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A STUDY ON THE POLLEN MORPHOLOGY OF SOME FAMILIES OF IRRIGATED PARTS OF GANGANAGAR DISTRICT

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Study of morphological characters of pollen grains of particular region is useful for the identification and classification of local plants and identification of atmospheric pollen. The conclusions on present study on plants belonging to 73 families, 229 genera and 279 species are being discussed here.28 out of total 73 families studied in this work are found important. 28 out of total 73 families studied in this work are found important. Analysis of major Eurypalynous families of the irrigated region is carried out.

Keywords: Eurypalynous, Ganganagar, Irrigated Parts, Pollen morphology, Pollen allergies.

Introduction

The pollen of irrigated region of Ganganagar shows a great variation in their morphoforms. In all, the pollen morphological characters of 279 species belonging to 229 genera have been studied. These plants are classified into 73 families, of which 66 belongs to dicotyledons and 7 to monocotyledons of Banthem and Hooker[1] system of classification. Among the dicotyledons the most dominating families are Papilionaceae with 22 species and Asteraceae with 15 species. Other important families are Cleomaceae, Capparaceae, Caryophyllaceae, Malvaceae, Tiliaceae, Zygophyllaceae, Rutaceae, Mimosaceae, Caesalpiniaceae, Cucurbiaceae, Asclepidaceae, Boraginaceae, Convolvulaceae, Solanaceae, Scrophulariaceae, Acanthaceae, Verbmaceae, Lamiaceae, Polygonaceae and Euphorbiaceae. Among the monocotyledons the most dominating family is Poaceae with 34 species.

Above analysis of different morphoforms of pollen grains of irrigated parts of Ganganagar will help in solving the taxonomical problems related to the identification of species of this area and at the same time it will serve as base data for the identification of airborne pollen grains which are responsible for allergic disorders among the local population.

Material and Methods

Pollen slides were prepared by the method given by Erdtman[2] and Nair[3]. Preparation of both Acetolysed (Ac) and Unacetolysed (Uc) grains were made on the same slide. The detailed method was as under:

The polliniferous material was collected from different irrigated parts of Ganganagar (Rajasthan) and placed in 70% alcohol in vials. After about 24 hours the material was crushed within plastic centrifuge tubes and the dispersion was sieved through a fine brass mash into a glass centrifuge tube.

The whole quantity of the dispersion was divided into two halves, A and B. The part A will be stained by safranin, warmed slightly over a flame, centrifuged and kept aside. The part B contained in another centrifuge tube was centrifuged, the supernatant alcohol decanted, the sediment was covered by glacial acetic acid and centrifuged. Again after pouring out the glacial acetic acid the pollen sediment was covered by the acetolysed mixture. The mixture contained in the centrifuged tube was placed in water bath and heated from

70°C to boiling point. The acetolysed mixture was stirred with a glass rod and the tube was left in the hot water for 2-3 minute to enable the complete dissolution of the protoplasm. The mixture was centrifuged, the liquid decanted and the sediments was again covered with glacial acetic acid followed by centrifuging and finally the sediment was washed many times by centrifugation and brought to 50% glycerin and left aside.

In order to prepare pollen slides, the dispersion of A and B was mixed and centrifuged, the glycerin decanted and the centrifuge tube was placed upside down on a filter paper so that the excess glycerin run down. A pellet of glycerin jelly, cut by means of blade was carried at the tip of a needle was taken inside the centrifuge tube kept inverted to touch the pollen sediment. The pollen was caught on the glycerin jelly, transfer to a microscope slide, warmed and left aside for 1 or 2 minutes so that the outer surface of the pellet of glycerin jelly slightly condenses. A cover glass was placed over the jelly and slightly pressed so that a round area of jelly was formed inside coverslip. A piece of paraffin wax of melting point 60°C will be placed on a slide of the cover slip. Warmed carefully so as to allow the molten wax to flow into the vacant area left by the glycerin jelly.

The slide was kept aside for a little while so that the wax solidifies. The extra wax will be scraped of a blade, the slide was cleaned by xylol and made ready for microscopic examination. Pollen grains were examined to observe their shape, size, aperture type, exine and its ornamentation etc. The present work is restricted mainly to the morphology of pollen grains of angiosperms as observed under light microscopy.

Measurements:

In taking the measurement of size 10-20 grains have been studied and the average size is mentioned. In those which bear excrescences on the exine surface, the measurements given are exclusive of the excrescences. For radio-symmetric grains the polar diameter (P) is followed by the equatorial diameter (E) and in case of bilateral grains the polar diameter is followed by two equatorial measurements (E and E). The size of pollen grain is measured from both acetolysed and unacetolysed grains, whereas, the other measurement have been made from acetolysed grains only.

Results and Discussion

Family Malvaceae with pantoporate and spinate exine sculpturing, Cucurbitaceae mostly with 3-zonocolporate and reticulate exine type, Hydrocharitaceae with 1-sulcate and granulate exine type are typical in aperture type and exine ornamentation condition. Liliaceae with 1-colpate, Cyperaceae with rudimentary apertures. Family Potamogetonaceae with in aperturate condition and reticulate exine ornamentation is also distinct.

Families typical in exine ornamentation are Cleomaceae with reticulate exine, Malvaceae with spinate.

While considering the pollen morphological characters, the aperture forms are of primary importance and in the present study almost all the major apertural forms have been reported. The most dominant aperture type is 3-zonocolporate representing as much as 32.61% of total aperture types studied. 3-zonocolpate (19.35%), l-porate (12.54%), pantoporate (10.39%), 3-zonoporate (4.65%), 3-zonocolporoidate (3.22%), l-Aperturate (2.86%), 1-zonocolpate (2.50%), stephenocolpate (2.86%), inaperturate (2.15%), polyad (1.43%), 4-zonocolporate (1.43%), pantocolpate (1.07%), 4-zonocolpate (0.35%), 2-zonoporate (1.07%), stephenocolporate (0.35%), 1-sulcate (0.71%) and 3-zonopororate (0.35%), are other representing apertural types.

As in the whole diversity the dominant apertural types in dicotyledons are 3-zonocolporate, 3-zonocolpate and pantoporate (14.16%). These apertural forms are absent from monocotyledons. Among the monocotyledons the dominant apertural types are 1-porate, I-aperturate

and l-zonocolpate. These apertural types are absent in dicotyledons. Inaperturate condition was found in both the groups.

As regards the exine ornamentation in present work, percentage of various type of exine mention in brackets are reticulate (35.47%), granulate (27.58%), psilate (14.33%), spinate (6.45%), areolate (2.54%), foveolate (2.54%), spinulate (2.15%), baculate (1.79%), punctate (0.35%), echinolophate (0.71%), striato-reticulate (1.07%), pilate (1.43%), punctitegillate (0.71%), rugulate (1.07%), obscure (0.71%), retipilate (0.71%), pilate and punctate (0.35%) and pitted (0.35%).

In dicotyledons the most dominating exine ornamentation is reticulate while in monocotyledons it is granulate. It is interesting to note that dominant aperture type 3- zonocolporate also have the dominant exine ornamentation, i.e., reticulate. Considering the exine thickness in present study, is ranges from 1 pm to 15 pm.

Spheroidal shape (33.33%) is dominant among all taxa studied. The percentage of other shape types is suboblate (19.35%), prolate-spheroidal (10.39%), oblate-spheroidal (8.64%), oblate (8.96%), subprolate (9.31%), prolate (2.54%), con exo-convex (2.15%), plano-convex (1.79%), almost spheroidal (0.71%), tetrahedral tetrad (1.07%), peroblate (0.35%), perprolate (0.35%), elliptical (0.35%), tetrahedral (0.35%) and ellipsoidal (0.35%).

In dicotyledons, majority of grains are with spheroidal, suboblate and prolate-spheroidal shape types. In monocotyledons spheroidal shape is most common and other shapes are convexo-convex and plano-convex. Plano-convex, convexo-convex and ellipsoidal shapes are not found in dicotyledons. Considering the size of pollen grains the smallest pollen grain is *Plantago amplexicaulis* (11 pm) and the largest is *Gossypium herbaceum* (150 qm). In present study pollen morphological diversity is also analyzed on the basis of plant habit. These habit types are herbs/weeds, shrubs, trees and grasses. In present work 279 plant species have been investigated for their pollen morphological characters. Out of these species 55.19% are herbs/weeds, 19.71% are shrubs, 12.18% are grasses and 12.90% are trees. In dicotyledons herbs/weeds contributes maximum whereas in monocolyledons grass habit is dominant. Distribution of pollen morphological characters in different plant habits is also presented. 3-zonocolporate apertural from is dominant among herbs/weeds (38.31%), shrubs (32.72%) and in trees (38.88%). It is followed by 3-zonocolpate condition (in herbs/weeds 21.42%, in shrubs 21.81% and in trees 25.00%). The pantoporate apertural form is also important as it contribute 14.28% for herbs/weeds and 12.72% for shrubs. Other apertural types contribute less than 5% for each habit type. Among grasses only l-porate apertural type is present. Reticulate exine type is prevalent among herbs/weeds, shrubs and trees as it contribute 36.36%, 38.18% and 41.15% respectively. It is followed by granulate exine type which contribute 25.32% for herbs/weeds and 20.00% for shrubs. Among trees psilate exine type occupy the second position with 27.77%. In grasses granulate exine type is dominant (61.76%) and it is followed by reticulte (20.58%) and psilate (17.64%) exine types. Spheroidal shape is found as common shape distributed in all habit types (except trees). This shape type contributes 24.67% in herbs\weeds, 23.63% in shrubs and 100% in grasses, while in trees the dominant type is suboblate (25.00%). For herb/weeds other shape types are suboblate (22.72%), prolate-spheroidal (12.33%) and oblate-spheroidal (11.03%), for shrubs suboblate (18.18%), prolate-spheroidal (14.54%), subprolate (12.72%) and oblate (9.09%) and for trees these are spheroidal (22.22%), subprolate (16.66%), oblate (13.88%) and oblate-spheroidal (8.33%). Above analysis of different morphoforms of pollen grains of irrigated parts of Ganganagar will help in solving the taxonomical problems related to the identification of species of this area and at the same time it will serve as base data for the identification of airborne pollen

grains which are responsible for allergic disorders among the local population.

Hensley and Ferguson[4] studied pollen morphology of the genus *Erythrina* Leguminosae: Papilionoideae and described pollen as oblate, rounded triangular shaped in polar view, ranging in size from 22 to 25 m diameter, triporate occasionely tetraporate and surface ornamentation was basically reticulate. Nair and Kothari[5] presented a monographic account on pollen grains of Indian Heteromeraes. Grewal[6] studied the pollen flora for Ganganagar (Rajasthan). Onmanerad[7] investigated the pollen morphology of 17 species representing 17 families of dicotyledonous terrestrial weeds. All studied pollen was monad spheroidal or rather spheroidal exept Mimosa pudica that was of tetrad type.

Trudel and Morton[8] illustrated the pollen morphology of 118 species of Labiateae of all the 36 genera native to North America. The value of pollen as taxonomic character in this family was discussed. Kaushik[9] describe the pollen flora for north-west Rajasthan in India. Pollen was tricolporate, angulaperturate and striato-rugulate. A thick tectum, a thin granular infratectal layer and a thick nexine was characterized in exine. Arora[10] studied the pollen flora of Chum. Furness investigated the pollen morphology of 64 species from 3 genera *Acanthopsis*, *Acanthus* and *Blepharis* in the tribe Acantheae (Acanthaceae). On the basis of pollen characters, endexine substructure, intra-specific variation and abnormal pollen five pollen types and ten subtypes were illustrated. Chaturvedi[11] et al observed variation in the pollen morphology of *Mesembryanthemum criniflorum* treated or not treated with gamma irradiation. In radiated plants exine ornamentation was completely changed and it was microverrucate instead of spinulose, whereas aperture character did not deviated from basic character. Perveen and Qaiser[12] examined the pollen morphology of 11 species representing 5 genera of the subfamily Caesalpinioideae. It was a eurypalynous subfamily.

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