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ONOPORDUM MYRIACANTHUM SUBSP. *ARACHNOIDEUM* COMB. & STAT. NOV. (ASTERACEAE: CARDUEAE)

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Abstract

Turkish endemic taxon *Onopordum bracteatum* Boiss. & Heldr. var. *arachnoideum* Erik & Sümbül is transferred to *O. myriacanthum* Boiss. as *O. myriacanthum* subsp. *arachnoideum* (Erik & Sümbül) Pınar & Behçet comb. & stat. nov. It is characterized by the phyllaries with densely and persistently arachnoid hairs both inside and outside, and upper stem leaves are 2–8 cm far from capitulum. In addition, the pollen characteristics and achene features are presented. The conservation status of *O. myriacanthum* subsp. *arachnoideum* has been assessed according to IUCN criteria. A distribution map of *O. myriacanthum* subsp. *arachnoideum* and its related taxa is also presented.

Introduction

The genus *Onopordum* L. (Asteraceae, Cardueae) is distributed in the Western and Central Asia, Europe, Northern Africa and the Canary Islands, comprising c. 60 taxa (Susanna and Garcia-Jacas, 2007). Danin (1975) reported 17 species of *Onopordum* for the *Flora of Turkey*. After the publication of this flora, 1 new taxon and 3 new records were added in the subsequent works (Davis *et al.*, 1988; Tuzlacı, 2000; Özhatay *et al.*, 2009; Pınar and Behçet, 2014). Currently, the genus *Onopordum* is represented by 21 taxa in Turkey, of which 7 are endemic. Within the scope of the PhD study of the first author, *O. bracteatum* var. *bracteatum, O. bracteatum* var. *arachnoideum* and *O. myriacanthum* specimens have been collected from different localities for revision of *Onopordum* in Turkey. In this study, we aimed to explore the similarity and variation among these taxa and to accurately determine their taxonomic status.

Materials and Methods

During an expedition carried out in 2010–2011, the endemic taxon *O. bracteatum* Boiss. & Heldr. var. *arachnoideum* Erik & Sümbül was collected from the type locality, Kazancı (Ermenek) district in Central Anatolia. This taxon was first collected by Mecit Vural in 1978 and identified as *O. bracteatum*. Afterwards, it was collected by Hüseyin Sümbül in 1984 and described as a new variety (Erik and Sümbül, 1986). These collections are compared with the type photo of *O. bracteatum* and *O. myriacanthum*, which were obtained from G, K, BM herbaria, and samples deposited in EGE, GAZI, HUB, KNYA, AEF and ANK herbaria. After a careful examination it is concluded that this taxon considerably differs from *O. bracteatum s.l.* Based on the morphological, palynological and geographical evidences presented in this study, we propose the collected taxon as new combination *Onopordum myriacanthum* subsp. *arachnoideum*. The examined specimens of *O. bracteatum, O. myriacanthum* subsp. *myriacanthum* and *O. myriacanthum* subsp. *arachnoideum* from different localities are also cited.

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Pollen and achenes of *O. bracteatum, O. myriacanthum* subsp. *myriacanthum* and *O. myriacanthum* subsp. *arachnoideum* were studied with both light microscope (LM) and scanning electron microscope (SEM). The pollen materials were obtained from either fresh or dried specimens. For LM studies, Wodehouse technique was followed for the preparation of the pollen slides (Wodehouse, 1935). For the SEM investigations, the achenes and pollen were mounted to aluminium stubs, coated with gold in a sputter-coater, and examined under LEO 440 SEM. The descriptive terminology of pollen was adopted from Erdtman (1969), Faegri and Iversen (1975) and Punt *et al.* (2007), and for the seed terminology Koul *et al.* (2000), Tantawy *et al.* (2004) and Hacıoğlu *et al.* (2012) were followed.

Results and Discussion

Onopordum myriacanthum Boiss. subsp. **arachnoideum** (Erik & Sümbül) Pınar & Behçet, **comb. & stat. nov.** (**Figs 1-3**).

O. bracteatum Boiss. & Heldr. var. *arachnoideum* Erik & Sümbül in Notes Roy. Bot. Gard. Edinburgh 44: 155 (1986).

Type: Turkey. [C4 Konya] Ermenek, around of Kazancı, 650-850 m, 21.6.1984, *H. Sümbül 3024* (Holotype: HUB!).

Onopordum myriacanthum subsp. *arachnoideum* differs from *O. bracteatum s.l.* in having phyllaries with densely and persistently arachnoid hair on both sides. In addition, plant is longer, upper stem leaves are 2-8 cm far from capitulum, with smaller and sparse arrangement in upper stem leaves, longer peduncle and presence of glands in corolla lobes. *O. myriacanthum* subsp. *arachnoideum* differs from the typical subsp. *myriacanthum,* by having densely arachnoid hairy phyllaries both inside and outside, more intensive inflorescence (not sparse) and larger capitulum and phyllaries. Comparison of morphological characters of the related taxa *O. myriacanthum* subsp. *arachnoideum, O. myriacanthum* subsp. *myriacanthum*, and *O. bracteatum* is shown in Table 1.

Onopordum bracteatum belongs to the Irano-Turanian element and is distributed mainly in Central and Southwestern Anatolia, between 150-1500 m. *O. myriacanthum* subsp. *arachnoideum* belongs to the Irano-Turanian element and is a local endemic to south of Central Anatolia, confined to Karaman province. It grows in rocky slopes and *Pinus brutia* glades, associated with *Picnomon acarna* L., *Euphorbia aleppica* L., *Centaurea solstitialis* L. subsp. *solstitialis, Quercus trojana* Webb, between 600-1200 m altitude. *O. myriacanthum* subsp. *myriacanthum* in comparison, belongs to the Mediterranean element and is distrubuted mainly in West and Southwestern Anatolia; grows on edge of the field, roadside, glades at 100-1000 m (Fig. 2).

Specimens examined:

Onopordum myriacanthum Boiss. subsp. **arachnoideum** (Erik & Sümbül) Pınar & Behçet, **comb. & stat. nov.:** Turkey. Ermenek, Kazancı, Özlüce village, 1150 m, 11.7.1978, *M. Vural* 1094 (*Paratypes*: ANK!, KNYA!, GAZI!); Ermenek, Ermenek-Kazancı, *Pinus brutia* glade, 1000 m, 12.7.1989, *H. Sümbül* 3408, *J. Venter* (HUB!); Ermenek, Kazancı, around of Çavuşköy, slopes, 785 m, 20.7.2011, 36°33'294" N, 32°58'689" E, *M. Pınar* 3205 (VANF!).

O. myriacanthum Boiss., Diagn. ser. 2(6): 114 (1859) subsp. **myriacanthum** – Syntypes: Greece. In regione media montis Malevo Laconiae, *Orphanides* 55 (G photo!, BM photo!); in regione media Parnassi inter Rachova et Gourna, *Heldreich* 3203 (G photo!, K photo!); Turkey. B1 İzmir: Bergama, Kozak paşa, around of çeşme, 21.7.1962, *K. Karamanoğlu* (AEF!); B1 Manisa: Turgutlu, 2 km west of Turgutlu, roadside, 100 m, 8.8.2011, 38°29'309" N, 27°40'007"

E, *M. Pınar* 3377 (VANF!); C2 Denizli: Çukurköy-Serinhisar (Kisilhisar), 10 km away from Çukurköy, edge of field, 985 m, 22.7.2011, 37°37' 098" N, 29°14'442" E, *M. Pınar* 3292 (VANF!); Çukurköy-Kızılhisar, 13.7.1947, *Davis* 13285 (ANK!); Çukurköy, Denizli river, 14.7.1947, *Davis* 13460 (ANK!) C2 Muğla: Fethiye, south slopes of Babadağ, around of Kozaağaç, glade, 750 m, 10.8.2011, 36°31'288" N, 29°09'284" E, *M. Pınar* 3420 (VANF!); Baba Dağ, 610 m, *Davis* 13666 (ANK!).

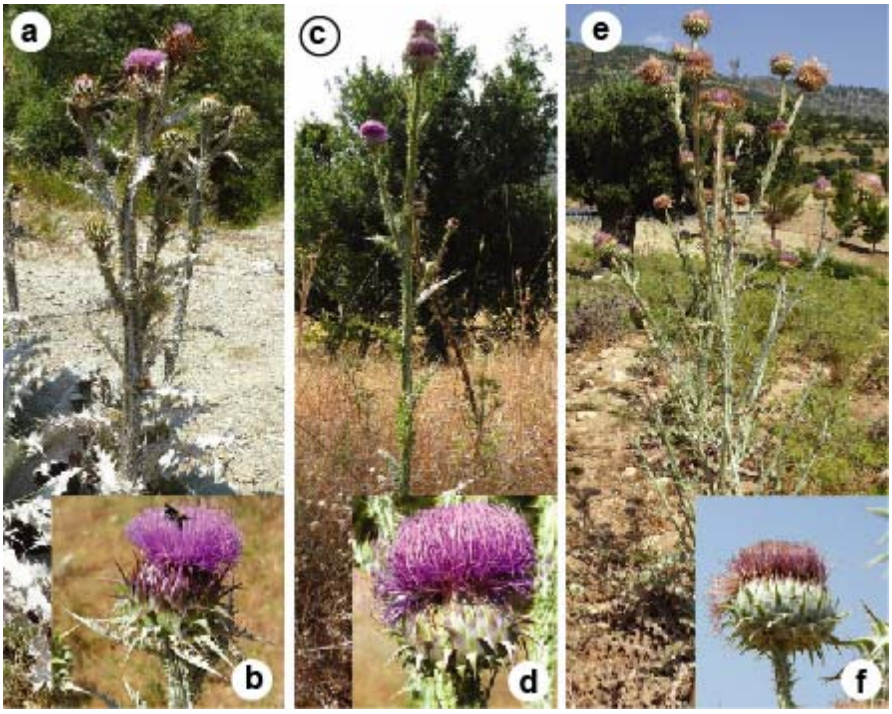

Fig. 1. Habit and capitulum of *Onopordum bracteatum* (a, b), *O. myriacanthum* subsp. *myriacanthum* (c, d) and *O. myriacanthum* subsp. *arachnoideum* (e, f).

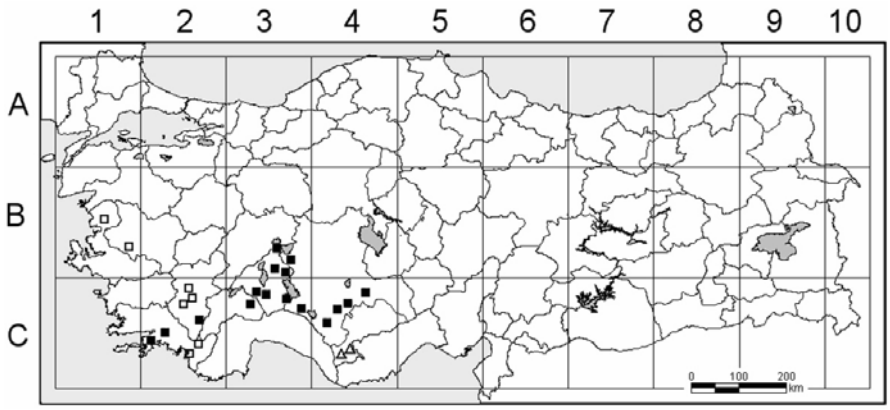

Fig. 2. Distribution map of *Onopordum bracteatum* (■), *O. myriacanthum* subsp. *myriacanthum* (□) and *O. myriacanthum* subsp. *arachnoideum* (Δ) in Turkey.

Table 1. Comparison of the diagnostic characters of *Onopordum myriacanthum* subsp. *arachnoideum*, *O. myriacanthum* subsp. *myriacanthum* and *O. bracteatum*.

Characters	*O. myriacanthum* subsp. *arachnoideum*	*O. myriacanthum* subsp. *myriacanthum*	*O. bracteatum*
Plant height	2.0–2.5 m	Up to 2 m	Up to 1.3 m
Stem	Branching from near to the base or from the middle	Branching from near to the base or from the middle	Branching from the middle
Stem branching	Dense	Sparse	Sparse
Upper stem leaves			
size	2–5 × 1–2 mm	2–5 × 1–2 cm	2–10 × 1–5 cm
position	away from capitulum or below the capitulum	away from capitulum or below the capitulum	below the capitulum
number	1–2	1–2	many
arrangement	sparse	sparse	densely clustered
Peduncles	2–8 cm long	2–10 cm long	0.5–3.0 cm long
Involucre	3–4 × 6–10 cm (excl. spines)	3–4 × 6–8 cm (excl. spines)	3–5 × 6–11 cm (excl. spines)
Phyllaries indumentum	Densely and persistently arachnoid hairy	Glabrous	Glabrous
Outer phyllaries	30–45 × 6–10 mm (spines 3–5 mm)	20–35 × 5–8 mm (spines 2–5 mm)	20–45 × 5–10 mm (spines 2–5 mm)
Median phyllaries	35–50 × 6–10 mm (spines 5–8 mm)	25–40 × 6–8 mm (spines 4–8 mm)	25–60 × 6–10 mm (spines 4–10 mm)
Inner phyllaries	30–45 × 2–4 mm (spines 3–5 mm)	30–42 × 2–4 mm (spines 4–6 mm)	30–50 × 2–5 mm (spines 2–5 mm)
Corolla			
length	38–48 mm	35–45 mm	35–50 mm
lobes	glandular	glandular	eglandular
lobe lengths	4 lobes equal, 10–12 mm 5th lobe longer, 13–15 mm	4 lobes equal, 9–10 mm 5th lobe longer,14–16 mm	4 lobes equal, 9–12 mm 5th lobe longer,13–16 mm
Corolla			
length	38–48 mm	35–45 mm	35–50 mm
lobes	glandular	glandular	eglandular
lobe lengths	4 lobes equal, 10–12 mm 5th lobe longer, 13–15 mm	4 lobes equal, 9–10 mm 5th lobe longer, 14–16 mm	4 lobes equal, 9–12 mm 5th lobe longer, 13–16 mm

O. bracteatum Boiss. & Heldr. in Boiss., Diagn. ser. 1(10) : 91 (1849) – *Holotype:* Turkey. C3 Burdur: in saxosis prope Aglansoun (Ağlasun) ad radices montis Boudroun Pisidiae, *Heldreich* 1130 (G photo!); B3 Konya: Southwest of Akşehir lake (Yeniköy), around of lake, roadside, 1050 m, 7.8.1982, *M. Küçükodük* 170 (KNYA!); B3 Afyon: Sultandağı, west of Sultandağı, steppe, 1340-1370 m, 1.8.1993, *A. Dönmez, M. Ekici, Z. Aytaç* 6425 (GAZI!); B3 Isparta: Akşehir-Isparta, around of Bağıllı, 5 km before Gelendost, roadside, 980 m, 22.7.2011, 38°08'507" N, 31°03'726" E, *M. Pınar* 3271(VANF!); C2 Denizli: Acıpayam, Abbas, *Davis* 13470 (ANK!); C2 Muğla: Marmaris, Kozcakara Dağ, 150 m, 15.7.1960, *Khan et al* 64 (ANK!); Marmaris, Marmaris-Muğla, Çetibeli pass, edge of field, 550 m, 10.8.2011, 36°56'515" N, 28°15'577" E, *M. Pınar* 3416 (VANF!); C3 Isparta: Eğirdir, Barda mount, 1150-1250 m, 8.9.1982, *Y. Gemici*, *L. Bekat* 607 (EGE!); Ş. Karaağaç, between Kıyakdede and Göztepe mountains, 1200-1300 m, 23.7.1994, *B. Mutlu* 998 (HUB!); Eğridir, 10 km before Eğridir, edge of lake, 1200 m, 22.7.2011, 37°52'583" N, 30°54'282" E, *M. Pınar* 3276 (VANF!); C3 Burdur: Ağlasun, East of Ağlasun, steppe, 1130 m, 22.7.2011, 37°38'499" N, 30°31'271" E, *M. Pınar* 3286 (VANF!); C3 Konya: Seydişehir, north of Koyucak mount, oak gap, 1500 m, 27.7.1983, *H. Ocakverdi* 1652 (KNYA!); Beyşehir, Hoyran-Kurucaova, steppe, 1160 m, 22.7.2011, 37°35'305" N, 31°33'540" E, *M. Pınar* 3266 (VANF); Çumra-Bozkır, around of Dinek, slopes, 1100 m, 20.7.2011, 37°20'532" N, 32°36'418" E, *M. Pınar* 3181 (VANF!).

The pollen polar axis average is 57.52 µm and equatorial axis 59.19 µm, P/E ratio 0.97, exine thickness 9.69 µm, colpus length 32.62 µm and colpus width 19.69 µm. Pollen shape is oblate-spheroidal, the ornamentation microreticulate and sculpture is echinate in *O. myriacanthum* subsp. *arachnoideum*. The achenes are greyish white, average size is 5.58 × 2.96 mm. Usually achenes shape are obovate and transversely rugose. Sculpture ornamentation of achene surface finely and irregularly undulate. A comparative account of palynological and achene properties of *O. bracteatum*, *O. myriacanthum* subsp. *myriacanthum* and *O. myriacanthum* subsp. *arachnoideum* are shown in Tables 2 and 3.

Table 2. Comparison of pollen characters of *Onopordum bracteatum, O. myriacanthum* subsp. *myriacanthum* and *O. myriacanthum* subsp. *arachnoideum* (Max.: maximum, Min.: minimum, M: mean, SD: standard deviation).

Characters	*Onopordum bracteatum*	*O. myriacanthum* subsp. *myriacanthum*	*O. myriacanthum* subsp. *arachnoideum*
	Min. - Max. (M ±SD)	Min. - Max. (M ±SD)	Min. - Max. (M ±SD)
Polar diameter (P) (µm)	54.87–58.84 (57.14 ±0.99)	53.98–57.85 (56.60 ±1.01)	54.85–60.60 (57.52 ±1.53)
Equatorial diameter (E) (µm)	55.36–60.48 (58.27 ±1.06)	55.79–59.41 (57.83 ±0.93)	56.07–62.41 (59.19 ±1.37)
P/E ratio	0.96–0.99 (0.98±0.01)	0.95–0.99 (0.97±0.01)	0.94–0.99 (0.97±0.01)
Exine thickness (µm)	8.91–9.70 (9.44 ±0.23)	9.15–10.10 (9.67 ±0.24)	9.23–10.09 (9.69 ±0.23)
Colpus length (µm)	29.40–31.41 (30.79 ±0.48)	33.67–36.43 (34.79 ±0.80)	32.15–33.22 (32.62 ±0.27)
Colpus width (µm)	17.38–19.82 (18.28 ±0.63)	19.68–21.48 (20.63 ±0.37)	18.60–20.44 (19.69 ±0.40)

Table 3. Comparison of the achene characters of *Onopordum bracteatum, O. myriacanthum* subsp. *myriacanthum* and *O. myriacanthum* subsp. *arachnoideum*.

Characters	*Onopordum bracteatum*	*O. myriacanthum* subsp. *myriacanthum*	*O. myriacanthum* subsp. *arachnoideum*
Length (mm)	5.7–6.2 (5.91 ± 0.10)	5.2–6.0 (5.60 ± 0.24)	5.3 –6.1 (5.58 ± 0.21)
Width (mm)	2.8–3.1 (2.96 ± 0.09)	2.5–3.5 (3.04 ± 0.30)	2.5 –3.5 (2.96 ± 0.32)
Shape	Oblong-obovate	Obovate	Obovate
Surface ornamentation	Transversely rugose	Transversely rugose	Transversely rugose
Colour	Cream	Greyish brown	Greyish white

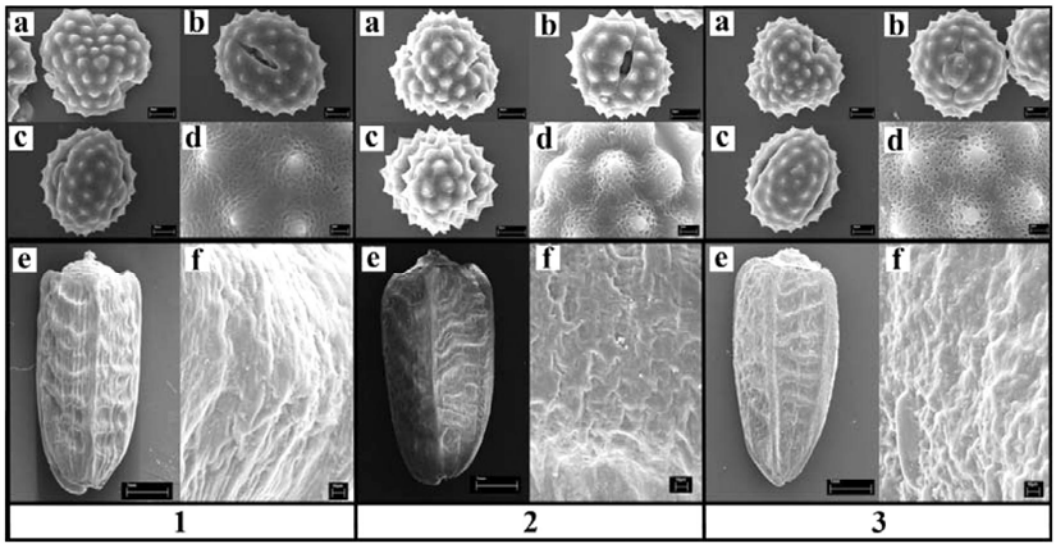

Fig. 3. SEM micrographs of pollen grains and achenes of *Onopordum bracteatum* (1), *O. myriacanthum* subsp. *myriacanthum* (2) and *O. myriacanthum* subsp. *arachnoideum* (3): a. polar view of pollen; b-c. equatorial view of pollen; d. ornamentation of pollen; e. gneral view of achenes; f. surface of achenes.

Onopordum myriacanthum subsp. *arachnoideum* is a local endemic taxon, with an estimated occupancy area of less than 10 km^2 [criterion B2ab(i)]. The population is endangered, with less than 100 individuals [criterion C2a(ii)]. Therefore, it should be classified as "Critically Endangered (CR)" based on the criteria of the IUCN Red List Categories (IUCN, 2011).

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References

Danin, A. 1975. *Onopordum* L. *In:* Davis, P.H. (Ed.), Flora of Turkey and the East Aegean Islands. Vol. **5**, Edinburgh Univ. Press, Edinburgh, pp. 356-369.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands (Supplement 1). Edinburgh Univ. Press, Edinburgh, pp. 317-550.

Erdtman, G. 1969. Handbook of Palynology. Hafner Publishing Co., New York, pp. 21-77.

Erik, S. and Sümbül, H. 1986. Three new taxa from Turkey. Notes Roy. Bot. Gard. Edinburgh **44**(1): 151-156.

Faegri, K. and Iversen, J. 1975. Textbook of Pollen Analysis. Fourth Edition, John Wiley and Sons, New York, pp. 283-284.

Hacıoğlu, B.T., Arslan, Y., Subaşı, İ. Katar, D., Bülbül, A.S. and Çeter, T. 2012. Achene morphology of Turkish *Carthamus* species. Australian J. Crop Sci. **6**(8): 1260-1264.

IUCN 2011. Guidelines for Using the IUCN Red List Categories and Criteria. Version 9.0. Prepared by the Standards and Petitions Subcommittee, Gland, Switzerland.

Koul, K.K., Ranjna, N. and Raina, S.N. 2000. Seed coat microsculpturing in *Brassica* and allied genera (Subtribes Brassicinae, Raphaninae, Moricandiinae). Ann. Bot. **86**: 385-397.

Özhatay, N., Kültür, Ş. and Aslan, S. 2009. Checklist of additional taxa to the Supp. Flora of Turkey IV. Turk. J. Bot. **33**: 191-226.

Pınar, S.M. and Behçet, L. 2014. *Onopordum hasankeyfense* (Asteraceae), a new species from south-eastern Turkey. Turk. J. Bot. **38**: 226-233.

Punt, W., Hoen, P.P, Blackmore, S., Nilsson, S. and Thomas, A. 2007. Glossary of Pollen and Spore Terminology. Review of Palaeobotany and Palynology **143**: 1-81.

Susanna, A. and Garcia-Jacas, N. 2007. Tribe *Cardueae* Cass. *In*: Kubitzki, K. (Ed.), Families and Genera of Vascular Plants, Vol. **VIII**, Flowering Plants, Eudicots, Asterales. Springer-Verlag, Berlin, pp. 123-146.

Tantawy, M.E., Khalifa, S.F., Hassan, S.A. and Al-Rabiai, G.T. 2004. Seed exomorphic characters of some Brassicaceae (LM and SEM Study). International J. Agri. Biol. **6**(5): 821-830.

Tuzlacı, E. 2000. *Onopordum* L. *In*: Güner, A., Ozhatay, N., Ekim, T. and Baser, K.H.C. (Eds), Flora of Turkey and the East Aegean Islands, (Supplement 2). Edinb. Univ. Press, Edinburgh, pp. 160-161.

Wodehouse, R.R. 1935. Polen Grains. McGraw-Hill, New York.

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