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Pollen Morphology of Some Desertic Crucifers

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ABSTRACT
Pollen morphology of 8 species belonging to 8 genera of family Brassicaceae is investigated from the Indian desert in Rajasthan. Brassicaceae is a stenopalynous family. Pollen grains vary from tricolpate, oblate to suboblate, prolate-spheroidal to rarely oblate-spheroidal. Sexine is thinner or thicker than nexine. Tectum is reticulate but sometimes it may be granulate.

Key Words: Stenopalynous, Tricolpate, Suboblate, Prolate-spheroidal, Oblate-spheroidal, Reticulate, Granulate.

INTRODUCTION
The Brasssicaceae is a cosmopolitan family of about 350 genera and 3000 species, occurring mainly in North Temperate Zone particularly in Mediterranean region (Mabberely, 1987). Rajasthan state is situated in the North-Western part of the Indian union covering the complete arid Great Indian Desert and parts of semi-arid climatic zone. The district of Bikaner is situated in North-West of the state between $27^0$11' to $29^0$03' North latitudes and $71^0$54' to $76^0$15' East longitude at an average altitude of 228m and covering the complete arid Great Indian Desert and parts of semi-arid climatic zone. Members of Brassicaceae are annual, biennial and perennial herbs having cruciform corolla (4 petals arranged in cross manner). Several workers Chiguriaeva (1973) and Javied and Naqushi (1975) 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. 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 and evaluation of honey.

MATERIALS AND METHODS
Pollen samples were collected randomly from Bikaner (Rajasthan). The pollen slides were prepared by the method of Arora and Modi (2008) and 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) and Faegri and Iversen (1964).

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 apertureare considerd 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 1). Pollen description for individual species has been given:

Brassica campestris Linn.: Pollen grains 31.5 µm (ED) x 29.6 (PD) µm, oblate-spheroidal, 3-zonocolpate with reticulate exine, exine thickness is 3.2 µm, colpus length and colpus breadth is 22.5 µm and 5.5 µm respectively. (Figs. 1A-B).

Coronopus didymus (Linn) Smith: Pollen grains 19.8 µm (ED) x 26.1 µm (PD), 3-zonocolpate, subprolate with reticulate exine pattern, exine thickness is 1.6 µm colpus length is 14.2 µm and colpus breadth is 2.2 µm. (Figs. 1C-D). .

Eruca sativa Linn: Pollen grains 22.4 µm (ED) x 19.7 µm (PD) , 3-zonocolpate, suboblate with reticulate exine ornamentation, exine thickness is 2 µm, colpus length and colpus breadth are 19.1 µm and 5.3 µm. (Figs. 1E-F).

Farsetia hamiltonii Royle .: Pollen grains 24.8 µm (ED) x 20.4 µm (PD), suboblate, 3-zonocolpate, with reticulate exine, exine thickness is 2 µm, colpus length is 19.3 µm and colpus breadth 5.4 µm. (Fig 1A-B). (Figs. 1G-H).

Iberis amara Linn.: Pollen grains 30.9 µm (ED) x 24.9 µm (PD), prolate-spheroidal, 3-zonocolpate, with granulate exine, exine thickness is 2.9 µm, colpus length and colpus breadth are 27.7 µm 3.7 µm respectively. (Figs. 2A-B).

Lepidium sativum Linn.: Pollen grains 14.3 µm (ED) x 9.8 µm (PD), oblate, 3-zonocolpate, with reticulate exine ornamentation, exine thickness is 2.9 µm, colpus length and colpus breadth are 27.7 µm 3.7 µm respectively.

Table 1: Pollen characters of the species

S.no	Plant name	Polar diameter	Equatorial diameter	P/E ratio	Shape	Exine type	Exine thickness	Colpus length	Colps breadth	Apocolpium	Mesocolpum
1	*Brassica campestris*	29.6µm	31.5µm	93	Oblate – spheroidal	Reticulate	3.2µm	22.5 µm	5.5 µm	9 µm	16.7 µm
2	*Coronopus didymus*	26.1 µm	19.8 µm	131	Subprolate	Reticulate	1.6 µm	14.2 µm	2.2 µm	5.7 µm	16.1 µm
3	*Eruca sativa*	19.7 µm	22.4 µm	87	Suboblate	Reticulate	2 µm	19.1 µm	5.3 µm	3.3 µm	15.8 µm
4	*Farsetia himailtonii*	20.4 µm	24.8 µm	82	Suboblate	Reticulate	2 µm	19.3 µm	5.4 µm	17.3 µm	5.5 µm
5	*Iberis amara*	34.5 µm	30.9 µm	111	Prolate-spheroidal	Granulate	2.9 µm	27.7 µm	3.7 µm	3.2 µm	15.5 µm
6	*Lepiduim sativum*	9.8 µm	14.3 µm	145	Oblate	Retiuclate	1.2 µm	6.3 µm	1.6 µm	7.6 µm	2.1 µm
7	*Raphanus sativus*	30.2 µm	28 µm	68	Prolate-spheroidal	Granulate	2.3 µm	20.7 µm	2.5 µm	8.7 µm	22.1 µm
8	*Sisymbrium irio*	24.7 µm	26.7 µm	92	Oblate-spheroidal	Reticulate	3.6 µm	22.4 µm	3.9 µm	4.3 µm	18.5 µm

Raphanus sativus Linn.: Pollen grains 28 µm (ED) x 30.2 µm (PD), prolate-spheroidal, 3-zonocolpate, with granulate exine, exine thickness is 2.3 µm, colpus length is 20.7 µm and colpus breadth is 3.7 µm. (Figs. 2C-D).

Sisymbrium irio Linn.: Pollen grains 26.7 µm (ED) x 24.7 µm (PD), oblate-spheroidal, 3-zonocolpate, with reticulate exine, exine thickness is 3.6 µm, colpus length and colpus breadth are 22.4 µm 3.9 µm respectively. (Figs. 2E-F).

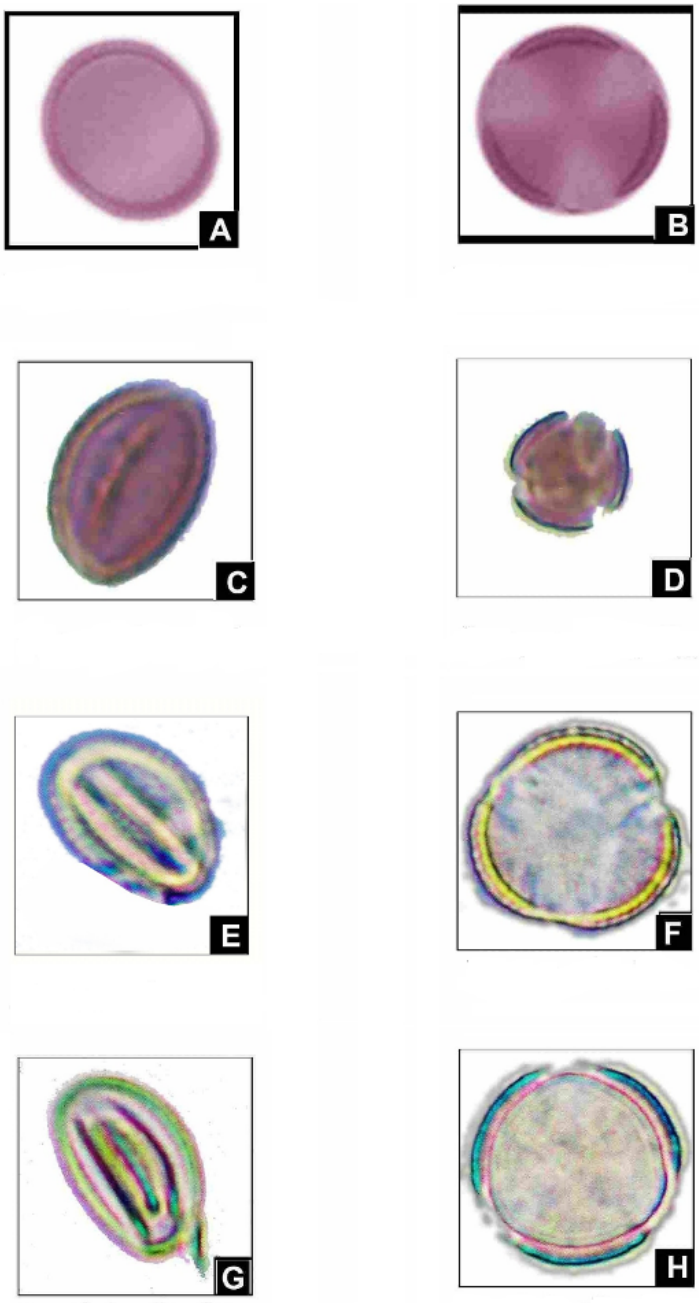

Fig. 1: Pollen microphotographs of various plants. *Brassica campestris* E.V. (A) and P.V. (B); *Cornopus didymus* E.V. (C) and P.V. (D); *Eruca sativa* E.V. (E) and P.V. (F); and *Farsetia hemiltonii* E.V. (G) and P.V. (H). **(*Abbrv.* P.V.** Polar View**; E.V.** Equatorial View**)**

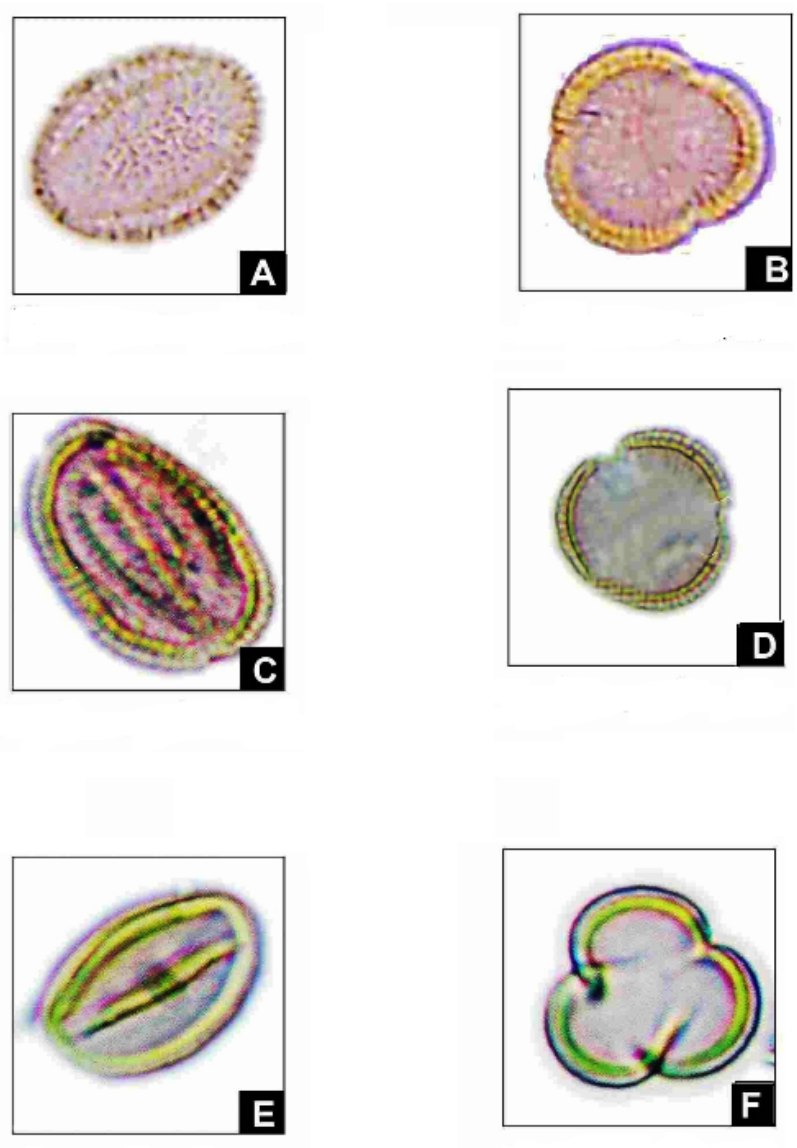

Fig. 2: **Pollen microphotographs.** *Iberis amara* E.V. (A) and P.V.(B); *Raphanus sativus* E.V. (C) and P.V. (D); and *Sisymbrium irio* E.V. (E) and P.V. (F). **(*Abbrv.* P.V.** Polar View**; E.V.** Equatorial View**)**

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 Brassicaceaeand 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, Eruca sativa, 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 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, Capparacaeae 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.

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