

# POLLEN MORPHOLOGY OF THE GENUS *DIPLOTAENIA* (APIACEAE) IN IRAN

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The pollen morphology of two species belonging to the genus *Diplotaenia* Boiss. have been investigated by SEM and LM. The results confirm the stenopalynous character of the family *Apiaceae*. The palynological observations reveal that pollen grains of the genus *Diplotaenia* are prolate in shape and possess tri-colporate aperture with costae. The sculpturing of both species are rugulate.

Therefore *D. cachrydifolia* and *D. damavandica* are similar in palynological characters, and show the type of Cerceau-Larrival's classification as sub-rectangular.

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## مطالعه دانه گرده جنس *Diplotaenia* Boiss. در ایران

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مورفولوژی دانه گرده جنس *Diplotaenia* بوسیله میکروسکوپیهای الکترونی و نوری مورد بررسی قرار گرفت. نتایج بدست آمده نشان داد که این جنس تیب عمومی خانواده چتریان را نشان می دهد. دانه گرده این جنس از نظر مورفولوژیکی دارای صفات سه شیار-روزنی، قطور شدن دیواره در اطراف منفذها و از نظر شکل کلی استوانه‌ای مستطیلی که در جهت محور قطبی طویل شده هستند (prolate). تزئینات سطحی از نوع rugulate است. بنابر این دو گونه متعلق به این جنس یعنی *D. cachrydifolia* و *D. damavandica* از نظر ساختار دانه گرده شبیه به هم بوده و در صفات دانه گرده در بین تیبهای گرده Cerceau-Larrival در تیب مستطیلی (sub-rectangular) قرار می گیرند.

## Introduction

The genus *Diplotaenia* Boiss. of the family *Apiaceae* consists of only two species *D. damavandica* Mozaffarian, Hedge & Lamond and *D. cachrydifolia* Boiss. which occur in central Alborz of Iran (Hedge & Lamond 1987). *D. damavandica* is endemic of Iran and used as a medicinal herb and as a phototoxic plant (Amin & Salehy Surmaghy 1995). *D. cachrydifolia* is known as a useful product (Harkiss & Salehy Surmaghy 1987) which grow in the North and West Alborz of Iran and extending to the Anatolian province (Davis 1972).

Erdtman (1952) summarized pollen morphology of 85 species from 62 genera of *Apiaceae* based on light microscopy observation. He claimed that *Apiaceae* is a stenopalynous, that is showing little variation in pollen morphology. Cerceau-Larrival (1971) used both Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) and from her studies on pollen morphology which supported by evidence from the inflorescence, fruit and vegetative morphology proposed an original division of *Apiaceae* into five subfamilies and 38 tribes. On the other hand extensive palynological observation on over 2000 species of *Apiaceae* by Cerceau-Larrival & Ronald - Heydacker (1976) revealed five fundamental pollen types. These pollen types ranked from very primitive to highly evolved as subrhomboidal, subcircular, ovoid, subrectangular and equatorially constricted types, respectively.

Although, there have been various reports on the palynological studies of the family *Apiaceae* (Nair & Kapour 1973, Tawoda 1982, Hebeda 1985 and Al-Eisawi 1988 ), but no such study exist in this genus. This work considered pollen morphology of two Iranian species of *Diplotaenia* to evaluate the exine ornamentation as a taxonomic character.

## Material and method

*Diplotaenia* species grow wild in the central Alborz , therefore both species collected from the region and the pollen material used for light (LM) and Scanning Electron Microscopy (SEM).

The material was acetolysed conventionally (Erdtman 1960) for LM, but for SEM observation unacetolysed pollen dusted onto SEM stubs and coated with gold using the TXA-840 SEM.

About ten measurements for pollen grain size (P and E) were made for each sample, in general the terminology of Erdtman (1969) and Cerceau-Larrival & Heydacker (1976) has been followed.

Table 1, gives a list of the specimens representative of 2 species of the genus *Diplotaenia* used in our study and their locations, voucher specimens are deposited in the herbarium of Shahid Beheshti University (USBU) and IRAN.

## Results and discussion

The result of this palynological studies are presented in table 2. The observation made on pollen grains of *Diplotaenia* species clearly revealed the grains: tri-colporate, prolate, subrectangular with internal thickening around the pores (costae), figs. 1-10. The pores are circular in plan view, with the long axis perpendicular to the polar axis of the grain. The average size of pollen grains ranges from 35.8 $\mu$ m-38.2 $\mu$ m in polar axis and 15.47 $\mu$ m - 16.7 $\mu$ m in equatorial axis (table2). The tectal surface with rugolose appearance (rugulate) is characterized by long and straight arches (rugae) at the poles, whereas in the equatorial zones shows a greatly thickened ectexine with shorter and compact arches (Figs. 1, 3, 4, 6, 8 and 9).

Table 1. Material used for pollen morphology of the genus *Diplotaenia*.

Taxa	Collection data
<i>D. damavandica</i>	Damavand: Lake Tar, Terme & Tehrany 40477-E. Damavand: Lake Tar, Aliha & Yousefzadi 85055. Damavand: between Havir and Lake Tar, Aliha & Yousefzadi 85056.
<i>D. cachrydifolia</i>	Tehran: Elika, Makliz, Terme 15331-E. Tehran: Chalus road, after Gachsar, Aliha & Yousefzadi 95437. Tehran: Kandovan, N.slope Kuh-e Gorz, Aliha & Yousefzadi 95438.

Table 2. Summary of pollen morphology data of *Diplotaenia* species (measurement in  $\mu\text{m}$ ).

Taxa \ Character	Polar length(P)			Equatorial width(E)			P/E	Colpus length
	Min	Mean	Max	Min	Mean	Max		Mean
<i>D. damavandica</i>	32	35.8	39	15	16.7	18	2/2	22/7
<i>D. cachrydifolia</i>	34	38.2	40	15	15.47	17	2/4	22.5

From the results of this study, the following points have been noticed; the pollen morphology of two species investigated are similar in shape as subrectangular which is now the most representative of the family *Apiaceae*. And the position of apertures exhibit tri-colporate, but the grain of *D. cachrydifolia* is slightly bigger than *D. damavandica*.

According to Cerceau-Larrival (1971) and Cerceau-Larrival & Ronald - Heydacker (1976). the *Apiaceae* has a wide variety of pollen shapes which can be grouped in five basic types as mentioned before and clearly distinguishable and ranging in size from 15 $\mu\text{m}$  to 70  $\mu\text{m}$ . The subrectangular type is characteristic by medium sized grain about 35-40 $\mu\text{m}$ , the exine is very substantial thickened either at the poles or in the sub-polar zones and as a developed pollen within 5 types.

The present study of genus *Diplotaenia* showed similar characteristic features to the subrectangular type of pollen, which recognized by Cerceau-Larrival's classification.

### References

Al-Eisawi, D & Jury, S. L. 1988: A taxonomic revision of the genus *Tordylium* L. (*Apiaceae*). -Botanical Journal of the Linnean Society. 97(4): 357-403.

Amin, G. & Salehy Surmaghy, M. H. 1995: Kozal a new phototoxic plant. -Proceeding of the 4<sup>th</sup> international congress of poisoning plants, Tehran-Iran.

Cerceau-Larrival, M. T. 1971: Morphologie pollinique et corrélations phylogénétiques chez les umbellifères. In Heywood, V. H(ed): The biology and chemistry of the Umbelliferae. 109-155. -Academic Press.

Cerceau-Larrival & Ronald-Heydacker, F. 1976: The evolutionary significance of the ultra structure of the exine in Umbelliferae pollen grains. In Ferguson & Muller (ed): The Evolutionary significance of the exine: 481-498. -London Academic Press.

Davis, P. H. 1972: Umbelliferae. in Flora of Turkey and East Aegean Islands 4: 404. Edinburg University Press.

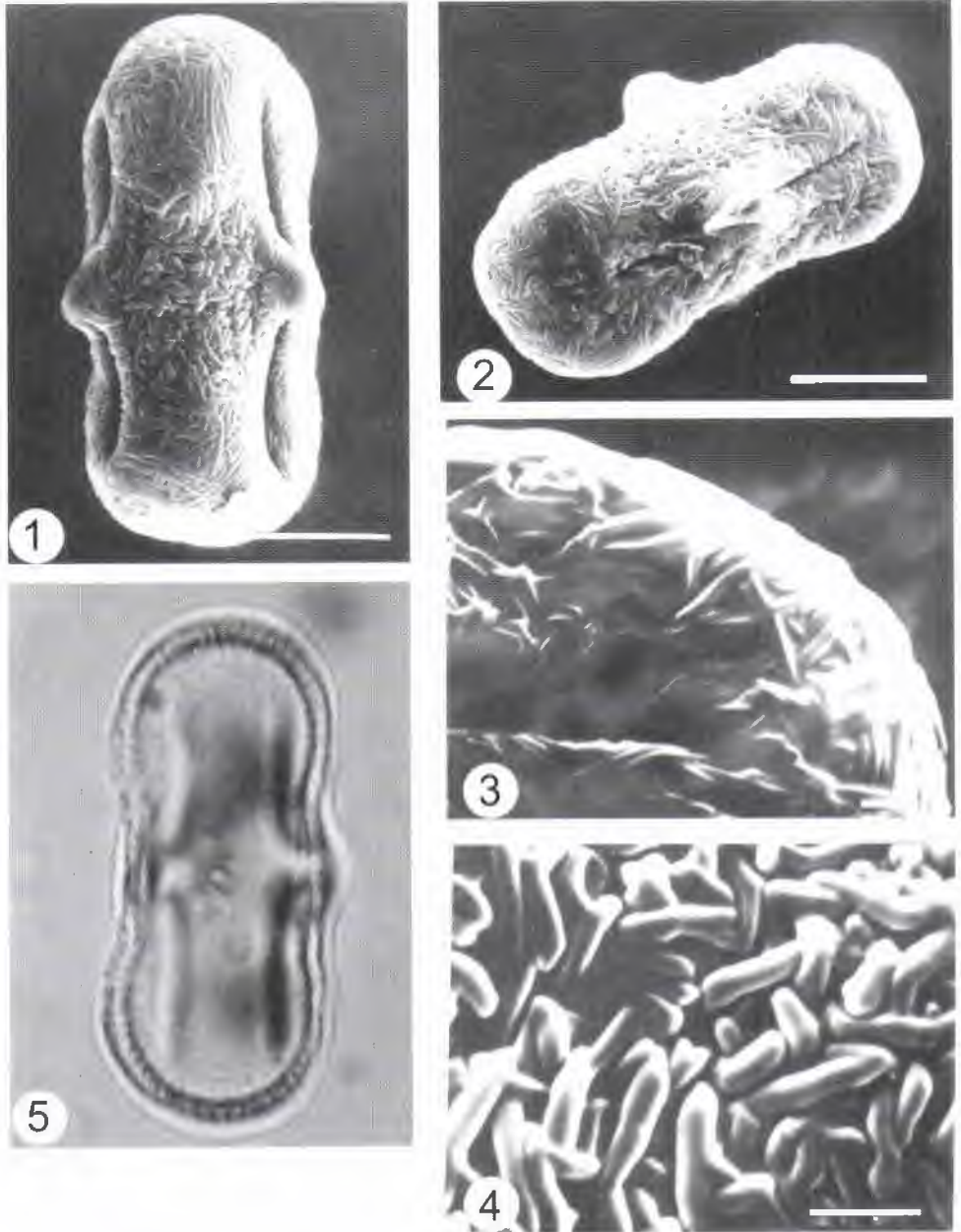
Erdtman, G. 1952: Pollen morphology and plant taxonomy. Angiosperms. -Almqvist & Wiksell Stockholm.

Erdtman, G. 1960: The acetolysis method. - Svensk. Bot. Tidskr. 54: 561-564.

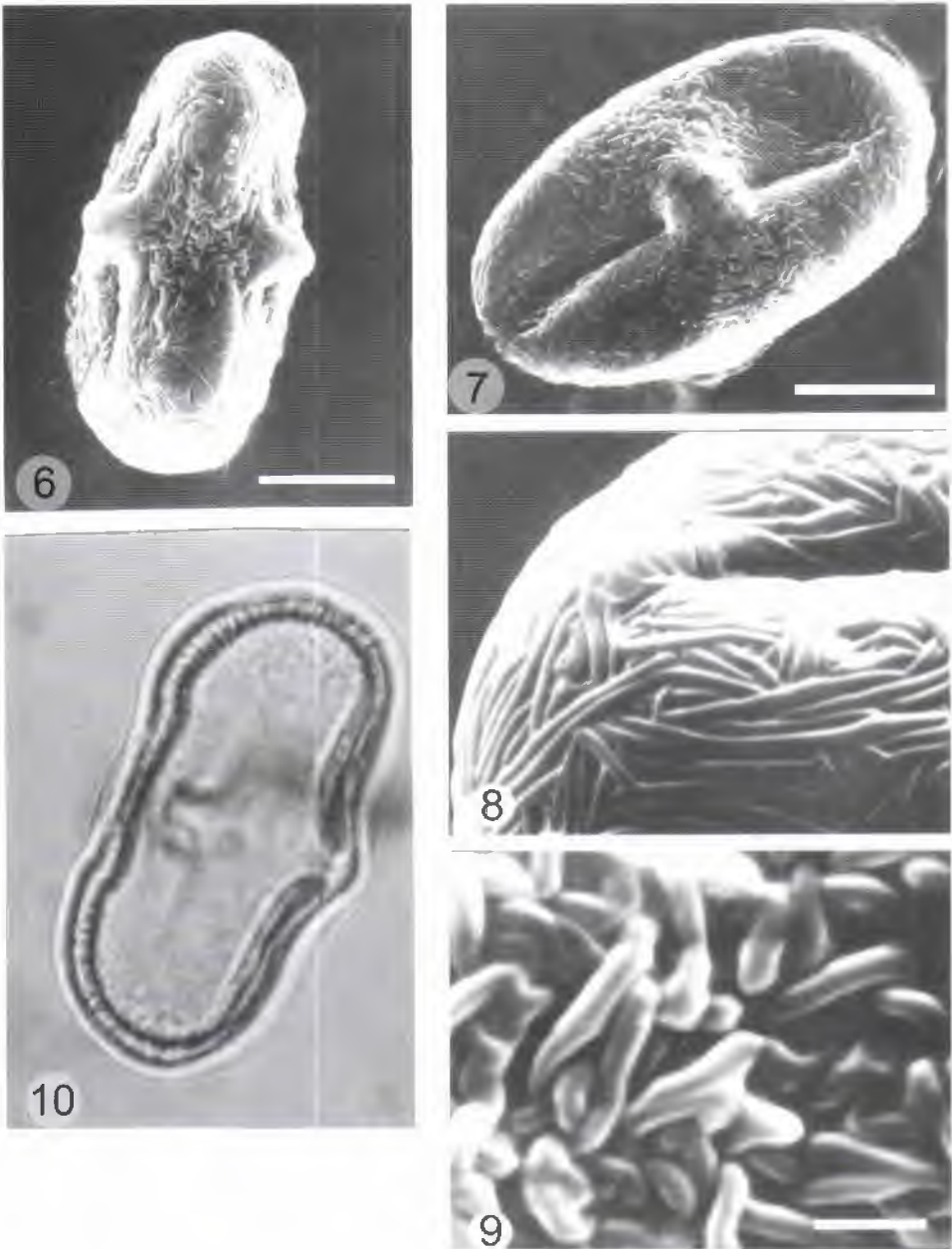
Erdtman, G. 1969: Hand book of palynology. Copenhagen: Munksgard.

Harkiss, K. J & Salehy Surmaghy, M. H. 1987: Volatiles from the root of *Diplotaenia cachrydifolia*, the first natural source of 6-

- camphenone. -Journal Natural Products.50 (5): 991-993.
- Hebeda, A. 1985: Pollen morphology of *Ligusticum* (Apiaceae) in Canada. - Canadian Journal Botany. 63 (10): 1880-1887.
- Hedge, I. C & Lamond, J. M. 1987: Umbelliferae. In Rechinger, K.H (ed) Flora Iranica, 162: 372-374. -Graz Akademische Druck-Und.
- Nair, P.K & Kapour, S. K. 1973: Pollen morphology production of *Daucus carota*. - Journal of Palynology 9 (2): 152-159.
- Tawoda, O. 1982: Taxonomy of some species of the family Apiaceae by the morphology of their pollen grains. -Biologia 37 (1): 89-97.



Figs. 1-5 Pollen grains of the *Diplotaenia cachrydifolia* (1-4 SEM and 5 LM): Figs. 1, 2, 5. Equatorial view; Figs. 3, 4 ornamentation of rugulate sculpture. Scale bar in 1, 2, 5= 10  $\mu$ m and 3, 4=1  $\mu$ m.



Figs. 6-10. Pollen grains of *Diplotaenia damavandica* (6-9 SEM and 10 LM): Figs. 6, 7, 10 Equatorial view; Figs. 8, 9 ornamentation of rugulate sculpture. Scale bar in 6, 7, 10= 10 $\mu$ m and 8, 9= 1  $\mu$ m.