



Varieties and chorology of *Convolvulus oleifolius* Desr. (Convolvulaceae) in Turkey

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Abstract

In this study, two varieties of *C. oleifolius* recorded in flora of Turkey, which were determined to distribute in our country. As a result of the identifications made by taking into account of the specimens collected during the field studies and the herbarium specimens, it is determined *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* distribute in our country. Descriptions of taxa, illustrative drawings and distributions are given in the study and pollen characters of both taxa were examined by light microscope and SEM.

Key words: Chorology, Convolvulaceae, *Convolvulus oleifolius*, Turkey

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Convolvulus oleifolius Desr. (Convolvulaceae)'un Türkiye'deki varyeteleri ve korolojisi

Özet

Bu çalışmada, Türkiye Florasında kayıtlı olan *C. oleifolius*'un, ülkemizde yayılış gösterdiği belirlenen iki varyetesi sunulmuştur. Arazi çalışmaları sırasında toplanan örnekler ile herbaryum örnekleri göz önüne alınarak yapılan teşhisler sonucunda, ülkemizde *C. oleifolius* var. *oleifolius* ve *C. oleifolius* var. *deserti*'nin yayılış gösterdiği tespit edilmiştir. Çalışmada taksonlara ait betimlemeler, tanımlayıcı çizimler ve yayılış alanları verilmiş, her iki taksonun polen karakterleri ışık mikroskobu ve SEM ile incelenmiştir.

Anahtar kelimeler: Convolvulaceae, *Convolvulus oleifolius*, Koroloji, Türkiye

1. Introduction

The family Convolvulaceae (bindweed family) is a family of herbaceous and woody, climbing or trailing vines, shrubs and trees. It is represented throughout temperate and tropical regions of the world, and has a wide range of habitats (Heywood, 1985). It consists of 58 genera and approximately 2000 species, with the genus *Convolvulus* L. comprising some 250 species throughout the world (Staples and Yang, 1998). The genus *Convolvulus* was revised by Parris (1978) in the 'Flora of Turkey and the East Aegean Islands' and one species was subsequently described (Davis *et al.* 1988). According to Flora of Turkey, belong to 33 species (36 taxa) of genus *Convolvulus* were distributed in Turkey.

C. oleifolius Desr. is a woody based perennials, shrublets or shrubs and distributing rocky and stony slopes, macchie areas, phrygana and sand dunes near the sea in Aegean and Mediterranean regions in Turkey. *C. oleifolius* is distribute in Aegean Islands, Cyprus, Egypt, Greece, Libya, Malta, North Africa, Palestine, Sicily and West Syria outside of Turkey. Three variety of this species, *C. oleifolius* Desr. var. *oleifolius*, *C. oleifolius* Desr. var. *deserti* Pamp. and *C. oleifolius* Desr. var. *pumilius* Pamp., are in Flora of Cyprus. According to Flora of Cyprus these varieties distinguished from each other especially with habit and leaves; *C. oleifolius* var. *oleifolius* is spreading subshrubs, leaves numerous and oblanceolate; *C. oleifolius* var. *deserti* is rigid, broom-like, usually erect and much branched shrubs and the branches often leafless towards the base, leaves narrowly linear (Meikle, 1985).

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These varieties were incorporated in Med-checklist which was published by Greuter *et al.* (1986). Similarly, *C. oleifolius* var. *oleifolius*, *C. oleifolius* var. *deserti* and *C. oleifolius* var. *pumilius* taxa weren't indicated as synonymous of this species (Greuter, 1986). Numerous specimens of *C. oleifolius* were collected during the field trips of "Taxonomical Studies on genus *Convolvulus* L. (Convolvulaceae) in Turkey" project. It is approved that the specimens of *C. oleifolius* are evaluate as two different variety which are *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* according to results of field observations, morphological and palynological studies. In the present study, morphological description of *C. oleifolius*, descriptions which show the differences between two varieties, identification key, palynological features and distribution map of the taxa are presented.

2. Materials and methods

During the field trips in West and Southwest Anatolia for Revision of Turkish *Convolvulus*, we collected some interesting specimens thought to belong to *C. oleifolius* According to 'Flora of Turkey' (Parris, 1978), *C. oleifolius* distributed in B1, C1 and C2 squares in Turkey, but the varieties of this species weren't mentioned. Therefore, they couldn't be identified by using 'Flora of Turkey'. Then specimens were crosschecked with various *Convolvulus* accounts given in the relevant literature, the 'Flora of Cyprus' (Meikle, 1985), 'Flora Europaea' (Stace, 1972), 'Flora Iranica' (Rechinger, 1979), 'Flora of Syria, Palestine and Sinai' (Post, 1932), Nouvelle Flore du Liban et de la Surie (Mouterde, 1986), Karamanoğlu (1964) and Sa'ad (1967). These specimens which belong to different varieties of *C. oleifolius* were determined by use of the 'Flora of Cyprus' (Meikle, 1985).

The pollen morphologies of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* were examined by means of light microscope (LM) and SEM. For LM, the pollen grains were first treated with 96% alcohol to remove oily substances, and then embedded in glycerin jelly stained with basic fuchsin (Wodehouse, 1935). In LM studies the following parameters were measured: polar axis (P), equatorial axis (E), exine and intine thickness. The measured pollen diameters were based on 50 samples. To examine the exine sculpture in detail, scanning electron microscopy (SEM) was also used. For SEM study, the pollen was first treated with 70% alcohol and then dried before mounting on stubs with gold. The photomicrographs were taken with Zeiss LEO-1430 Electron Microscopes. In this study, the terminology of Punt *et al.* (2007) was used.

This study was based on the herbarium materials deposited in GAZI, HUB, ANK, ISTE, ISTF and on the plants collected in the field and deposited in the herbarium of AKDU (Herbarium of the Biology Department of Akdeniz University).

3. Results and discussions

Convolvulus oleifolius Desr. in Lam., Encycl. 3:552 (1789)

Type: Levant, probably from Crete (Parris, 1978).

The following description of the species was based on the specimens collected from B1, C1, C2 and C3 squares in Turkey.

Woody-based, perennials, shrublets or shrubs. Stem 10–50 cm, prostrate, erect or ascending, silvery-silky indumentum. Leaves linear, oblanceolate or oblanceolate-spathulate, 10–60 x 1.5–7 mm, acute or obtuse, attenuate at the base, adpressed-sericeous; occasionally sparsely pilose at the base; the basal leaves resemble to the cauline leaves, sometimes dense clustered and imbricate at the base of stem, sometimes semi-amplexicaule and scarious margin at the base. Inflorescence axillary and terminal, solitary or 2–8 flowered cymes (especially dichasia); pedicel 0.5–4 mm or wanting; peduncle 5–60 mm. Bracts similar the cauline leaves, 6–15 x 0.5–1 mm, adpressed-sericeous sometimes with sparsely soft and spreading hairs. Bracteoles linear, 3–20 x 0.2–1 mm, longer than pedicel. Sepals erect at flowering and fruiting period; outer sepals elliptic-lanceolate to obovoid-lanceolate, 8–12 x 2.5–4.5 mm, long acuminate to caudate, scattered villose, usually black dotted. Middle sepal elliptic-lanceolate, 8–11.5 x 3–5 mm, long acuminate to caudate, with the right and the left half unequal, one half membranous towards margin; the membranous part glabrous or glabrescent. Inner sepals elliptic-lanceolate to obovoid-lanceolate, 8–11 x 3–5 mm, long acuminate to caudate, with the both half membranous towards margin; the membranous part glabrous or glabrescent. Corolla pale pink or rose pink, 15–25 mm long, with hairy bands on the outside; petals pubescent at the apex. Stamens unequal, 9.5–14 mm long; filaments entire at margin; anthers oblong with retuse apex, 2.5–3 mm long. Ovary ovoid-conical, 1.5–2 x 1–1.5 mm, hairy, surrounded by a glabrous disc at the base; style 5–6 mm, hairy; stigma lobes filiform, 5.5–6 mm. Capsule ovoid to conical, 4–5 x 3–5 mm, glabrescent towards base, hairy above, bilocular, 2- or 4- seeded; seeds ovoid, 3–3.5 x 2–3 mm, densely hairy. Flowering time April-June. (in Turkey).

General Distribution: Aegean Islands, Cyprus, Egypt, Greece, Libya, Malta, North Africa, Palestine, Sicily, west Syria, Turkey.

Habitat: Macchie, phrygana, stony, sandy, limestone and dry rocky slopes, under *Pinus brutia* and sand dunes, from sea-level to 250 m.

The following key can be used for distinguishing two varieties of *C. oleifolius* in Turkey:

- 1. Rigid, broom-like branched, usually erect, shrublets or shrubs, leaves dense clustered at the base of stem..... var. *deserti*
- 1. Prostrate or ascending, woody based perennials, stem branched from the base, leaves scattered on the stem.....var. *oleifolius*

C. oleifolius* Desr. var. *oleifolius (Figure. 1)

Type: ‘vient du Levant & est cultivée au Jardin du Roi’ (P).

Woody-based, perennials. Stem 10–50 cm high, prostrate or ascending, branched from the base, adpressed- sericeous. Leaves oblanceolate to oblanceolate-sphatulate, numerous and scattered on the stem. Inflorescence axillary and terminal, solitary or 2–3 flowered dichasia. Outer sepals elliptic-lanceolate with green acuminate apex, 9–10.5 x 3–4.5 mm, scattered villose. Corolla pale pink, 20–25 mm long. Filaments 8-11 mm long; anthers oblong, 3 mm long. Ovary ovoid, 1.5–2 x 1–1.5 mm, hairy; style 5–5.5 mm long, hairy; stigma lobes 6 mm long.

Specimens examined: **C3 Antalya:** Finike, 5 km from Finike to Demre, dry rocky slopes, macchie, 47 m, 12.v.2009, C. Aykurt (2429), N. Kemaloğlu (AKDU). **Antalya:** Finike, 5 km from Finike to Demre, dry rocky slopes, macchie, 47 m, 28.iv.2010, C. Aykurt (2957), N. Kemaloğlu (AKDU). **Antalya:** Between Finike and Demre, macchie, 50 m, 02.v.1979, H. Peşmen (4569), A. Güner (GAZI).

C. oleifolius* Desr. var. *deserti Pamp. in Archivio Bot., 12: 41 (1936) (Fig.1)

Type: Libya, Cyrenaica.

Rigid, broom-like, much branched shrublets or shrubs. Stem 10–50 cm, erect or ascending, adpressed-sericeous. Leaves linear, oblanceolate or oblanceolate-sphatulate and dense clustered at the base of stem; the branches sometimes leafless towards the base. Inflorescence axillary and terminal, solitary or 3–8 flowered cymes (often dichasia). Outer sepals elliptic-lanceolate with long, green acuminate apex, 8–12 x 2.5–3 mm, long and scattered villose. Corolla white, pale pink, or rose pink, 15–20 mm long. Filaments 7–11 mm long; anthers oblong, 2.5-3 mm long. Ovary ovoid, 2 x 1.5 mm, hairy; style 5.5–6 mm long, hairy; stigma lobes 5.5–6 mm long.

Specimens examined: **B1 İzmir:** Çeşme, Harbor district, phrygana, dry rocky hillside, 4 m, 13.v.2008, C. Aykurt (1950), N. Kemaloğlu (AKDU). **C1: Muğla:** Datça, 44 km from Marmaris to Datça, stony slopes, 80 m, 26.v.2008, C. Aykurt (2041), N. Kemaloğlu (AKDU). Muğla: Datça, between Marmaris and Datça, under *Pinus brutia*, 30 m, 1.vi.2009, N 36.76203 E 27 88094, C. Aykurt (2631), N. Kemaloğlu (AKDU). Muğla: Datça, Gebekum shore, sand dunes, 5 m, 2.vi.2009, C. Aykurt (2637), N. Kemaloğlu (AKDU). Muğla: Datça, Gebekum, under *Pinus brutia*, sandy slopes, 16 m, 2.vi.2009, C. Aykurt (2638), N. Kemaloğlu (AKDU). **C1 Muğla:** Datça, Gebekum, sea shores, 0-10 m, 10.v.2001, H. Duman 8534 (GAZI). **C2: Muğla:** Marmaris, between Datça and Marmaris, 33 km to Marmaris, slopes, 50 m, 2.vi.2009, C. Aykurt (2639), N. Kemaloğlu. (AKDU). **C3 Antalya:** Finike, 7 km from Finike to Demre, dry rocky slopes, 40 m, 28.iv.2010, C. Aykurt (2955), N. Kemaloğlu (AKDU). **Antalya:** Finike, 12 km from Finike to Demre, dry rocky slopes, 40 m, 28.iv.2010, C. Aykurt (2956), N. Kemaloğlu (AKDU).

A detailed comparison of the *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* given in the Table 1 and the geographical distributions of the two varieties are mapped in Figure 2.

Table 1. Comparison of some diagnostic morphological characters of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti*

	<i>C. oleifolius</i> var. <i>oleifolius</i>	<i>C. oleifolius</i> var. <i>deserti</i>
Habit	Prostrate or ascending, woody based perennials, 10–50 cm	Rigid, broom-like, erect or ascending much branched shrublets or shrubs, 10–50 cm
Leaves	Leaves numerous and scattered on the stem	Leaves dense clustered at the base of stem, the branches sometimes leafless towards the base
Inflorescence	Inflorescence axillary and terminal, solitary or 2–3 flowered cymes	Inflorescence axillary and terminal, solitary or 3–8 flowered cymes
Outer sepals	9–10.5 x 3–4.5 mm	8–12 x 2.5–3 mm

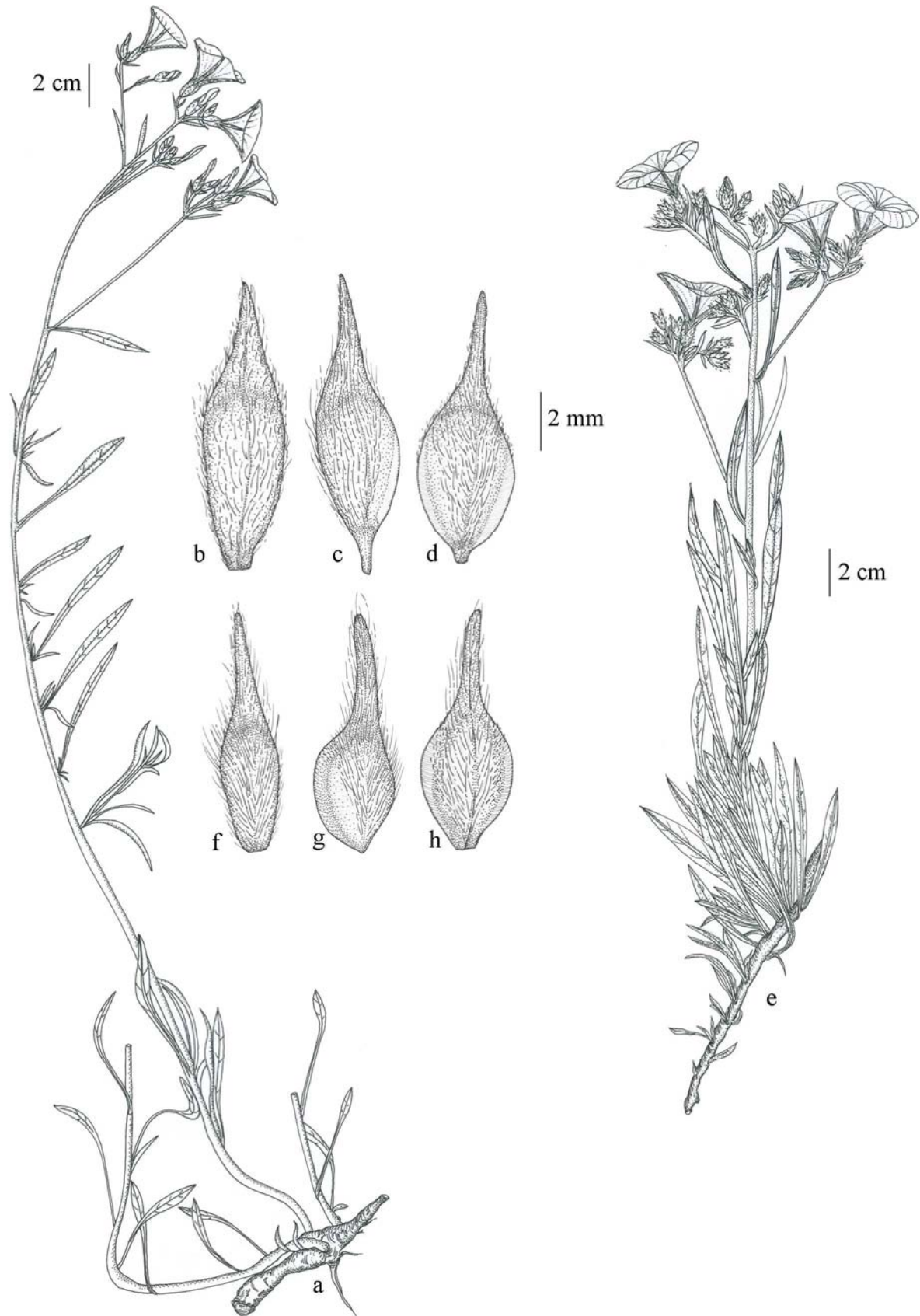


Figure 1. *C. oleifolius* var. *oleifolius*: a: Habit; b, c, d: Outer, middle, inner sepals; *C. oleifolius* var. *deserti*: e: Habit; f, g, h: Outer, middle, inner sepals.

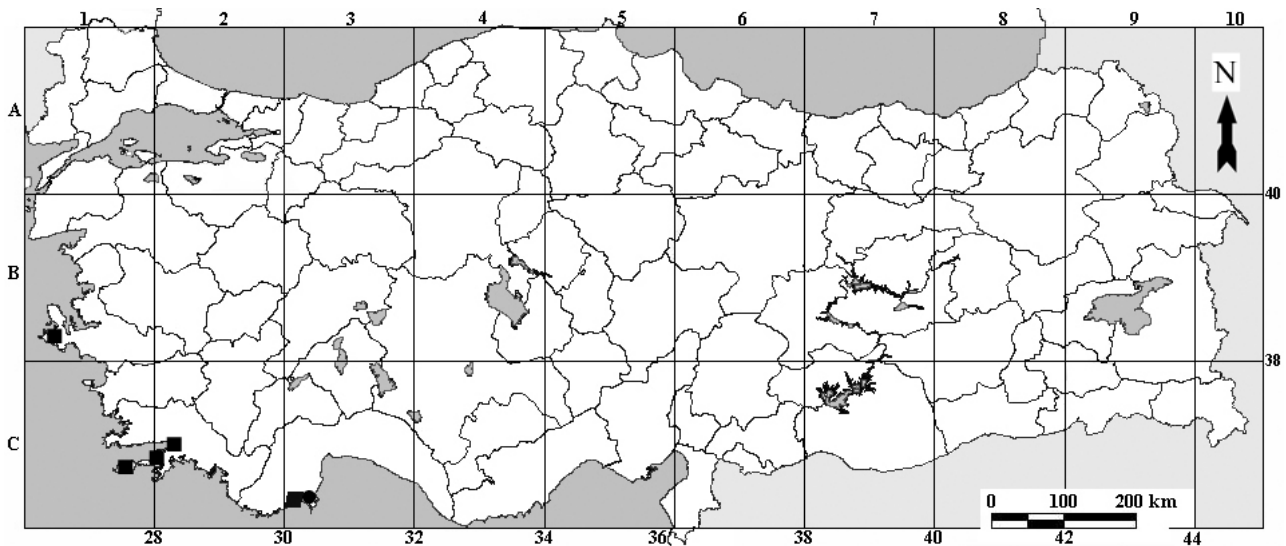


Figure 2. Distribution of *C. oleifolius* var. *oleifolius* (●) and *C. oleifolius* var. *deserti* (■) in Turkey

Pollen Morphology

According to LM (Figure 3) and SEM (Figure 4-5) investigations, the pollen grains of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* are tri- or tetracolpate, are large in size (51-100 μm). The pollen shapes (based on P/E ratio) are oblate-spheroidal to spheroidal and the ornamentation is microechinate-perforate; perforations are approximately circular, dense, distinct and irregularly distributed (specimens *C. Aykurt* 2429 and *C. Aykurt* 2638). The main palynological features of the examined *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* are summarized in Table 2.

Table 2. Pollen characteristics of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti*

Taxa	Shape	P/E	P (μm)			E (μm)			Exine (μm)	Intine (μm)	Ornamentation
			M	SD	V	M	SD	V			
<i>C. oleifolius</i> var. <i>oleifolius</i>	oblate-spheroidal to spheroidal	0,95	69,30	$\pm 2,61$	64,57–75,85	73,08	$\pm 1,98$	69,7–77,9	1,02–2,05	1,02	microechinate-perforate
<i>C. oleifolius</i> var. <i>deserti</i>	oblate-spheroidal to spheroidal	0,98	57,91	$\pm 1,82$	54,32–61,5	58,91	$\pm 1,74$	56,37–62,52	1,02–2,05	1,02–1,54	microechinate-perforate

[Abbreviations: P – Polar axis, E – equatorial axis, M – mean value, SD – standard deviation, V – variation].

These results show that the pollen grains of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* are mainly morphologically similar. The pollen grains of *C. oleifolius* var. *oleifolius* are distinguished by *C. oleifolius* var. *deserti*, which are usually tetracolpate and larger. Lewis and Oliver (1965) studied the pollen grains of the genus *Convolvulus*. They described the *Convolvulus* pollen grains as 3- or rarely 4-zonocolpate and prolate to subspheroidal. Our results are similar to the earlier studies (Menemen and Jury, 2002; Tellería and Daners, 2003; Lewis and Oliver, 1965).

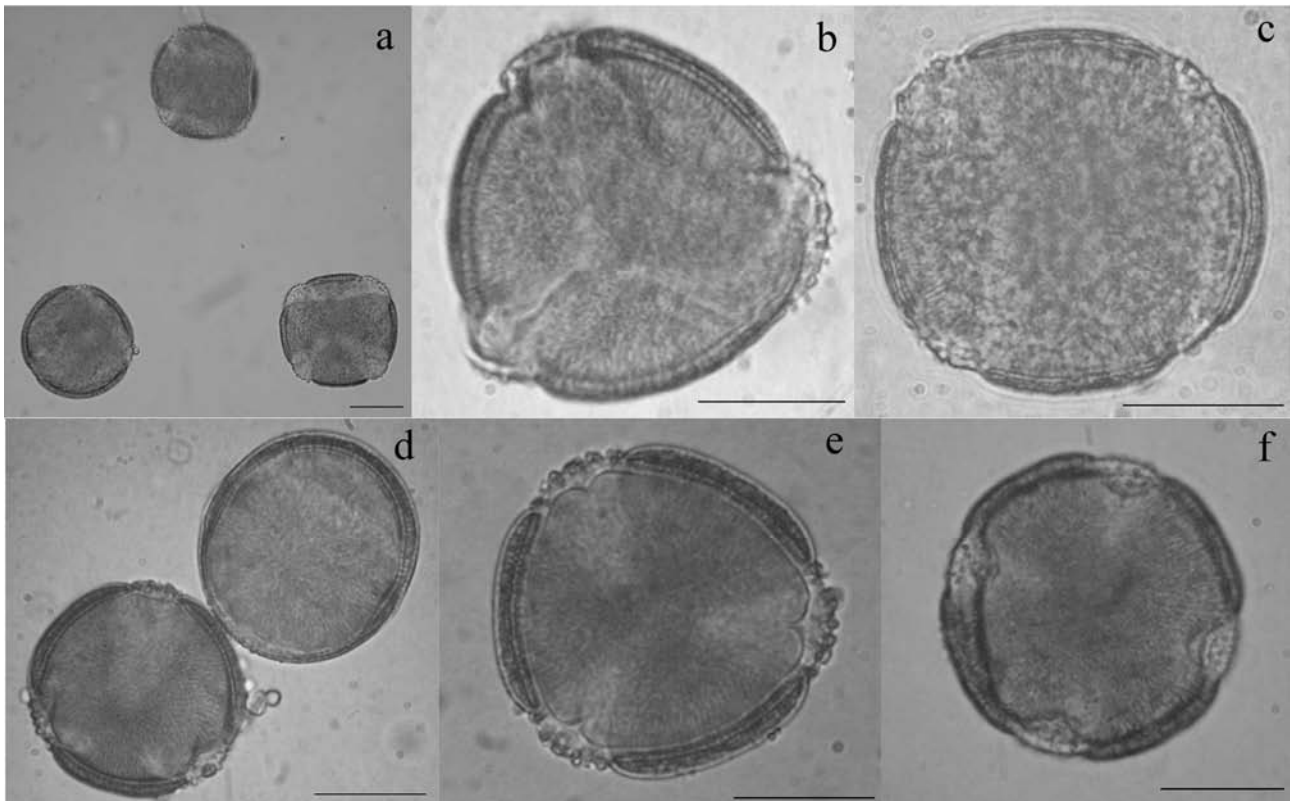


Figure 3. LM photographs of the pollen grains of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti*: a-b-c: *C. oleifolius* var. *oleifolius*; d-e-f: *C. oleifolius* var. *deserti* (bars = 30 µm).

It is approved that the specimens of *C. oleifolius* are evaluate as two different variety which are *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* according to results of field observations, morphological and palynological studies. Because, the specimens belonging these two varieties clearly separated from the each other with especially habit and leaf characters like it was specified in Flora of Cyprus. *C. oleifolius* var. *oleifolius* is a prostrate or ascending woody based perennials; leaves scattered on stem and not clustered at the base of stem. On the other hand, *C. oleifolius* var. *deserti* is a usually erect, rigid and broom-like branched shrublets or scrubs; leaves imbricate and dense clustered at the base of stem.

During the field trips, it is determined that both *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti* are distributed on rocky places and macchie between Finike and Demre (Antalya) in Mediterranean Region; but only *C. oleifolius* var. *deserti* among both varieties is distributed on stony and rocky slopes, macchie, phrygana, under *Pinus brutia* forests and sandy dunes around Çeşme (İzmir), Datça, Marmaris (Muğla) in Aegean Region. *C. oleifolius* var. *oleifolius* wasn't observed in the suitable habitats or places where *C. oleifolius* var. *deserti* was collected in the Aegean Region. It is possible to say that the individuals belonging both varieties have distributed simpatrically between Finike and Demre.

Flora of Turkey records of *C. oleifolius*:

B1 İzmir: nr Urla, *Kegel* (EGE 12678). CI İzmir: Kuşadası, s.l., *Hub.-Mor.* 17530; *ibid.*, 15 m, *Sorger* 65-9-52! CI/2 Muğla: Marmaris to Datça, 25-30 km from Hisarönü, 250 m, *Dudley* (*D.* 35421)!

During field studies, specimens of *C. oleifolius* collected between Datça and Marmaris, were identified as *C. oleifolius* var. *deserti*. Although field studies were performed also around Urla and Kuşadası, any *C. oleifolius* species weren't met.

In Turkey, a great number of specimens of *Convolvulus* in large herbaria such as GAZI, HUB, ANK, ISTE, ISTF were examined. Specimens which are defined to belong to this species weren't met during herbarium studies. Only two different specimens of *C. oleifolius* were met. One of them was collected from Gebekum (Datça, Muğla) by Hayri Duman, one of the esteemed botanists of Turkey, and was considered under the name of *C. oleifolius* var. *deserti* within our study; and the other one was collected from the macchie area between Finike and Demre (Antalya) by deceased botanist Prof. Dr. Hasan Peşmen, and was considered under the name of *C.oleifolius* var. *oleifolius* within our study.

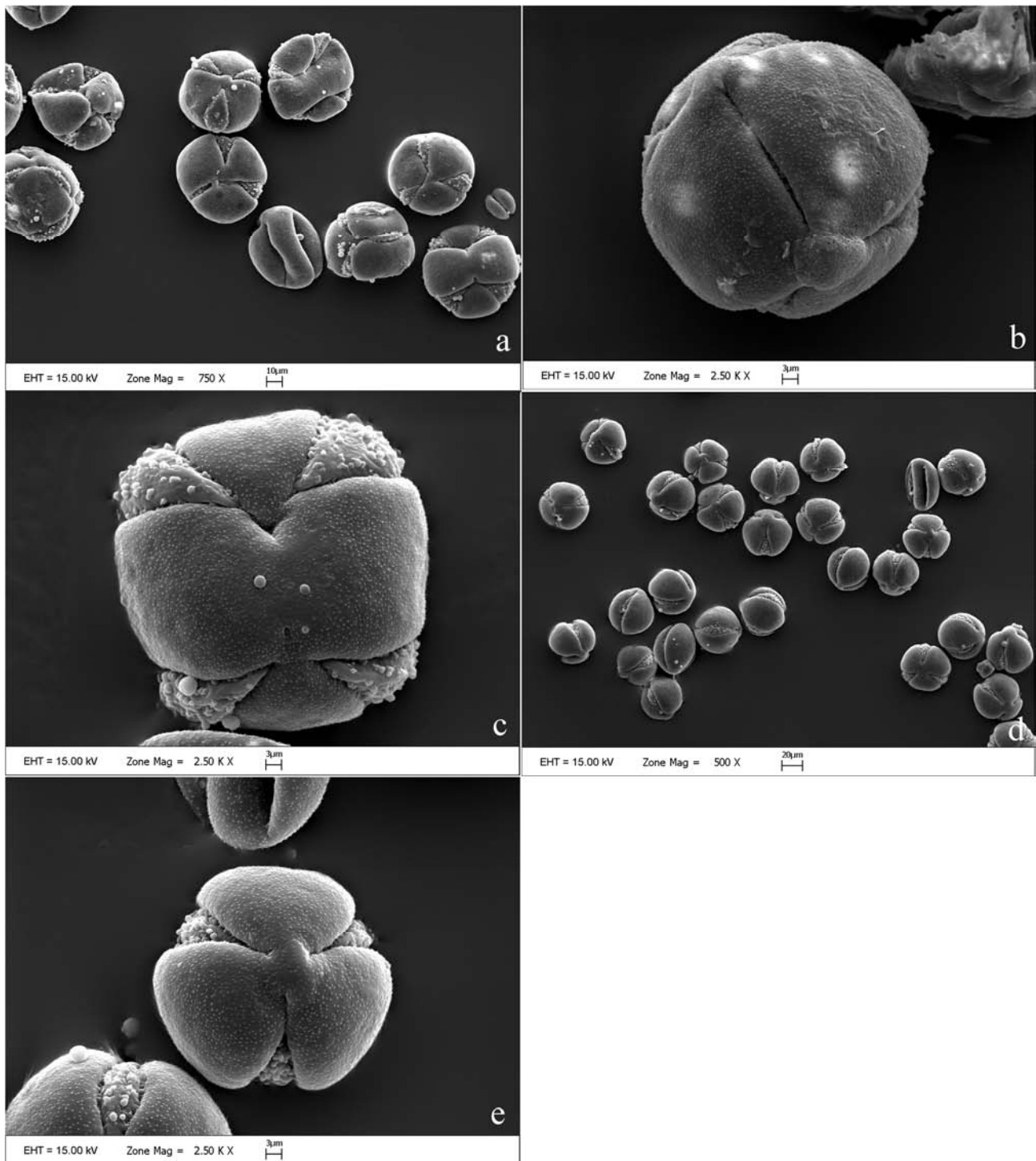


Figure 4. SEM photographs of the pollen grains of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti*: a-b-c: *C. oleifolius* var. *oleifolius*; d-e: *C. oleifolius* var. *deserti*.

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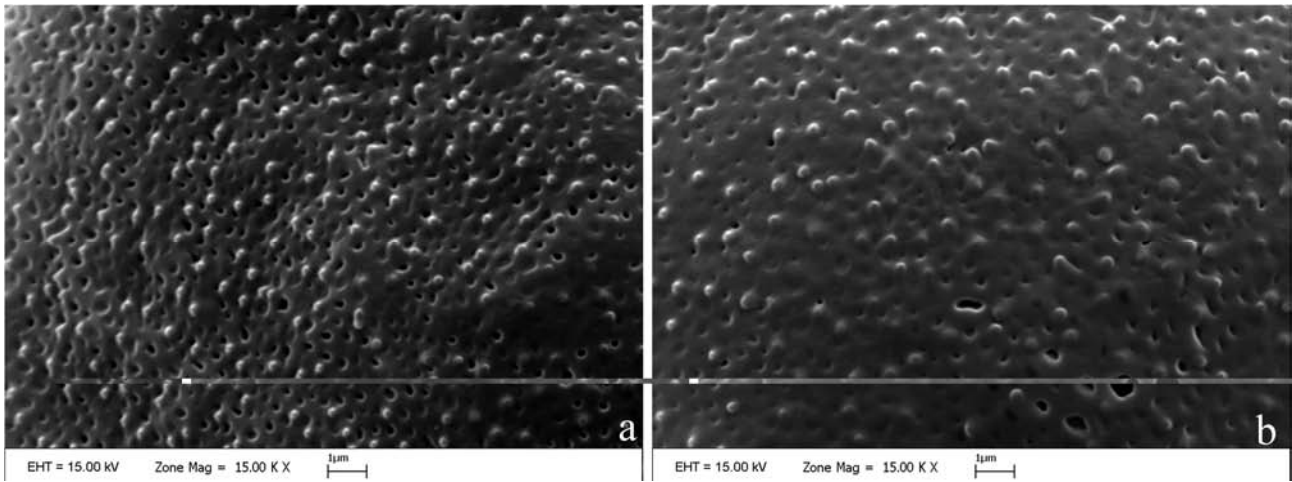


Figure 5. SEM photographs of the pollen surfaces of *C. oleifolius* var. *oleifolius* and *C. oleifolius* var. *deserti*: a: *C. oleifolius* var. *oleifolius*; b: *C. oleifolius* var. *deserti*.

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