

Morphology Study of Some Crucifers Pollen in North Rajasthan



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Abstract

In this study pollen morphology some crucifers were investigated in detail for the first time in North Rajasthan. Pollen morphology of 6 species belonging to different genera of family brassicaceae is investigated from the north Rajasthan. Pollen grains are prolate, spheroidal to rarely oblate spheroidal, oblate to suboblate and tricoplate. To evaluate the comparative study of width between sexin and nexine.

Keywords: Morphology, Suboblate, Reticulate, Exine, Granulate.

Introduction

The brassicaceae family is represented by 350 genera and about 3660 species in the world and with these numbers it is known as a huge dicot family (Al Shehbaz et al. 2012). The major distribution centers of the family are the Mediterranean region (Meerberly et al. 1987). Sri Ganganagar and Hanumangarh are situated in north part of the Rajasthan with semi-arid climate zone, members of brassicaceae are annual, biennial and perennial herbs having cruciform corolla (4 petals arranged in cross manner). Recently some phylogenetic investigation were carried out using molecular methods based on nuclear ITS region (Warwick et al. 2010, German et al. 2009, Cecchi et al. 2011) or nuclear and chloroplast DNA sequence data on the genetically related to some genera (Resetnik et al. 2013)

The Great Indian desert includes all the districts North-West of the Aravalis, including Ganganagar, Hanumangarh, Bikaner, Churu, Sikar, Nagaur, Jaisalmer, Jhunjhunu, Jalore, Jhodhpur and Badmer. Northern Rajasthan includes Ganganagar, Hanumangarh, Churu, and Bikaner districts.

Hanumangarh was raised to District on 12th July 1994 and is situated in North-West part of Rajasthan state between 280.15' & 300.6' North latitude and 740.00' & 76.30' East longitude. It is spread in about 9,630 sq. km. and constitutes a part of Great Indian Desert with district Ganganagar on its North-West; district Bikaner on its South-West.

Review of Literature

Study of pollen morphology of plant is important in providing clue for identification of pollen allergens while undertaking an aerobiological survey of any locality. Since, the time Blackely (1873) discovered that pollen grains cause allergy in human beings, morphological studies on pollen have attracted the attention of many research workers. A lot of work have been done to study aeroallergens in form of pollen on the basis of study of allergic pollen of a region pollen calander (Arora & Modi 2008) can be prepared which may is helpful in forcasting of allergic diseases.

Members of Brassicaceae are annual, biennial and perennial herbs having cruciform corolla (4 petals arranged in cross manner). Several workers Chiguruaeva (1973) and have explored Brassicaceae for its pollen morphology and taxonomic relationships. Lahham and Al-Eisawi (1987) examined pollen morphology of Brassicaceae from Jordan. Pollen morphology of the family Brassicaceae has been investigated by Erdtman (1963), Sharma and Nair (1973), Carter *et al.*, (1975), Moore and Webb (1978), Josnell (1986) and Anjum Perveen *et al.*, (2004). However, there are no reports on pollen morphology of the family Brassicaceae from Desert area.

Aim of the Study

The main objective of the present work is to investigate and describe the pollen of some of the taxa of wild and cultivated Brassicaceae growing in Desert and to discuss the results obtained with recent classification of the family. This study is also useful for identification of allergic pollen grains, evaluation of honey and reveal there contribution to the taxonomy of genera.

Materials and Methods

Pollen samples were collected during the flowering and fruiting period from different natural habitats in Sri Ganganagar and Hanumangarh.

Pollen samples are listed in table1. Specimens for morphological studies were dried according to standard herbarium techniques were stored in the botany department S.D. (P.G.) College.

The measurement was based on 8 to 10 reading from each species. Examined under binocular microscope. The measurements were based on 10 readings from each species. Parameters such as pollen diameter, pollen axis (P) and equatorial diameter (E), aperture type and size, apocolpium, mesocolpium and exine thickness were recorded. The terminology used is in accordance with Erdtman (1952).

Results and Discussion

Pollen grains in Brassicaceae are 3-zonocolpate with reticulate exine sometime it may be granulate. Shape type varies from oblate, oblate-spheroidal or prolate-spheroidal, subprolate or prolate. The study of the distribution of these pollen characters is very useful in plant taxonomy. In such a study the characters relating to the germinal aperture are considered primary, those of the shape secondary and other characters such as exine ornamentation, size etc. are the tertiary in the degree of importance (All the studied characters in the present study are summarised in the Table 2). Pollen description for individual species has been given:

1. **Brassica campestris** Linn.: Pollen grains 31.5 μ m (ED) x 29.6 (PD) μ m, oblate-spheroidal, 3-zonocolpate with reticulate exine, exine thickness is 3.2 μ m, colpus length and colpus breadth is 22.5 μ m and 5.5 μ m respectively.(Fig. A).
2. **Coronopus didymus** (Linn) Smith: Pollen grains 19.8 μ m (ED) x 26.1 μ m (PD), 3-zonocolpate, subprolate with reticulate exine pattern, exine thickness is 1.6 μ m colpus length is 14.2 μ m and colpus breadth is 2.2 μ m. (Fig. B).
3. **Farsetia hamiltonii** Royle: Pollen grains 24.8 μ m (ED) x 20.4 μ m (PD), suboblate, 3-

zonocolpate, with reticulate exine, exine thickness is 2 μ m, colpus length is 19.3 μ m and colpus breadth 5.4 μ m. (Fig.C).

4. **Iberis amara** Linn.: Pollen grains 30.9 μ m (ED) x 24.9 μ m (PD), prolate-spheroidal, 3-zonocolpate, with granulate exine, exine thickness is 2.9 μ m, colpus length and colpus breadth are 27.7 μ m 3.7 μ m respectively.(Fig.D).
5. **Lepidium sativum** Linn: Pollen grains 14.3 μ m (ED) x 9.8 μ m (PD), oblate, 3-zonocolpate, with reticulate exine ornamentation, exine thickness is 2.9 μ m, colpus length and colpus breadth are 27.7 μ m 3.7 μ m respectively. (Fig. E).
6. **Brassica juncea** Linn: Pollen grains 34 μ m (ED) x 28 (PD) μ m, oblate-spheroidal, 3-zonocolpate with reticulate exine, exine thickness is 2.5 μ m, colpus length and colpus breadth is .24 μ m and 4.5 μ m respectively.(Fig.F).

Table -1 Collection of Data For The Investigated Specimens of Some Crucifers

Location	Collector	Date	Herbarium
Sri Ganganagar			
Raisinghnagar	Ajay Sharma	10-04-2014	BDS
Vijay Nagar	Ajay Sharma	15-04-2014	BDS
Sadulshahar	Ajay Sharma	18-04-2014	BDS
Karanpur	Ajay Sharma	25-04-2014	BDS
Hanumangarh			
Rawatsar	Ajay Sharma	05-04-2015	BDS
Sangira	Ajay Sharma	11-04-2015	BDS
Bhadra	Ajay Sharma	19-04-2015	BDS
Nohar	Ajay Sharma	01-05-2015	BDS

BDS (Botany Department of SD College)

Table -2 Pollen Characters of the Species

S. No.	Plant Name	Polar Diameter	Equatorial diameter	P/E Ratio	Shape	Exine type	Exine Thickness	Colpus Length	Colpus Breadth	Apocolpium	Mesocolpium
1	Brassica campestris	28 μ	31 μ	90	Oblate Spheroidal	Reticulate	31 μ	22 μ	6 μ	15 μ	16 μ
2	Coronopus didymus	16 μ	19 μ	0.84	Subprolate	Reticulate	2 μ	.14 μ	3 μ	8 μ	9 μ
3	Faresetia himailtonii	18 μ	22 μ	0.81	Subprolate	Reticulate	1.54 μ	16 μ	6 μ	10 μ	11 μ
4	Iberis amara	26 μ	29 μ	0.89	Subprolate	Reticulate	2.9 μ	17 μ	3 μ	16 μ	18 μ
5	Lepidium sativum	16.1 μ	15.1 μ	0.7	Prolatespheroidal	Reticulate	2.9 μ	273. μ	3.7 μ	7.6 μ	2.1 μ
6	Brassica juncea	28 μ	34 μ	0.82	Oblate	Reticulate	2.2 μ	19 μ	6 μ	7 μ	7.5 μ

Discussion

Brassicaceae is a stenopalynous family (Erdtman, 1952), pollen grains 3-zonocolpate, generally prolate to subprolate oblate to oblate-spheroidal, or prolate-spheroidal with reticulate or granulate exine ornamentation. Apple and Al-Shehbaz (2003) also reported tricolpate reticulate pollen in the family Brassicaceae. On the basis of exine thickness two pollen types were identified by Erdtman (1963) in Brassicaceae. Moore and Webb (1987) also observed tricolpate aperture type with reticulate exine pattern in the family Brassicaceae. Anjum Perveen *et al.*, (2004) studied 77 members of Brassicaceae and organized four pollen types on the basis of exine ornamentation. But in the present work on the basis of exine morphology only two pollen types could be recognized i.e., pollen grains with reticulate exine in *Brassica campestris*, *Coronopus didymus*, *Farsetia hamiltonii*, *Lepidium sativum* and *Sisymbrium irio* and pollen with granulate exine in *Iberis amara* and *Raphanus sativus*. Pollen morphology of this family is more closely related to family Resedaceae, Bombacaceae, oxalidaceae and Tamaricaceae due to having 3-zonocolpate pollen with reticulate tectum (Qaiser & Perveen, 2004). Erdtman (1952) reported that the family Brassicaceae is closely related to family Capparaceae on the basis of aperture type. However, Capparaceae is eurypalynous family but 3-zonocolpate aperture type is common character. Pollen morphology confirms the homogenous nature of the family. This study also justified the right position of the family in the Takhtajan System of Classification (1997) where Capparaceae and Brassicaceae both are placed in same order Capparales. *Methiola incana* have unique feature i.e. pollen inaperturate for easy identification among this family

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Fig 1: Pollen Microphotographs of Varies Plants

