

## *Cousinia papillosa*، گونه جدیدی برای ایران همراه با

### مطالعات کروموزومی و گرده‌ای

*Cousinia papillosa*, a new species from eastern Iran including chromosome count and palynological studies

سیده باهره جوادی\*، فریده عطار و مجید اسکندری

موسسه تحقیقات گیاهپزشکی کشور و دانشگاه تهران

پذیرش: ۱۳۸۶/۹/۱۸

دریافت: ۱۳۸۶/۲/۳۱

گونه *Cousinia papillosa* (Asteraceae)، به عنوان گونه جدیدی از شرق ایران معرفی می‌گردد. اختلافات موجود بین این گونه و نزدیک‌ترین خویشاوند آن *Cousinia meshhedensis* مورد بحث قرار می‌گیرد. نقشه پراکنش هر دو گونه ارایه گردیده است. مطالعات گرده‌ای اختلاف بین دو گونه را کاملاً نشان می‌دهد. شمارش کروموزومی برای گونه جدید انجام گرفته است (n=۱۳). متن کامل مقاله در قسمت انگلیسی ارایه شده است.

**واژه های کلیدی:** *Cousinia*، Asteraceae، مطالعات کروموزومی، مطالعات گرده‌ای

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\* مسئول مکاتبه (E-mail: sb\_djavadi@hotmail.com)

نشانی نگارندگان: سیده باهره جوادی و مجید اسکندری، بخش تحقیقات رستنی‌ها، موسسه تحقیقات گیاهپزشکی کشور و دکتر فریده عطار، دانشکده علوم، دانشگاه تهران.

## **COUSINIA PAPILLOSA, A NEW SPECIES FROM EASTERN IRAN, INCLUDING CHROMOSOME COUNT AND PALYNOLOGICAL STUDIES**

**S.B. DJAVADI<sup>\*</sup>, F. ATTAR and M. ESKANDARI**

Iranian Research Institute of Plant Protection and University of Tehran

Received: 21.05.2007

Accepted: 09.12.2007

### **Abstract**

*Cousinia papillosa* (Asteraceae) from eastern Iran is described and illustrated as a new species. Differences between the new species and its closest relative, *C. meshhedensis*, are discussed. A map showing the distribution of the two species is given. The scanning electron micrography of the pollen grains shows obvious differences between the two species especially in the sculpturing of exine. The meiotic chromosome count is also reported (n=13).

**Key words:** *Cousinia*, Asteraceae, palynological studies, chromosome studies, new species, Iran

### **Introduction**

Iran is well known for its high diversity in flowering plant flora, with total number of ca. 8000 species, of which ca. 1800 are endemic (GHAHREMAN &

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\* Corresponding author (E-mail: sb\_djavadi@hotmail.com)

ATTAR 1999). This is also reflected by the species richness in the genus *Cousinia* Cass. In the Flora Iranica, the genus *Cousinia* is represented by ca. 360 species, distributed in 53 sections, of which 220 are found in Iran (RECHINGER 1972, 1979). With extensive recent collections and investigations, the number of species reaches to ca. 250, out of which nearly 200 species are endemic to the area. In this paper, a new species is described.

### Materials and Methods

This study is based on materials collected during excursions in the Khorasan and Semnan Provinces, east part of Iran, during June-July 2006. Materials are preserved in the Herbarium of Ministerii Iranici Agriculturae ("IRAN") and Tehran University Herbarium ("TUH").

Pollen grains were removed from herbarium specimens and prepared for scanning electron microscopy (SEM). The locality and voucher specimen references are presented in Table 1. For scanning electron microscopy, unacetolyzed pollen grains were dusted onto stubs and coated with gold using the TX-840 SEM. The mean of about three measurements for pollen grain size (polar length & equatorial width) were considered for each sample.

Chromosome count was made on pollen mother cells at meiosis stage. Floral buds were collected and fixed in Piennr's fluid containing ethanol 96 %, chloroform and propionic acid (6:3:2) for 24 hours. Anthers were squashed and stained in 2 % acetocarmine. Chromosome photographs were taken by using a Canon camera mounted on a Zeiss microscope.

### Results and Discussion

#### *Cousinia papillosa* Djavadi & Attar, *sp. nova* (Figs 1-3)

Type: Iran: Khorasan, Sabzevar to Bardeskan, 38 km Bardeskan, 1750 m, 2 June 2006, Djavadi, Eskandari & Torabi, IRAN 43536 (holotype IRAN).

Perennis, collo residuis petiolorum comoso et araneoso-floccoso. Caulis usque ad 70 cm altus, fere a medio ramosus, rami laterales capitulum centrale manifeste superantes, in parte superiore glabrescentes. Folia omnia rigidissima, coriacea, costa mediana utrinque valde prominenti, utrinque appresse araneoso-

tomentella; folia basalia rosulata, spinis inclusis ca. 18 x 3.5 cm, lanceolata, breviter petiolata, lamina in petiolum sensim attenuata, utrinque remotissime pinnato-lobata, lobis lineari-lanceolatis rigide spinosis, spina ca. 5 mm longa; folia caulina inferiora basalibus similia; media tota latitudine cauli adnata et longe decurrentia; summa valde diminuta, non decurrentia, in spinam terminalem excurrentia, subintegra. Capitula singula terminalia, spinis inclusis ca. 4 cm diametro, ca. 40-flora. Involucrum oblongo-semihemisphaericum, basi rotundatum, densissime aranesofloccosum, valde papilloso-glandulosum. Involucri phylla ca. 60, 7-seriata; phylla exteriora multo breviora, reflecta, exappendiculata; intermedia appendiculata, in spinam terminalem usque 4 mm longam attenuata; phylla interna oblonga, recta, in parte superiore lata, acuminata, involucri exerta, eburnea; phylla intima linearia, recta, eburnea. Receptaculi setae laeves. Corolla purpurea, 16 mm longa. Antherarum tubus glaber, concolor. Achenia 3 mm, obovata,  $\pm$  triangularia, apice denticulata, auriculata, canescentia, maculata, irrregulariter foveolata. Pappus valde caducus.

Prennial. Stem up to 70 cm high, arachnoid-tomentose, becoming glabrous especially in upper half, branched from median, lateral branches apparently longer than central capitul, root collars with remains of petioles of old leaves, arachnoid-floccose. Leaves rigid, leathery, midrib prominent on both sides, appressed arachnoid-tomentose on both sides; basal leaves rosulate, ca. 18.5 x 3.5 cm (including spines), lanceolate, with short petiols, lamina attenuate towards the petiole, remotely pinnate-lobate, lobes linear-lanceolata, with rigid spines, spines 5 mm long; lower cauline leaves similar to basal leaves; middle cauline leaves adnate and long decurrent; uppermost leaves diminished, not decurrent,  $\pm$  entire excurrented to a terminal spine. Heads solitary, ca. 40-flowered, ca. 4 cm in diam. Involucre oblong-semihemispherical, densely arachnoid-floccose, finely papillose-glandular. Involucral bracts ca. 60, 7-seriates; external ones shorter, reflected, exappendiculate; middle ones appendiculate turning into  $\pm$  4 mm spine at apex; inner ones oblong, erect, wider towards the apex, acuminate, white ivory, exceeding from involucre; innermost ones linear, erect, white ivory. Bristle of receptacles smooth. Corolla purple, 16 mm long. Anther tube purple, glabrous. Achene 3 mm

long, obovate,  $\pm$  triangular, toothed above, auriculate, canescent, maculate, irregularly foveolate. Pappus caducous.

Note: This new species is characterized by having solitary heads, long decurrent and adnate leaves in middle part of stem, the uppermost leaves are diminished, not decurrent, sub-entire excurrented to a terminal spine. The middle involucre bracts are appendiculate. These characters correlate the new species to *C. meshhedensis*.

The most important differences between *C. meshhedensis* and *C. papillosa* are as follows: In *C. papillosa*, involucre bracts are densely arachnoid-floccose and finely papillose-glandular in dorsal portion (not only arachnoid-floccose), inner involucre bracts are white ivory (not brown to brownish purple), middle ones are slightly appendiculate, not exceeding from capitulum (not distinctly exceeding from capitulum). (Fig. 3).

Since, the new species have decurrent leaves and appendiculate bracts, it is similar to section *Cynaroideae* Bunge. But, according to RECHINGER (1986), the members of a section must show some several correlated characters: their components have similar ecological requirements and well-delimited compact distributional area. Section *Cynaroideae* Bunge is mainly western. Besides, almost all chromosome counts in species of this section resulted in the same basic chromosome number,  $x=12$  (SUSANNA *et al.* 2003). Therefore, as our new species is eastern and the chromosome number in meiosis was  $n=13$ , it is so far that this species have been belonged to the section *Cynaroideae* Bunge.

The new species is also similar to section *Platyacanthae* Rech. f. Because all six species belonging to this section are distributed in east of Iran in Khorasan Province. This section is also characterized by having appendiculate bracts and lateral branches that are more apparently longer than central capitulum. Also, chromosome studies on this section shows the basic chromosome number  $x=13$  (GHAFFARI 1984, DJAVADI 2005, GHAFFARI *et al.* 2006). But, the stem leaves are not decurrent in this section which indicates that, the new species as well as *C. meshhedensis* do not belong to the section *Platyacantha* Bunge.

Distribution: *C. papillosa* is distributed in a small district in east of Iran. Except the type collection, it could not be found in any other parts of area. Whereas, *C. meshhadensis* is a relatively widespread species throughout Khorasan and

Semnan Provinces. Besides the herbarium materials, we could make some new collection.

***Cousinia meshhedensis* Bornm. & Rech. f., Feddes Repert. 48: 144, 1940**

Type: Iran: between Robat-e Sefid and Torbat-e Heydariyeh, RECHINGER 1567.

Endemic of Iran

Specimens observed: Khorasan: Shahpasand to Bojnourd, Almehr (Dasht), 1200-1300 m, 7.6.1975, Termeh, IRAN 9097 (34039 & 34040-E); Mashhad to Torbat-e Heydariyeh, Robat-Sang to Kadkan, Bors, 1750-1850 m, 19.6.2002, Djavadi & Sadeghi, IRAN 43469; Mashhad, Robat Sang, Kadkan, Bezg (in mountains), 18.6.2005, Djavadi, Eskandari & Torabi, IRAN 46367; Torbat-e Heydariyeh to Mashhad, Khomari, 1800 m, 5.6.1998, Ghahreman & Attar, TUH 21768; Semnan: Damghan to Shahroud, Tazareh, 30 km north of Mehmandoust, Sefid Shekar (mountain), 2700-3000 m, 22.7.1975, Mousavi & Karavar, IRAN 9095 (33884-E); Shahroud, Tash to Shah Kouh, 10 km NW of Tash, 2550 m, 1.8.1975, Mousavi & Karavar, IRAN 9096 (33805-E), Shahroud, Tash, 2400-2600 m, 30.7.1975, Mousavi & Karavar, IRAN 9098 (33807-E); Shahroud to Bastam, Mojen, 7 km Shah Kouh to Mojen, 2450 m, 11.8.1988, Mousavi, Delghandi & Tehrani, IRAN 9099; Shahroud, Mojen, 1700 m, 27.6.2006, Eskandari & Amini Rad, IRAN 43495;

Table 1. Morphological characters along with voucher No. of *Cousinia meshhedensis* and *C. papillosa* (measurements in  $\mu\text{m}$ )

Species	Polar length (P)	Equatorial width (E)	P/E	Colpus length	Voucher No.
<i>C. meshhedensis</i>	59.93	30.1	1.98	51.1	IRAN 43495/2
<i>C. papillosa</i>	52.06	27.16	1.93	40.26	IRAN 43536/5

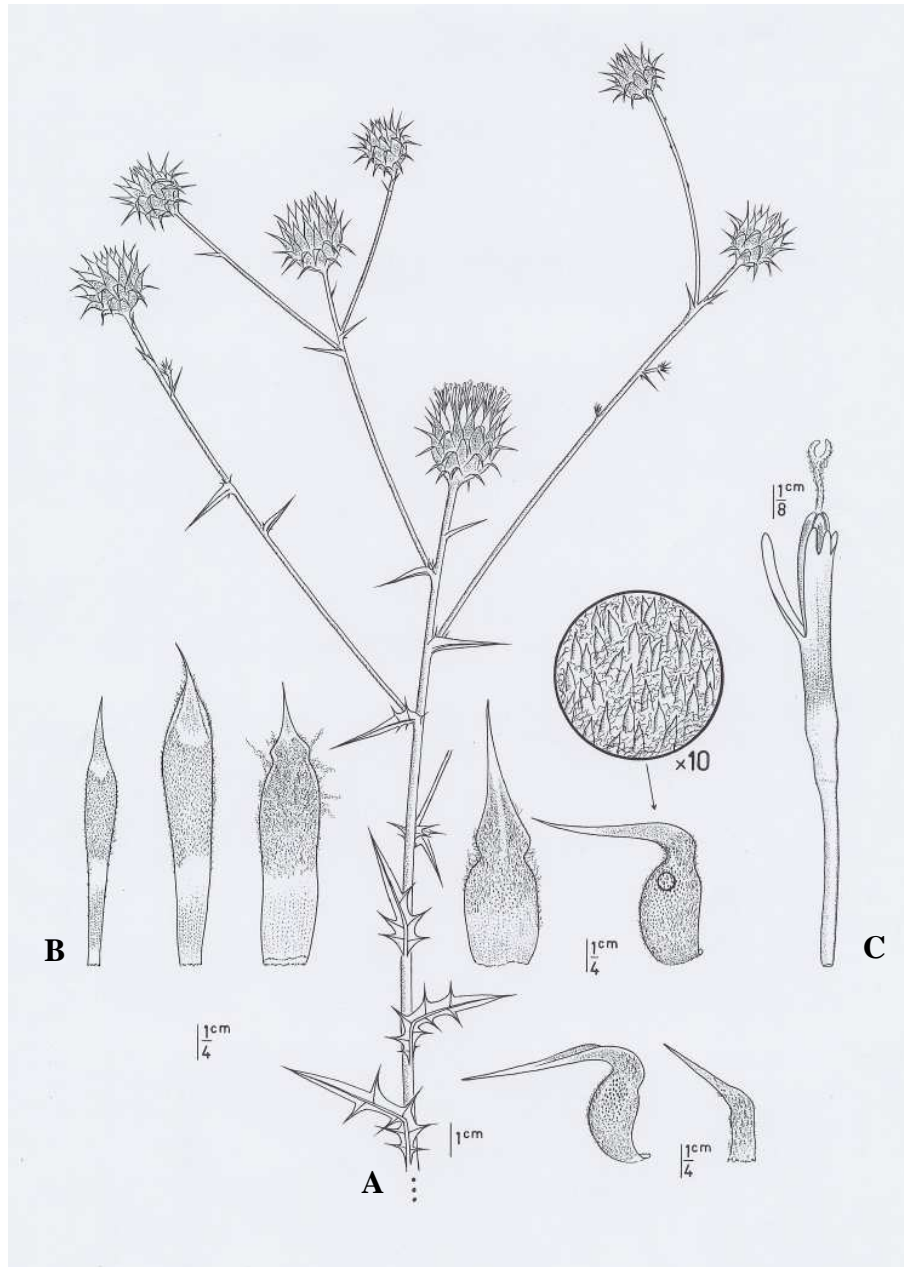


Fig. 1. *Cousinia papillosa*: A. Habit, B. Involucral bracts, C. Flower.

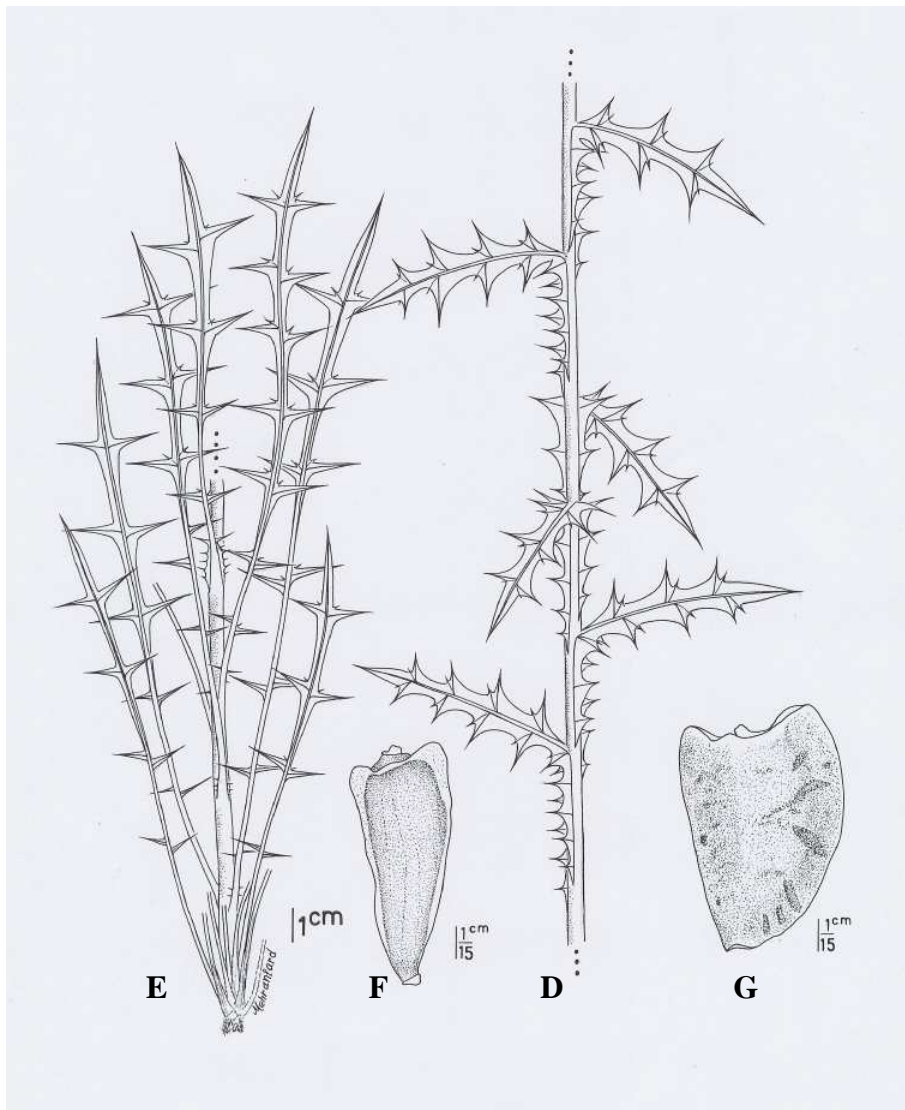


Fig. 2. *Cousinia papillosa*: D. & E. Habit, F. Immature achene belonging to current year plant, G. Mature achene belonging to previous year plant.



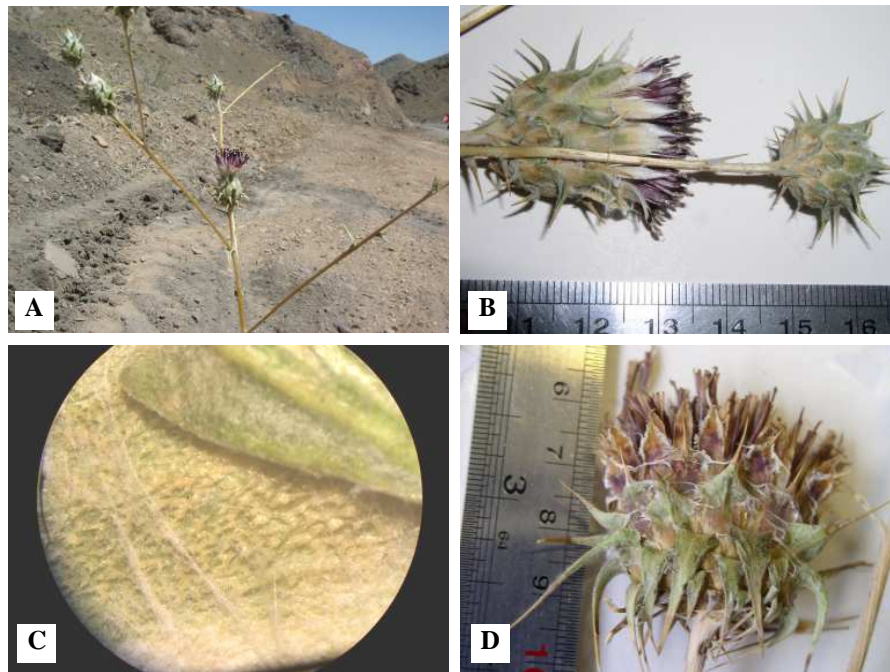


Fig. 3. (A) *Cousinia papillosa* in the nature, (B) herbarium specimen of *C. papillosa*, (C) showing arachnoid-floccose and papillose-glandular dorsal portion of *C. papillosa*, (D) herbarium specimen of *Cousinia meshhedensis*, showing the purple-brownish inner bracts and status of middle ones.

#### Pollen morphology:

The summary of pollen grain characters of *Cousinia meshhedensis* and *C. papillosa* are presented in Table 1.

The palynological observations revealed that, pollen grains of *C. meshhedensis* and *C. papillosa* are prolate in shape and possess tricolporate aperture (Fig. 5). The exine sculpturing of both species are tuberculate-perforate, but shows obvious differences in details.

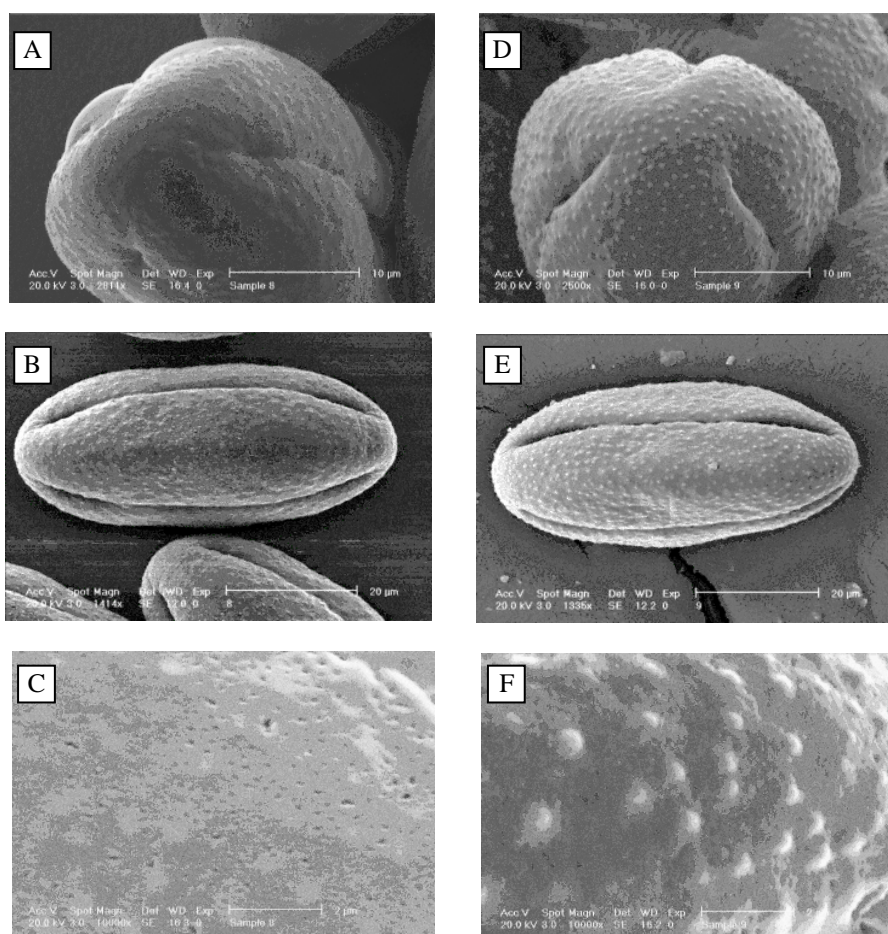


Fig. 5. Scanning electron micrograph of the tricolporate pollen grains and exine ornamentation in *Cousinia papillosa* (1-3) and *C. meshhedensis* (4-6): (1 & 4) polar view, (2 & 5) equatorial view, (3 & 6) ornamentation of tuberculate-perforate sculpture.

#### Chromosome count:

Meiosis in *Cousinia papillosa* showed 13 bivalents at first metaphase (Fig. 6, the lower cell at the left, the upper cell shows diakinesis stage). There is only one chromosome count for *C. meshhedensis*,  $n=13$ , by GHAFARI *et al.* (2006) in the literature.

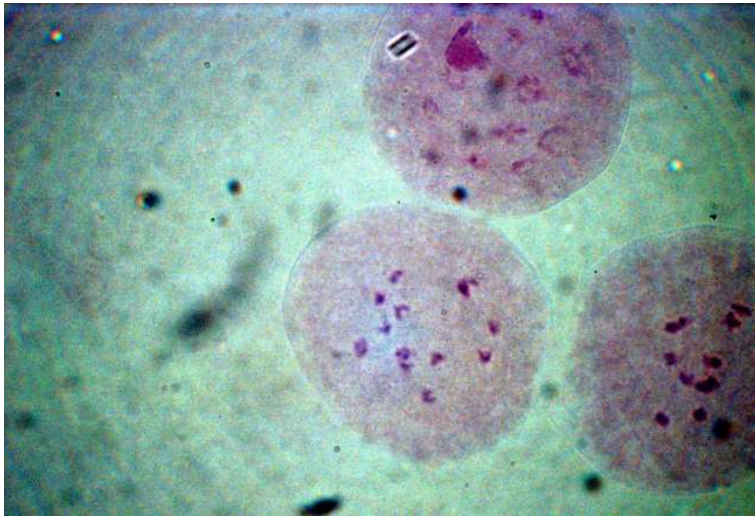


Fig. 6. Metaphase 1 (below left cell) in *Cousinia pappilosa* (n=13).

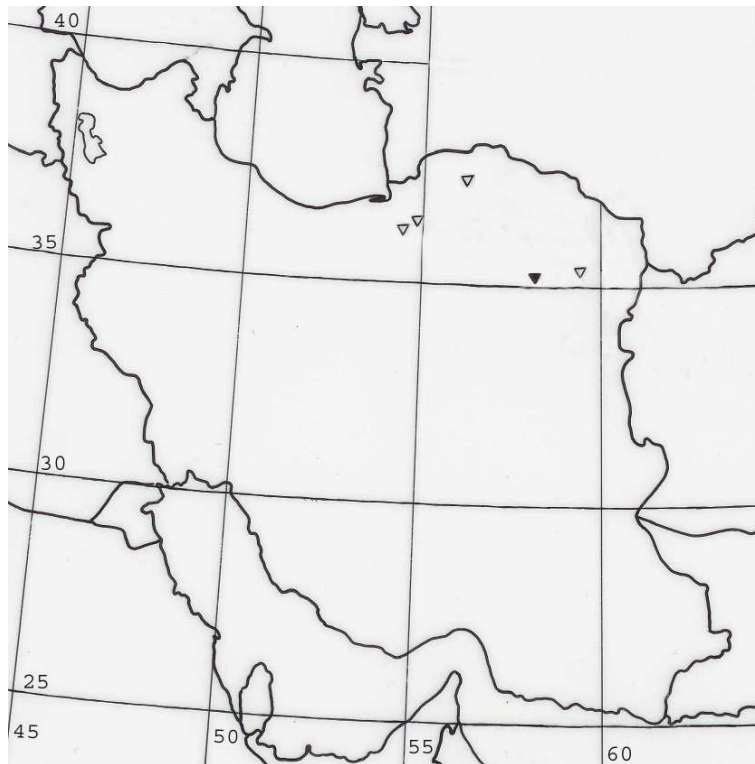


Fig. 5. Distribution of *Cousinia meshhedensis* ( $\nabla$ ) and *C. papillosa* ( $\blacktriangledown$ ) in Iran.

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### Acknowledgements

We are grateful to Dr. Musa Iranshahr for editing the Latin diagnosis of the manuscript and also to Mr. M. Mehranfard for drawing the illustrations.

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**Addresses of the authors:** S.B. DJAVADI and M. ESKANDARI, Department of Botany, Iranian Research Institute of Plant Protection, P.O. Box 1454, Tehran 19395 and Dr. F. ATTAR, Central Herbarium, Faculty of Science, Tehran University, Tehran, Iran.