

POLLEN MORPHOLOGY OF SOME TURKISH ENDEMIC *HELICHRYSUM* GAERTNER SPECIES (COMPOSITAE)

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Abstract

Pollen morphology of 6 endemic taxa in the genus *Helichrysum* Gaertner (Compositae) has been investigated using light and scanning electron microscopy. The pollen grains of all the *Helichrysum* taxa are similar in that they are tricolporate with spines and rugulate ectexine sculpturing. They are spheroidal, prolate-spheroidal or oblate-spheroidal in shape.

Introduction

Helichrysum Gaertner belonging to the family Compositae, tribe *Imuleae*, is a cosmopolitan genus in Turkey and its taxonomy has been revised by Davis & Kupicha (1975) in the Flora of Turkey. It is represented by 16 species and 3 subspecies, 7 of which are endemic to Turkey.

Pollen morphology of *Helichrysum* has received little attention since Inceoglu & Karamustafa (1977) studied only *H. plicatum* DC ssp. *plicatum* under the light microscopy and made a comparison with other members of Compositae. The present report describes pollen morphology of Turkish endemic *Helichrysum* species using light and scanning electron microscopy.

Materials and Methods

Plant materials were obtained from the herbarium of Gazi University (GAZI). Pollen grains were prepared according to the acetolysis method as described by Erdtman (1960).

The light microscopical work was carried out using a Leitz-Wetzlar microscope (100 x). Measurements are based on 20 pollen grains for each taxon. Photographs were taken with a Leitz Phan-Photo microscope. All selected taxa were also studied under scanning electron microscopy. The air-dried pollen were covered with gold during evaporation prior to examination on the screen of a JEOL 100 CXII scanning electron microscope.

Terminology as used by Erdtman (1952), Faegri & Iversen (1989), Mesfin *et al.*, (1995) and Salgado-Labouriau (1982) has been followed.

Results

Size: The size of the pollen grains (polar axis x equatorial diameter, excluding spines) of the species of *Helichrysum* in Turkey ranges from 17.7x16.5 µm in *H. compactum* to 40.9x38.8 µm in *H. chionophilum*. There is little variation in the size of pollen grains. *H. pamphylicum*, *H. arenarium* ssp. *erzincanicum* and *H. noeoanum* have pollen grains similar in size (Table 1 and Fig. 1A-B).

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Table 1. Summary of morphometric data on some Turkish endemic *Helichrysum*. The values are in μm .

	P*	E*	Length	Width	Length	Width	C*	P/E	Exine	AMB diameter	t*	Collection data
(A) <i>H. pamphylicum</i> Davis & Kupicha	22.9	22.9	14.1	4	2.1	3.3	3	spheroidal	2.1	20.8	10.4	C ₃ Antalya: H. Pesmen (GAZI)
(B) <i>H. chasmolycicum</i> P.H. Davis	17.9	17.9	14.5	3.4	2.1	3.1	3	spheroidal	1.7	16.6	7.3	C ₃ Isparta: H. Duman (GAZI)
(C) <i>H. compactum</i> Boiss.	16.5	17.7	11.4	3.4	1.9	3.3	3	prolate-spheroidal	1.8	15.6	7.3	C ₃ Antalya: H. Pesmen (GAZI)
(D) <i>H. noeanum</i> Boiss.	23.6	23.6	14.1	4.9	2.9	4.4	3	spheroidal	3.1	20.8	11.4	B ₄ Ankara: M. Vural (GAZI)
(E) <i>H. chitonophyllum</i> Boiss & Bal.	38.8	40.9	26	-	6.8	6.8	3	prolate-spheroidal	3.2	36.9	14	A ₄ Ankara: F. Orhan (GAZI)
(F) <i>H. arenarium</i> (L.) <i>Moench</i> subsp. <i>erzincanum</i>	22.3	22	14.2	4.1	2.5	3	3	oblate-spheroidal	2	18.4	6.2	C ₆ Kahramanmaraş: H. Duman (GAZI)

Abbreviations:

C* = Number of colpi

E* = Equatorial diameter

P* = Polar axis

t* = Apocolpium diameter

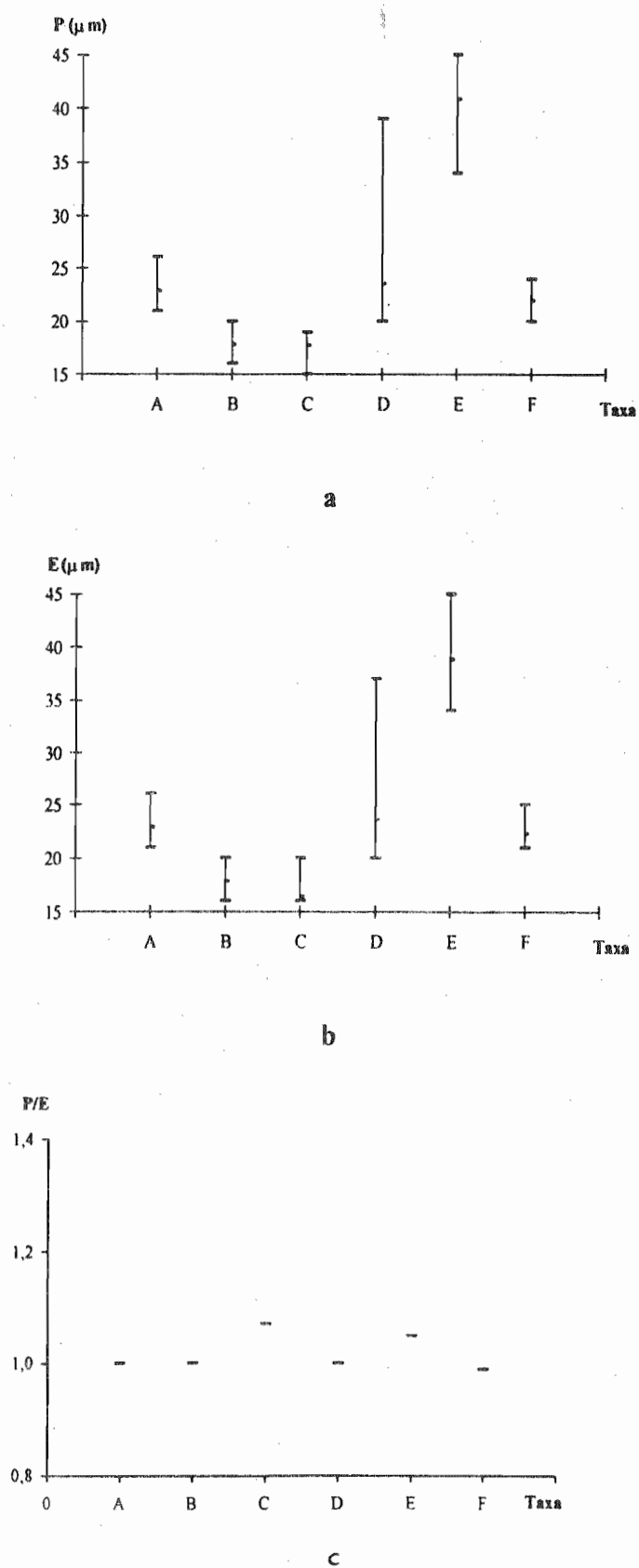


Fig. 1. a: for P; b: for E; c: for P/E. Polar axis (P), Equatorial axis (E) and P/E values for the taxa studied.

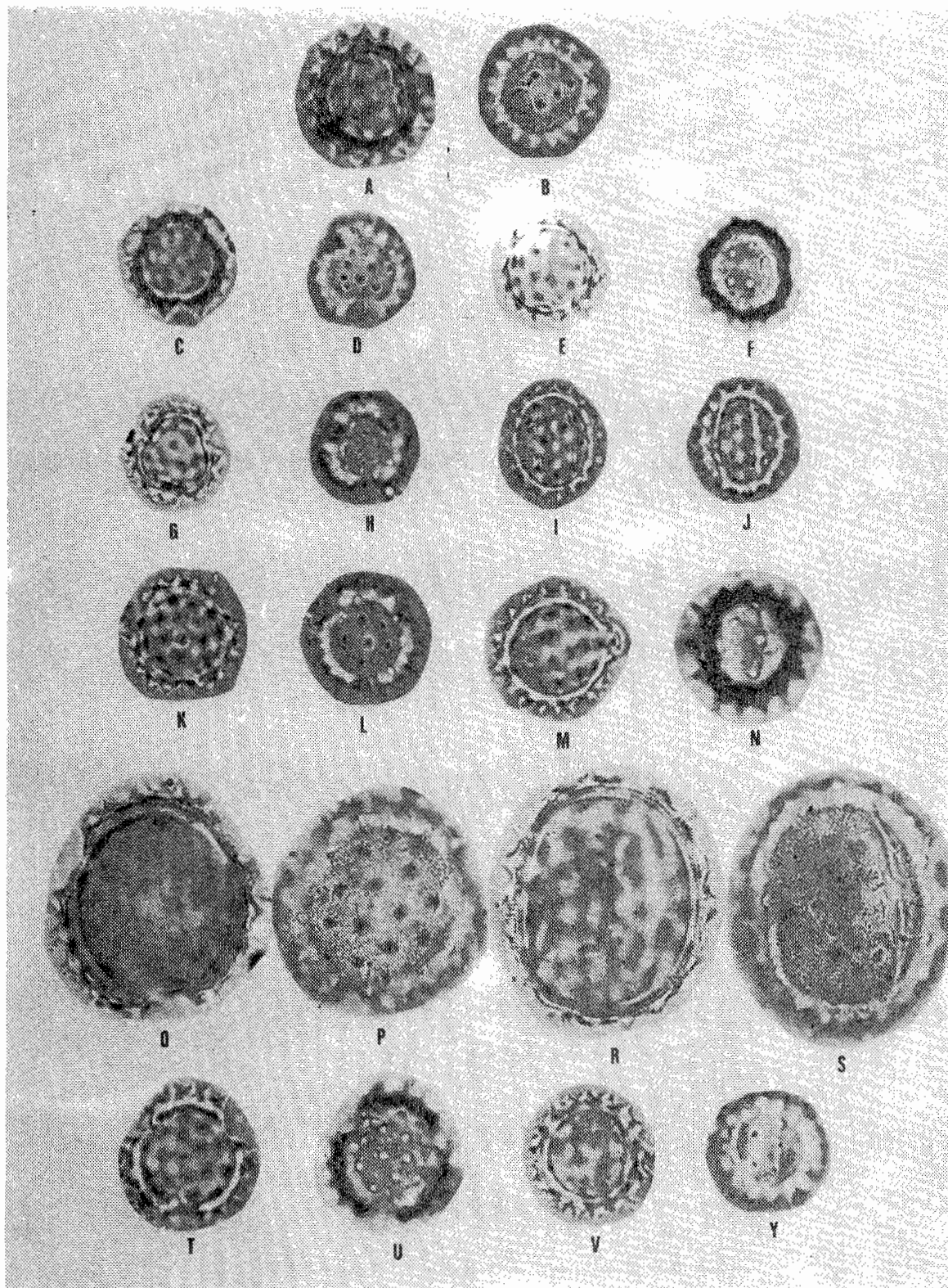


Fig. 2. Light microscopy micrographs of pollen grains of *Helichrysum* x 1000 C, D, G, H, K, L, O, P, T and U, optical equatorial view. A, B, E, F, I, J, M, N, R, S, V and Y, optical meridional view showing aperture in profile. (A-B) *H. pamphylicum*. (C-F) *H. chasmolyticum*. (G-J) *H. compactum*. (K-N) *H. noeocanum*. (O-S) *H. chionophilum*. (T-Y) *H. arenarium* ssp. *erzincanicum*.

Symmetry and shape: The pollen grains are radially symmetrical, isopolar and spheroidal, prolate-spheroidal or oblate-spheroidal (Fig. 1C). The ratio of P (length of the polar axis) to E (equatorial diameter) is 0.99-1.07. Outline is elliptic in equatorial optical section and circular in meridional optical section (Fig. 2).

Apertures: The pollen in *Helichrysum* is tricolporate with a longate ora. The ora are elliptic or quite circular (Fig. 2B, F). The longest colpi and ora were observed in *H. chionophilum* (Fig. 2S). *H. compactum* has the shortest colpi (Fig. 2J). Apertural membrane is psilate (Fig. 2B, F, J, N, S, Y). Apocolpium is more or less broad (t: 6.2-14 μm) (Fig. 2D, H, L, P, U).

Spines: The spines are commonly conical with a broad base and a blunt apical portion (Fig. 3). The spine length varies between 2 and 3.1 μm and the width of the spine base varies between 2.3 and 4 μm . The base of the spines in almost all species studied has irregularly 1-2 seriate perforations with the small holes (cavities) often found distally (Fig. 3D). In none of the species examined we encountered subapical holes or channels.

Tectum: The pollen wall under the SEM showed spines and rugulate sculpturing (Fig. 3D, F). The tectum surrounding the spine base is microperforate. Exine thickness of the pollen grains ranges from 1.7-3.2 μm . *H. noeonum* and *H. chionophilum* have the thickest exine. Caveate sexine is much thicker than nexine.

Conclusion

Species of the genus *Helichrysum* showed similarities in palynological characters. A certain homogeneity for P and E values was observed (Fig. 1A-B). However, the maximum P and E values were observed in *H. chionophilum* with minimum values in *H. compactum*. For P/E, the highest value was found in *H. compactum* having the lowest E value and the minimum P/E value in *H. arenarium* ssp., *erzincanicum*. Besides, in the taxa spheroidal, prolate-spheroidal or oblate-spheroidal grains were found.

Inceoglu & Karamustafa (1977) reported that the exine stratification of *H. plicatum* ssp., *plicatum* is similar to that of the senecoid/inuloid type exine as defined by Skvarla (1966). Our results are in agreement with those of Inceoglu & Karamustafa that the pollen exine of all 7 *Helichrysum* Turkish endemic taxa have one columellar layer and caveatae and their sexine is much thicker than nexine. In the genera of the family Compositae, spine cavities of pollen exine have been regarded as diagnostic characters. *Helichrysum* species examined in this study have 1-2 irregularly seriate cavities.

Acknowledgements

We would like to express our sincere thanks to the workers of GAZI for use of the herbarium materials of *Helichrysum*.

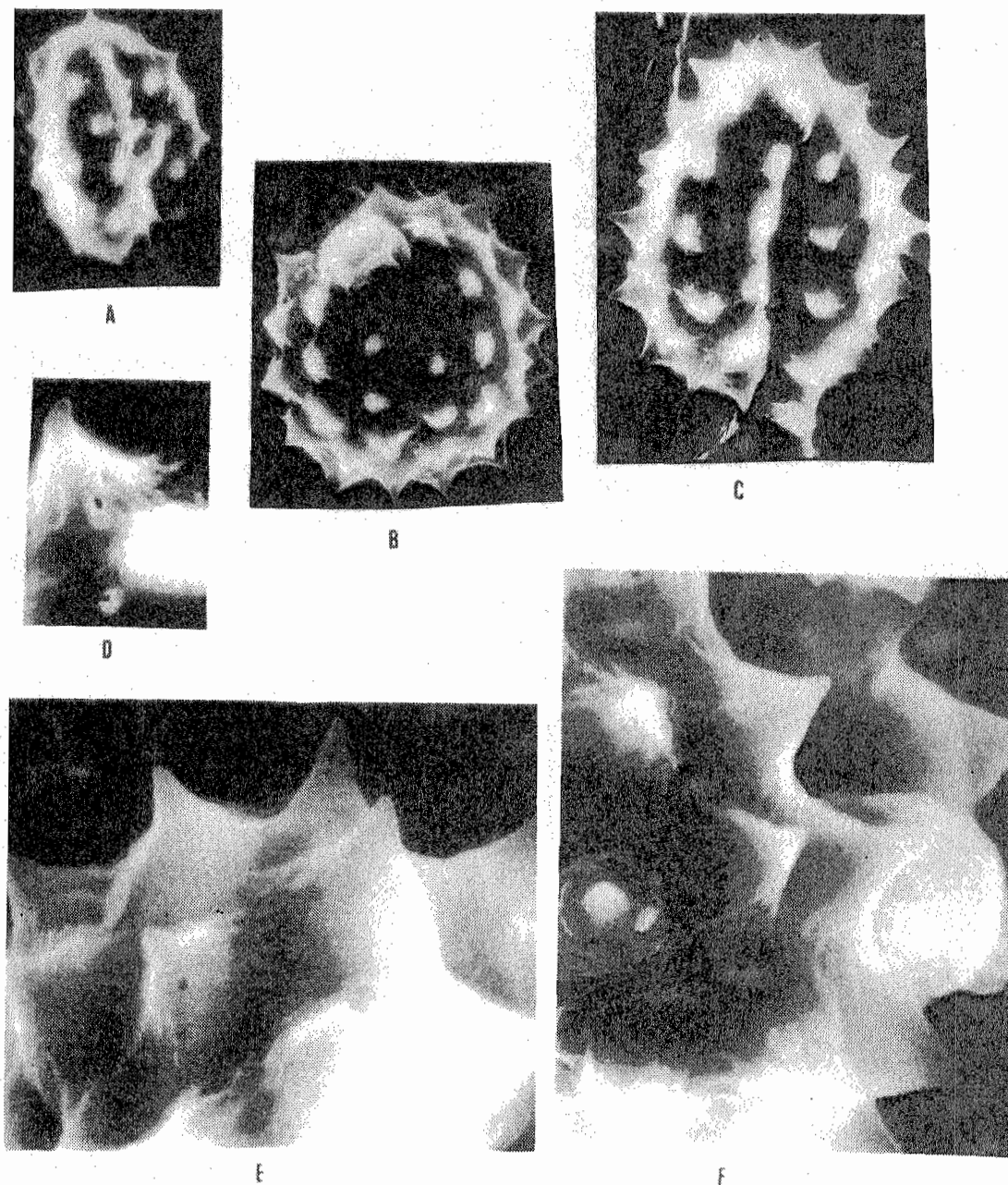


Fig. 3. Scanning electron microscopy micrographs of pollen grains. A. *H. compactum*: equatorial view, x 3000. B. *H. noeaeum*: equatorial view, x 3000. C. *H. chionophilum*: equatorial view x 3000. D. *H. compactum*: exine pattern, x 10000. E. *H. arenarium* ssp. *erzincanicum*: exine pattern, x 10000. F. *H. pamphylicum*: exine pattern, x 10000.

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(Received for publication 12 May 1999)