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A Study On The Pollen Morphology Of Asteraceae Family Of Irrigated Region Of Ganganagar District

Ved Prakash Siraw[*], Raja Ram Choyal[**], Anil Arora[***]
Govt Senior Secondary School Dullapur Keri*
Department of Environmental Science, MGS University, Bikaner**
Department of Botany, Govt. Dungar College, Bikaner***

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Abstract

Study of morphological characters of pollen grains of family Asteraceae of particular region is useful for the identification and classification of local plants and identification of airborne pollen. In present study 14 species of family Asteraceae from irrigated region of Ganganagar District have been discussed. All species comes under Eurypalynous families of the irrigated region of Ganganagar District.

Keywords: Eurypalynous, Pollen Grains, Ganganagar, Morphoforms

Introduction

The District Ganganagar having an area of 10,000 sq km is situated in the North of the Rajasthan state between 28 ^{0}2.49'-30^{0}.6'North latitude and 72^{0}.36'-74^{0}.16' East longitude. Sri Ganganagar is established as the major plan of irrigating the Erstwhile Bikaner State. Sri Ganganagar is situated at the point where the Satluj Waters enters Rajasthan or Erstwhile Bikaner state. Desert land was converted to a green town by the efforts of Maharaja Ganga Singh, who brought the Gang canal which carries the excess waters of Punjab and Himachal Pradesh to the region, making Ganganagar district known as "the food basket of Rajasthan".

Asteraceae or Compositae, is a very large and widespread family of flowering plants. The family includes over 32,000 currently accepted species, in over 1,900 genera in 13 subfamilies. Recent studies reveal that Asteraceae, with its 1314 taxa under 204 genera distributed in to 20 tribes, is the most diversified Angiospermic plant family in Indian flora, (Mitra, 2016).

The pollen of Asteraceae of irrigated region of Ganganagar show a great variation in their morphoforms. Pollen grains of some Asteraceae species were described by Erdtman (1952), Zafar *et al.* (2007) and Ahmad *et al.* (2010), who noted echinate and psilate sculpture. In the current paper, the pollen morphology, types and sculpture of indigenous asteraceous species from the irrigated region of Ganganagar District were studied. The study aimed to determine how pollen from the Asteraceae from this unique area can help in species identification.

Analysis of different morphoforms of pollen grains of family Asteraceae 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 pollengrains which are responsible for allergic disorders among the local population.

Methodology

Pollen slides were prepared by the method given by Erdtman (1952) and Nair(1979). Preparation of both Acetolysed(Ac)and Unacetolysed(Uc) grains were made on the same slide.

Measurements

Measurement of size 10-20 grains have been studied and the average size is mentioned. Forradio-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.

Pollen 3-ZonoColporate

***Ageratum conyzoides* Linn.**

Prolate-spheroidal; Amb-circular; 3-colpi with pore in equatorial view; Exine Spinulate Equatorial diameter, 21.5 µm; Polar diameter 23.5 µm Exine thickness 3.3 µm; Colpus length 13.5 µm; Colpus breadth 5.5 µm; Mesocolpium14.5 µm; Apocolpium 8 µm; Spinule length 2 µm.

***Artemisia scoparia* Waldst. *et* Kit.**

Suboblate; Amb triangular; 3 colpi with pores in equatorial view; Exine Reticulate, ectoexine as thick as endoexine; Equatorial diameter 36 µm; Polar diameter29 µm; Colpus length23 µm; Colpus breadth 5.5 µm; Mesocolpium 23.2 µm; Exine thickness 2 µm.

***Bidens biternata* (Lour.) Merr. *et* Sherff**

Spheroidal; 3 colpi with pores in equatorial view; Exine Spinate, spine long with pointed tip and broad base; Acetolysed pollen diameter 30.5 µm; Colpus lengt19 µm; Colpus breadth 3 µm; Apocolpium 12 µm; Mesocolpium 15 µm; Spine length 4.5 µm; Interspinal distance4.5 µm.

***Carthamus oxyacantha* M. Bieb.**

Oblate; 3 colpi with pores in equatorial view; Exine Spinate, spine tip pointed with conical base; Acetolysed pollen; Equatorial diameter 63.2 µm; Polar diameter 44.2 µm; Colpus length 41µm; Colpus breadth 3 µm; Endocolpium 8 x 12 µm; Exine thickness 6 µm; Spine length 4.3 µm; Interspinal distance 3 µm.

***Dicoma tomentosa* Cass.**

Suboblate; Aperture3 colpi with pores in equatorial view; Endocolpium lalongate; Exine Granulate, ectoexine thicker than endoexine; Exine more thick at poles; Acetolysed pollen Equatorial diameter 24 µm; Polar diameter 18 µm; Colpus length 16 µm; Colpus breadth 4.6 µm; Endocolpium 3 x 4 µm; Apocolpium 8 µm; Mesocolpium 10 µm Exine thickness 3.5 µm.

***Echinops echinatus* Roxb.**
Suboblate; Amb-goniotreme; Aperture3-colpi with pore in equatorial view; Exine Spinulate; Acetolysed pollen Equatorial diameter 94 µm; Polar diameter76 µm; Exine thickness 3.7 µm; Colpus length 56 µm; Colpus breadth3 µm; Mesocolpiumc 49 µm; Apocolpium7 µm.

***Helianthus annus* Linn.**
Oblate-spheroidal; Amb-circular; Aperture 3-colpi with pore in equatorial view Exine Spinate; Acetolysed pollen Equatorial diameter 42.2 µm; Polar diameter 38.5 µm; Exine thickness 3.5 µm; Colpus length 14 µm; Colpus breadth 3.5 µm; Mesocolpium22.5 µm; Apocolpium13 µm; Spinal length 5.6 µm.

***Erigeron bonariensis* Linn.**
Oblate-spheroidal; Aperture3 colpi with pores in equatorial view; ExineSpinate; Acetolysed pollen Equatorial diameter 24µm; Polar diameter 21 µm; Apocolpium18 µm; Exine thickness 4 µm.

***Parthenium hysterophorus* Linn.**
Prolate-spheroidal; Aperture3 colpi with pores in equatorial view; Endocolpium circular; Exine Spinulate; Acetolysed pollen Equatorial diameter17 µm; Polar diameter 19 µm; Colpus length 10.5 µm; Colpus breadth 2.1 µm; Endocolpium 2.5 µm; Mesocolpium 10 .5µm; Apocolpium 4 µm; Interspinule distance 2 µm.

***Pulicaria crispa* (Forsk.) Benth. *et* Hook.f.**
Spheroidal; Aperture3 colpi with pores in equatorial view; Endocolpium circular; ExineSpinulate, ectoexine as thick as endoexine; Acetolysed pollen Diameter19.5 µm; Colpus length 13.7 µm; Colpus breadth 2 µm; Endocolpium 4.5 µm; Mesocolpium12 .2 µm; Apocolpium5.3 µm; Exine thickness 3.2 µm; Spinule length 3 µm; Interspinule distance 4 µm.

***Tridax procumbens* Linn.**
Spheroidal; Aperture3 colpi with pores in equatorial view; Endocolpium lalongate; Exine Spinate, spine tip pointed; Acetolysed pollen Diameter 31.9µm; Colpus length22 µm; Colpus breadth 3 µm; Endocolpium 2 x 4 µm; Mesocolpium 15 µm; Apocolpium 8 µm; Exine thickness3.5 µm; Spine length 4 µm; Interspinal distance 4.1 µm.

***Verbesina encelioides* (Cav.) Benth. *et* Hook.f. ex Grey**

Prolate-spheroidal; Aperture 3 colpi with pores in equatorial view; Endocolpium lalongate; ExineSpinate, spine tip pointed; Ectoexine as thick as endoexine; Acetolysed pollen Equatorial diameter 30 µm; Polar diameter 32 µm; Colpus length 20 µm; Colpus breadth 3 µm; Endocolpium 3 x 6 µm; Mesocolpium 16 µm; Exine thickness3 µm; Spine length 4.5 µm; Interspinal distance 5.2 µm.

Pollen 3-Zoncolpoidorate

***Launaea fallax* (Jaub. *et* Spach) Kuntze**

Suboblate; Aperture 3 indistinct colpi with pores in equatorial view; Endocolpium circular; Exine Echinolophate; Acetolysed pollen Equatorial diameter 37 µm; Polar diameter29.5 µm; Endocolpium 8 µm; Exine thickness 7.5 µm.

***Sonchus asper* (Linn.) Hill.**

Subprolate; Aperture 3-4 indistinct colpi with pores in equatorial view; Exine Echinolophate; Acetolysed pollen Equatorial diameter 31 µm; Polar diameter 38µm; Exine thickness 7 µm.

Pollen 3-Zonoporate

***Xanthium strumarium* Linn.**

Spheroidal; Aperture 3-4 pores in equatorial view Exine Granulate, Acetolysed pollenDiameter 28 µm; Exine thickness 3 µm.

Results and Discussion

The pollen taxa from plants growing in the irrigated region examined here in exhibited a wide range of variation in size and sculpture which has potential taxonomic value. In all, the pollen morphological characters of 14 species have been studied. These plants are belongs to dicotyledons. The largest grains were *Echinops echinatus* in equatorial and polar views (94 µm and76 µm; respectively). The minimum size of 19.5 µm was found in *Parthenium hysterophorus*. The rest of the species are intermediate in size. The polar and equatorial relationship (P/E ratio) was also recorded for all species.The exine thickness was highest (7.5 µm) in *Launaea fallax*. *Artemisia scoparia*is characterised by a thin exine (2 µm). The exine is echinolophate. The spine length varies from 5.6µm in *Helianthus annus*to 4µm in *Tridax procumbens*. Three pollen aperture types were observed i.e. 3-zonocolporate (11species), 3-zonocolpoidorate (2species) and 3-zonoporat6e (1 species).

Family Asteraceae is typical in exine ornamentation with spinate and spinulate types (9 species), Echinolophate (2 species), Granulate (2 species) and reticulate (1 species). The pollen grains of the Family Asteraceae are helianthoid, spherical or slightly flattened, they are mainly tricolporate, echinate, and the size and colpus number varies significantly (Wodehouse 1930, 1935; Skvarla*et al.* 1977). Furthermore, the Asteraceae is a eurypalynous

family and possesses zonocolporate pollen grains(Erdtman 1952; Sachdeva & Malik 1986). Wodehouse (1935) outlined the principles of the morphological evolution of spine form in the Asteraceae, and suggested a reduction from long to minute spines. The spinate pollen character is considered to be a primitive feature compared to spineless pollen. Clark *et al*.(1980) studied the tribe Astereae (Asteraceae) and distinguished some genera on the basis of pollen size, spine length and the number of spine rows between the colpi. The number of spine rows between colpi is also a variable character in this family. Variation in exine thickness is also significant in this family. This parameter is useful at the species level, as almost all the species have different exine thickness. More studies are needed, utilising cosmopolitan taxa, to achieve more conclusive results.

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