants, but they may be susceptible to worms, snails and aphid. The larvae of some Lepidoptera species also use them as food plants, for example the giant leopard moth

Pollen grains is 3-4 zonicolpate; sub-oblate to spheroidal to prolate-spheroidal; sexine reticulate and mostly thicker than nexine.

4. Mirabilis jalapa

Mirabilis jalapa, the marvel of Peru or four o'clock flower, is the most commonly grown ornamental species of Mirabilis plant, and is available in a range of colours. Mirabilis in Latin means wonderful and Jalapa (or Xalapa) is the state capital of Veracruz in México. Mirabilis jalapa was cultivated by the Aztecs for medicinal and ornamental purposes.

The flowers usually open from late afternoon or at dusk (namely between 4 and 8 o'clock), giving rise to one of its common names. Flowers then produce a strong, sweet-smelling fragrance throughout the night, then close for good in the morning. New flowers open the following day. It arrived in Europe in 1525. Today, it is common in many tropical regions and is also valued in Europe as a (not hardy) ornamental plant.

The name of Mirabilis jalapa given by Carl Von Linne in 1753 is formed from the scientific Latin Mirabilis meaning "admirable" by allusion to the remarkable colors of its flowers and the specific name jalapa that would refer to its origin in the Jalapa in Guatemala. But the epithet of jalapa could also refer to the city of Xalapa (Jalapa) in Mexico from which came a former purgative drug, named jalap, taken from the tubers of the tuberous jalapa.

The pollen grains are spheroidal, circular, irregular in shape.

5. Lantana camara

Lantana camara is a species of flowering plant within the verben family (Verbenaceae), native to the American tropics. Other common names of L. camara include big-sage (Malaysia), wild-sage, red-sage, white-sage (Caribbean), tickberry (South Africa),West Indian lantana, and umbelanterna.

As an ornamental, L. camara is often cultivated indoors, or in a conservatory, but can also thrive in a garden with sufficient shelter. It has spread from its native Central and South America to around 50 countries,where it has become

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

an invasive species. It first spread out of the Americas when it was brought to Europe by Dutch explorers and cultivated widely, soon spreading further into Asia and Oceania, where it has established itself as a notorious weed.
L. camara will often out-compete other more desirable species, leading to a reduction in biodiversity. It can also cause problems if it invades agricultural areas as a result of its toxicity to livestok, as well as its ability to form dense thickets which, if left unchecked, can greatly reduce the productivity of farmland.
Lantana camara is known to be toxic to livestock such as cattle, sheep, horses, dogs and goatsThe active substances causing toxicity in grazing animals are pentacyclictriterpenoide which result in liver damage and photosensitivyL. camara also excretes chemicals which reduce the growth of surrounding plantsby inhibiting germination and root elongation.
Pollen grains Tricolpate when triangular and some are square when 4 colporate.

6. Tridax procumbens

Tridaxprocumbens, commonly known as coatbuttons or tridax daisy, is a species of flowering plant in the daisyfamily It is best known as a widespread weed and pest plant. It is native to the tropical Americas, but it has been introduced to tropical, subtropical, and mild temperate regions worldwide. It is listed as a noxious weed in the United States and has pest status in nine states.[1]Its common names include coatbuttons and tridax daisy in English.
The plant bears daisylike yellow-centered white or yellow flowers with three-toothed ray florets. The leaves are toothed and generally arrowhead-shaped. Its fruit is a hard achene covered with stiff hairs and having a feathery, plumelike white pappus at one end. Calyx is represented by scales or reduced to pappus. The plant is invasive in part because it produces so many of these achenes, up to 1500 per plant, and each achene can catch the wind in its pappus and be carried some distance. This plant can be found in fields, meadows, croplands, disturbed areas, lawns, and roadsides in areas with tropical or semi-tropical climates.It is listed in the United States as a Noxious Weed and regulated under the Federal Noxious Weed act
Pollen grains poratespinulous spheroid shape and radial symmetry.

7. Hibiscus rosa-sinensis

Hibiscus rosa-sinensis, known colloquially as Chinese hibiscus, China rose,Hawaiian hibiscus, rose mallow and shoeblackplant, is a species of tropical hibiscus, a flowering plant in the Hibisceaetribe of the familyMalvaceae. It is widely cultivated in tropical and subtropical regions, but is not known in the wild, so that its native distribution is uncertain. An origin in some part of tropical Asia is likely.
Hibiscus rosa-sinensis was named in 1753 by Carl Linnaeusin his Species Plantarum. The Latin term rosa-sinensis literally means "rose of China", though it is not closely related to the true roses. Hibiscus rosa-sinensis is a bushy, evergreenshrub or small tree growing 2.5–5 m (8–16 ft) tall and 1.5–3 m (5–10 ft) wide, with glossy leaves and solitary, brilliant red flowers in summer and autumn. The 5-petaled flowers are 10 cm (4 in) in diameter, with prominent orange-tipped red anthers.
The flowers of Hibiscus rosa-sinensis are edible and are used in salads in the Pacific Islands The flower is additionally used in hair care as a preparation. It is also used to shine shoes in certain parts of India. It can also be used as a pH indicator. When used, the flower turns acidic solutions to a dark pink or magenta color and basic solutions to green. It is also used for the worship of Devi, and the red variety is especially prominent, having an important part in tantra. In the Bengal area of eastern India, the red variety of this flower is used to worship Devi Kali. In Indonesia, these flowers are called "kembangsepatu", which literally means "shoe flower". In several countries the flowers are dried to use in a beverage, usually tea.
The pollen grains are microscopic in size, ranging in diameter from less than 0.01 mm (about 0.0000004 in) to a little over o.5mm (about 0.00002 in).

8. Euphorbia hirta

Euphorbia hirta (sometimes called asthma-plant is a pantropical weed, possibly native to India. It is a hairy herb that grows in open grasslands, roadsides and pathways. It is used in traditional herbal medicine. This erect or prostrate

annual herb can grow up to 60 cm (24 in) long with a solid, hairy stem that produces an abundant white latex. There are stipules present. The leaves are simple, elliptical, hairy (on both upper and lower surfaces but particularly on the veins on the lower leaf surface), with a finely dentate margin. Leaves occur in opposite pairs on the stem. The flowers are unisexual and found in axillary cymes at each leaf node. They lack petals and are generally on a stalk. The fruit is a capsules with three valves and produces tiny, oblong, four-sided red seeds. It has a white or brown taproot.
The pollen grains are Tricolpate reticulate equatorial shape is proate sub prolate polar shape circular grain colpi usually as long exinesexine finely reticulate nexine thinner than sexine thickness medium.

9. Crossandra infundibuliformis

Crossandra infundibuliformis (firecracker flower) is a species of flowering plant in the familyAcanthaceae, nativeto southern India and Sri Lanka. It is most often found in south Indian region Malenadu. It is an erect, evergreen subshrub growing to 1 m (3 ft 3 in) with glossy, wavy-margined leaves and fan-shaped flowers, which may appear at any time throughout the year.The flowers are unusually shaped with 3 to 5 asymmetrical petals. They grow from four-sided stalked spikes, and have a tube-like ¾ inch stalk. Flower colours range from the common orange to salmon-orange or apricot, coral to red, yellow and even turquoise. This plant requireminimum temperature of 50 °F (10 °C), and in temperate regions is cultivated as a houseplant. It is usually grown in containers but can be attractive in beds as well. The flowers have no perfume but stay fresh for several days on the bush. A well-tended specimen will bloom continuously for years. It is propagated by seeds or cuttings.
This plant has gained the Royal Horticultural Society's Award of Garden Merit.The tiny flowers are often strung together into strands, sometimes along with white jasmine flowers and therefore in great demand for making garlands which are offered to temple deities or used to embellish women's hair.

10. Catharanthus roseus

Catharanthus roseus, commonly known as the Madagascar periwinkle, rose periwinkle, or rosy periwinkle, is a species of flowering plant in the dogbane family Apocynaceae. It is native and endemic to Madagascar, but grown elsewhere as an ornamental and medicinal plant, a source of the drugsvincristine and vinblastine, used to treat cancer. Other English names include "“Cape periwinkle” and "old-maid". It was formerly included in the genus Vinca as Vincarosea. Catharnthus roseus is an evergreensubshrub or herbaceous plant growing 1 m (39 in) tall. The leaves are oval to oblong, 2.5–9 cm (1.0–3.5 in) long and 1–3.5 cm (0.4–1.4 in) broad, glossy green, hairless, with a pale midrib and a short petiole 1–1.8 cm (0.4–0.7 in) long; they are arranged in opposite pairs. The flowers are white to dark pink with a darker red centre, with a basal tube 2.5–3 cm (1.0–1.2 in) long and a corolla 2–5 cm (0.8–2.0 in) diameter with five petal-like lobes. The fruit is a pair of follicles 2–4 cm (0.8–1.6 in) long and 3 mm (0.1 in) broad.
In the wild, C. roseus is an endangered plant; the main cause of decline is habitat destruction by slash and burn agriculture. It is also however widely cultivated and is naturalized in subtropical and tropical areas of the world like Australia, Malaysia, India, Pakistan and Bangladesh. It is so well adapted to growth in Australia, that it is listed as a noxious weed in Western Australia and the Australian Capital Territory, and also in parts of eastern Queensland.
Pollen grains are tricolporate, reticulate, prolate and subprolate.

11. Parthenium hysterophorus

Parthenium hysterophorus is a species of flowering plant in the aster family, Asteraceae. It is native to the American tropics. Common names include Santa-Maria, Santa Maria feverfew,whitetop weed, and famine weed. In India, it is locally known as carrot grass, congress grass or GajarGhans.It is a common invasive species in India, Australia, and parts of Africa.
Parthenium hysterophorus invades disturbed land, including roadsides. It infests pastures and farmland, causing often disastrous loss of yield, as reflected in common names such as famine weed. In some areas, heavy outbreaks have been ubiquitous, affecting livestock and crop production, and human health. As an invader it first appeared as a contaminant in imported wheat

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

The plant produces allelopathic chemicals that suppress crop and pasture plants, and allergens that affect humans and livestock. It also frequently causes pollen allergie

It is being investigated as a means of removing heavy metals and dyes from the environment, control of aquatic weeds, commercial enzyme production, an additive in manure for biogas production, as a biopesticide, and as green manure and compost.

Contact with the plant causes dermatitis and respiratory malfunction in humans, and dermatitis in cattle and domestic animals. The main substance responsible is parthenin, which is dangerously toxic. It also is responsible for bitter milk disease in livestock when their fodder is polluted with Parthenium leaves.

Among other allelopathic effects of the species, the presence of Parthenium pollen grains inhibits fruit set in tomato, brinjal, beans, and a number of other crop plants.

Light infestations of Parthenium hysterophorus in cultivated fields may be hoed or weeded by hand if labour is available at acceptable cost.

Contact with the plant causes dermatitis and respiratory malfunction in humans, and dermatitis in cattle and domestic animals. The main substance responsible is parthenin, which is dangerously toxic. It also is responsible for bitter milk disease in livestock when their fodder is polluted with Parthenium leaves.

Among other allelopathic effects of the species, the presence of Parthenium pollen grains inhibits fruit set in tomato, brinjal, beans, and a number of other crop plants.

Pollen grains are trizonocolporate, subspheroidal and exinespinulose.

12. Triticum aestivum

Common wheat (Triticum aestivum), also known as bread wheat, is acultivated wheat species. About 95% of the wheat produced is common wheat, which is the most widely grown of allcrops and the cereal with the highest monetary yield.

Common wheat was first domesticated in Western Asia during the early Holocene, and spread from there to North Africa, Europe and East Asia in the prehistoric period. Naked wheats (including Triticum aestivum/durum/turgidum) were found in Roman burial sites ranging from 100BCE to 300BCE.

Wheat first reached North America with Spanish missions in the 16th century, but North America's role as a major exporter of grain dates from the colonization of the prairies in the 1870s. As grain exports from Russia ceased in the First World War, grain production in Kansas doubled.

Pollen grains are normal oval shaped, shriveled and collapsed smooth sufface in exine wall of pollen grain.

13. Zea mays

Maize also known as corn, is a cereal grain first domesticated by indigenous peoples in southern Mexico about 10,000 years ago. The leafy stalk of the plant produces polleninflorescences and separate ovuliferous inflorescences called ears that yield kernels or seeds, which are fruits.

Maize is the most widely grown grain crop throughout the Americas, with 361 million metric tons grown in the United States in 2014 (Production table). Approximately 40% of the crop—130 million tons—is used for corn ethanol. Genetically modified maize made up 85% of the maize planted in the United States in 2009.

Introduced into Africa by the Portuguese in the 16th century, maize has become Africa's most important staple food crop. Maize meal is made into a thick porridge in many cultures: from the polenta of Italy, the angu of Brazil, the of Romania, to cornmeal mush in the US (and hominygrits in the South) or the food called mealie pap in South Africa in other parts of Africa. Maize meal is also used as a replacement for wheat flour, to make cornbread and other baked products. Masa (cornmeal treated with limewater) is the main ingredient for tortilla, atole and many other dishes of Central American food.

Pollen grains are heavier and larger (60-125µm in diameter).

14. Helianthus annuus

Helianthus annuus, the common sunflower, is a large annual forb of the genus Helianthus grown as a crop for its edible oil and edible fruits. This sunflower species is also used as wild bird food, as livestock forage (as a meal or a silage

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

plant), in some industrial applications, and as an ornamental in domestic gardens. The plant was first domesticated in the Americas. Wild Helianthus annuus is a widely branched annual plant with many flower heads. The domestic sunflower, however, often possesses only a single large inflorescence (flower head) atop an unbranched stem. The name sunflower may derive from the flower's head's shape, which resembles the sun, or from the impression that the blooming plant appears to slowly turn its flower towards the sun as the latter moves across the sky on a daily basis. Sunflower seeds were brought to Europe from the Americas in the 16th century, where, along with sunflower oil, they became a widespread cooking ingredient.

However, for commercial farmers growing commodity crops other than sunflowers, the wild sunflower, like any other unwanted plant, is often considered a weed. Especially in the Midwestern US, wild (perennial) species are often found in corn and soybean fields and can decrease yields.

Pollen grains are spheroidal, tricolporate, echinate, tectate. The size is 31.34 ± 0.41µm by 29.99 ± 0.94 µm.

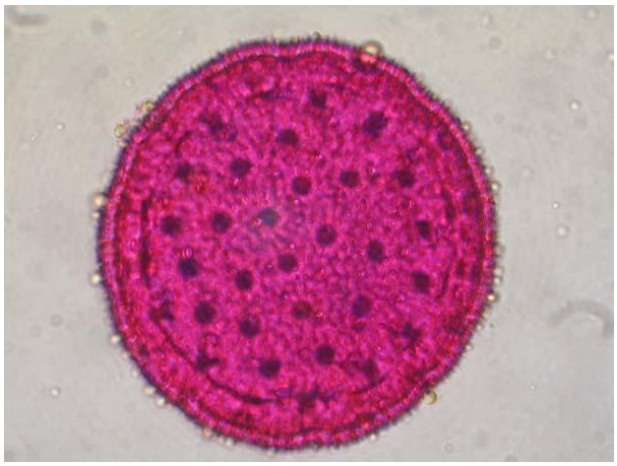
15. Carthamustinctorius

Safflower (Carthamustinctorius) is a highly branched, herbaceous, thistle-like annual plant. It is commercially cultivated for vegetable oil extracted from the seeds and was used by the early Spanish Colonies along the Rio Grande river as a substitute for Saffron. Plants are 30 to 150 cm (12 to 59 in) tall with globular flower heads having yellow, orange, or redflowers. Each branch will usually have from one to five flower heads containing 15 to 20 seeds per head. Safflower is native to arid environments having seasonal rain. It grows a deep taproot which enables it to thrive in such environments.

Pollen grains are radially symmetrical, isopolar, oblate-spheroid, tricolporate rearely tetracolporate.

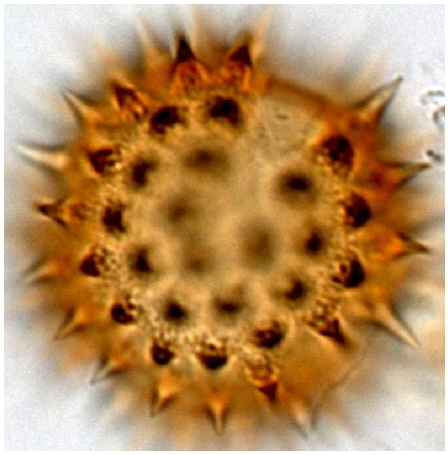
Plate 3: Pollen morphology of selected plants

Plumeria rubra

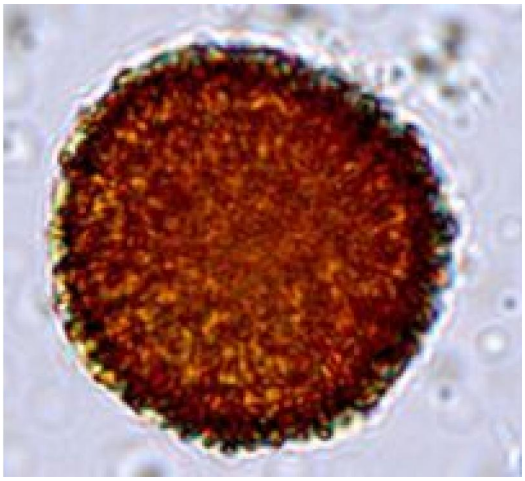


Mirabilis jalapa

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731



Tridax procumbens

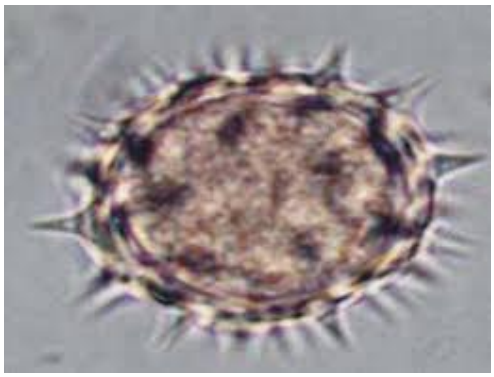


Bougainvillea spectabilis

Euphorbia hirta

Lantana camara

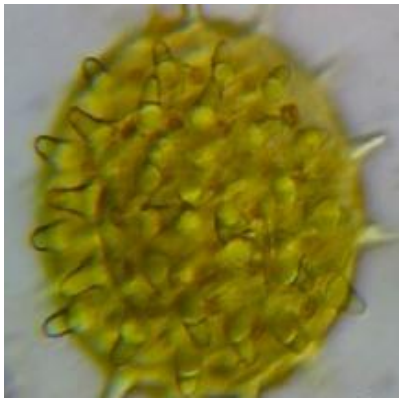
Plate 4: Pollen morphology of some selected plants



Parthenium hysterophorus

Carthamus tinctorius

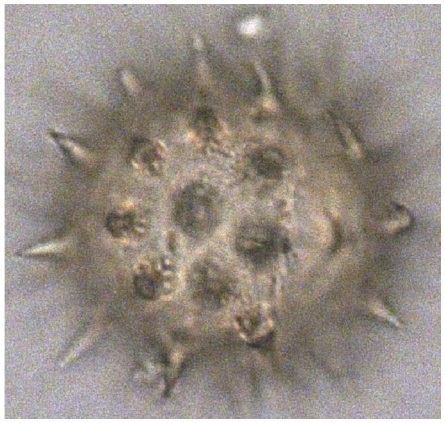
IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731



Hibiscus rosa sinesis

Triticum aestivum

Zea mays



Helianthus annus

Table 2: Light Microscopic study of pollen of different plant.

Sr. No	Plant Name	Family	Description of Pollen grain
1	Tradescantiaspathacea	Commelinaceae	Pollen grains are oblate, elliptic, boat shaped, sulcate and the size is medium (26-50µm.)
2	Plumeria	Apocynaceae	Pollen grains are colporate, spheroidal,circular, prolate and the size is medium(26-50µm).
3	Bougainvillea	Nyctaginaceae	Pollen grains is 3-4 zonicolpate; sub-oblate to spheroidal to prolate-spheroidal; sexine reticulate and mostly thicker than nexine
4	Mirabilis jalapa	Nyctaginaceae	The pollen grains are spheroidal, circular, irregular in shape.
5	Lantana camara	Verbenaceae	Pollen grains Tricolpate when triangular and some are square when 4 colporate
6	Tridaxprocumbens	Asteraceae	Pollen grains poratespinulous spheroid shape and radial symmetry.

IJETIR
ISSN (Online) 2583-0554
International Journal of Emerging Technologies and Innovative Research (IJETIR)
Volume 4, Issue 1, January 2024
Impact Factor: 5.731

7	Hibiscus rosasinesis	Malvaceae	The pollen grains are microscopic in size, ranging in diameter from less than 0.01 mm (about 0.0000004 in) to a little over o.5mm (about 0.00002 in).
8	Euphorbia hirta	Euphorbiaceae	The pollen grains are Tricolpate reticulate equatorial shape is proate sub prolate polar shape circular grain colpi usually as long exinesexine finely reticulate nexinethinner than sexine thickness medium.
9	Crossandra infundibuliformis	Acanthaceae	Pollens are tricolporate.
10	Cathranthus roseus	Apocynaceae	Pollen grains are tricolporate, reticulate, prolate and subprolate.
11	Parthenium hysterophorus	Asteraceae	Pollen grains are trizonocolporate, subspheroidal and exinespinulose.
12	Triticum aestivum	Poaceae	Pollen grains are normal oval shaped, shriveled and collapsed smooth sufface in exine wall of pollen grain.
13	Zea mays	Poaceae	Pollen grains are heavier and larger (60-125µm in diameter).
14	Helianthus annus	Asteraceae	Pollen grains are spheroidal, tricolporate, echinate, tectate. The size is 31.34 ± 0.41µm by 29.99 ± 0.94 µm.
15	Carthamustinctorius	Asteraceae	Pollen grains are radially symmetrical, isopolar, oblate-spheroid, tricolporatereare lytetracolporate.

IV. DISCUSSION

The present study is useful in the preparation of a complete pollen calendar in different seasons of the area under investigation. A pollen calendar is useful for allergy clinics (Tilak, 2012). Pollen calendar is compiled based on data and knowledge obtained from field botanical survey of the area under investigation combined with data from aeropalynological survey (Agashe, 2012).

The angiosperm pollen is a highly reduced male gametophyte, utilized by higher plants for their reproduction. It forms a unique entity both with regard to form and structure and also function, and it represents an essential genetic bridge between one generation and the next. As an organ less influenced by changing ecological conditions, the characters of pollen grains are considered to be more dependable and stable, and serve as a supplementary potential tool in studies of comparative morphology that leads to conclusions in plant taxonomy, phylogeny and evolution than those of any other vegetative organ.

Among the bases of angiosperm phylogeny, palynolgy is unique in that through no other study can one obtain as great an amount of information from so little material in such short a time. The morphological characters of pollen grains are those relating to the germinal aperture, exine ornamentations, exine strata, size and shape, of which the aperture character is considered to be of primary importance, exine surface pattern secondary and the others tertiary. The aperture characters are based on their form, number and position, all showing variation in different plants at various levels so as to be of use in identification of genera, species and varieties.

V. SUMMARY AND CONCLUSION

During the present study, fifteen different plant genera belonging to nine families were studied. Family Asteraceae includes 4 genera viz.Tridax, Parthenium, Helianthus and Carthamus. All shows oval shaped pollens. Family Nyctaginaceae includes two genera viz. Bougainvillea and Mirabilis which shows spheroidal pollens. Family Apocynaceae includes two genera viz. Plumeria and Catharanthus which shows reticulate pollens. Family Poaceae

includes two genera viz. Triticum and Zea mays which show normal oval shaped pollens, while, families like Acanathaceae, Malvaceae, Euphorbiaceae, Verbenaceae and Commelianaceae includes one genus each.

Study of pollen grains used in phylogenetic analysis because the morphology of pollen grains forms the basic criteria for their identification. The morphological features of pollen grains can often be used to identify a particular taxon. Thus, pollen morphology is one of the significant tools in solving some taxonomic problems on the family, generic and specific level and has become part of multidisciplinary and collaborative approach in plant systematics and evolution.

REFERENCES

[1]. Ahmad, M., Bahadur, S., et al. (2023). Pollen morphology of family Thymelaeaceae Juss. in India and its taxonomic implications. Flora, 303, 152291

[2]. Agashe S. N. (2012). Is Aerobiology Really Useful to Mankind. Proc.17th. National Conference of Indian Aerobiological Society on Impact of Airborne Microbes pp.3.

[3]. Banerjee, D., & Bandyopadhyay, S. (2022). Morphology and morphometric diversity of pollen grains of 26 Indian species of Dioscorea L. (Dioscoreaceae). Nelumbo, 64(2), 32–56.

[4]. Bera S. K., Basumatary S. K., and Dixit Swati (2007) Studies on pollen morphology and phonological characteristics of some economically important arborescent taxa of tropical forest,lower Brahmaputra valley, Assam, North East India. Journal of Palynology 43:1-19.

[5]. Bhattacharya, K., Majumdar, M. R., and Gupta Bhattacharya, S. (2009). A text Book of Palynology. New Central Book Agency (P) Ltd., Kolkata, India.

[6]. Chakraborty, P., Ghosh D., Chowdhury, I., Ray I., Chatterjee, S., Chanda S., and Gupta Bhattacharya, S. (2005). Aerobiological and Immunological studies on Carica papaya L. Pollen: An aeroallergen from India. Allergy 60: 920-926.

[7]. Chanda S., and Gupta-Bhattacharya S (2007). Allergy to Periwinkle pollen (Catharanthus roseus G. DON.) Ann Agric Environ Med. 14: 3943.

[8]. Chauhan, S. V. S., and Goyal R. (2006). Pollen calendar of Agra city with special reference to allergenic significance. J Envtal Biol. 27: 275281.

[9]. Erdtman, G. (1952). Pollen morphology and plant taxonomy Angiosperm. (In Introduction to Palynology, Vol.1 Almqvist and Wiksell, Stockholm, Sweden.

[10]. Faegri J., and Iversen K. (1964). Text Book of Pollen Analysis. 2nd. Ed. Munksgaard, Copenhagen, Denmark.

[11]. Ghosh D., Ray, Endrani Chanda S., and Gupta Bhattacharya, S. (2007). Allergy to Periwinkle pollen (Catharanthus roseus G. DON.) Ann Agric Environ Med. 14: 39-43.

[12]. Graham, A. & Graham, S.A. (1967). Pollen morphology and taxonomy of Cuphea (Lythraceae). Rev. Palaeobot. Palynol. **3**: 155-162.

[13]. Keshavarzi M, Abassian S, and Sheidai M (2012). Pollen morphology of the genus Clypeola (Brassicaceae) in Iran. PhytologiaBalcanica 18 (1): 17-24.

[14]. Kremp G. O. W. (1965). Encyclopedia of Pollen Morphology. Univ. Arizona Press Tuscon, USA.

[15]. Kumar, B., Singh, K., Kumar, P., Batool, Z., et al. (2022). Palynological diversity of highly medicinal rare, endangered, and threatened plants from Western Himalaya, India. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 50(3), 12787

[16]. Mitra, D., Chowdhury, M., Singh, N., Basumatary, S. K., & Tripathi, S. (2025). Pollen morphological analogue of some Himalayan angiosperm species from Arunachal Pradesh, Northeast India. Palynology, 50(1).

[17]. Moore P. D., and Webb J. A. (1978). An illustrated guide to pollen analysis. Hodder and Stoughton, London, UK.

[18]. Murshida, C., & Robi, A. J. (2025). Pollen morphology of Rotala L. (Lythraceae) from South India and its taxonomic significance. Palynology, 49(4). https://doi.org/10.1080/01916122.2025.2517036

[19]. Muller, J. (1969). A palynological study of the genus Sonneratia(Sonneratiaceae). Pollen & Spores **11**: 223-298.
[20]. Pal J. K. (1992). Cytopalynological studies on some woody angiospermic taxa and effects of mutagen as well as polyploidizing chemical on cell nuclei. Ph.D thesis. Central library, Visha Bharati University, Santiniketan.
[21]. Pal J. K., Datta B. K., Mandal S., and Bhattacharya G. N. (1993a). Cyto-palynological Investigation in Cassia fistula L. Envt. Ecol. 11: 435-438.
[22]. Pal J. K., Mandal S., and Bhattacharya G. N. (1993b). Cytopalynological studies in ShorearobustaGaertn. F. Sci. Cult. 59:55-57.
[23]. Perveen A. (2006). A contribution to the pollen morphology of family Gramineae. Wor App Sci J 1:60-65.
[24]. Praglowski, J. (1970). The pollen morphology of the Haloragaceae with reference to taxonomy.Grana**10**: 159-239.
[25]. Priyadarshini, S., Sahu, S. C., & Dhal, N. K. (2025). Pollen morphology and taxonomic implications of Zingiberaceae in Eastern India. Palynology, 50(2).
[26]. Quamar, M. F., Singh, P., Garg, A., Tripathi, S., et al. (2022). Pollen characters and their evolutionary and taxonomic significance: Using light and confocal laser scanning microscope to study diverse plant pollen taxa from Central India. Palynology
[27]. Rao, A.N. & Lee, Y.K. 1970. Studies on Singapore pollen. Pacific Sci. **24**: 255- 268.
[28]. Sharma, C.M. & Gaur, R.D. (1984). Studies on morphology, germination and viability of Pomegranate (PunicagranatumL.) pollen. J.Palynol. **20 (2)**: 87-92.
[29]. Singh A. B., and Kumar P. (2004). Aerial pollen diversity in India and their clinical significance in allergic diseases. Ind. J Clin. Biochem. 19:190201.
[30]. Tamboli, A. S., Patil, S. S., Kadam, S. K., Choo, Y. S., Lekhak, M. M., & Pak, J. H. (2022). Morphology, palynology and molecular phylogeny of Barleria cristata L. (Acanthaceae) morphotypes from India. Diversity, 14(8), 677.
[31]. Talukdar G. Hossain, Ismile, Ray, Nitai, Soma N. K., Kabir S. R., Biswas K. K., Roy N., and Saha R. K. (2012). Allergen Protein from Mango (Mangiferaindica) flowers pollen. Asian Pac J. Mol. Biol. Biotechnol
[32]. Tilak S. T. (2012). Renaissance of Aerobiology. Proc. 17th. National Conference of Indian AerobiologicalSociety on Impact of Airborne pathogens.
[33]. Tripathi, S., Garg, A., Shukla, A. N., Farooqui, A., et al. (2022). Pollen micro-morphometry of two endangered species of Rauvolfia L. (Apocynaceae) from the Indo-Gangetic Plains of Central India using LM, CLSM and FESEM. Palynology, 46(2).
[34]. Tripathi, S., Basumatary, S. K., & Farooqui, A. (2024). Recent advances in pollen morphology studies of Indian angiosperms and their taxonomic applications. Palynology. (Recent Indian palynological investigations).
[35]. Tripathi, S., Basumatary, S. K., & Farooqui, A. (2025). Recent advances in pollen morphology studies of Indian angiosperms and their taxonomic applications. Palynology. (Recent Indian palynological investigations).