ANADOLU, J. of AARI
ISSN: 1300-0225 (Print)
E-ISSN: 2667-6087 (Online)
2022, 32 (2): 287-300
DOI: 10.18615/anadolu.1216309

Centaurea ptosimopappa var. elegans Güzel. A New Centaurea L. (Asteraceae) taxon from Türkiye with taxonomical notes on sect. Ptosimopappus and with lectotypification

Yelda GÜZEL*

****Mustafa Kemal University, Faculty of Arts and Science, Department of Biology, 31040 Antakya-Hatay/TÜRKİYE***

**https://orcid.org/0000-0002-7975-3130*

**Corresponding author (Sorumlu yazar): yeldaguzel@gmail.com*

Received (Geliş tarihi): 08.12.2022 Accepted (Kabul tarihi): 19.12.2022

***Abstract**: A new variety of **Centaurea (Asteraceae)** section **Ptosimopappus** from the Amanus Mountains, South Anatolia was described. The new taxon is considered as a variety of **C. ptosimopappa** due to shared morphological characters such as sterile and fertile leathery basal rosettes and branched shrub habit. On the other hand, it differs by achene morphology and by involucre, spinule and cauline leaf sizes as well as other morphological and anatomical differences. Detailed morphological, carpological and microsculptural analyses were carried out in order to reveal the differences between the varieties. Also, Lectotype for **C. ptosimopappa var. ptosimopappa** based on isotypes of its basionym **Ptosimopappus bracteatus** was designated. Taxonomic studies on wild flora elements will not only help us to take a world species inventory, but also contain important clues about the present and future of our cultivars.*

***Keywords: Centaurea, Ptosimopappus,** new variety, endemic flora, Lectotypification.*

Centaurea ptosimopappa var. elegans Güzel. Türkiye'den, Centaurea L. (Asteraceae) cinsine ait yeni bir taxon. sect. Ptosimopappus'a dair taksonomik notlar ve lektotipifikasyonu

***Öz:** Güney Anadolu'daki Amanos Dağları'ndan yeni bir **Centaurea (Asteraceae)** sect. **Ptosimopappus** varyetesi tanımlanmıştır. Yeni takson, steril ve fertil derimsi taban yaprak rozetleri ve dallanmış çalımsı habitus gibi ortak morfolojik karakterler nedeniyle bir **C. ptosimoppa** varyetesidir. Öte yandan, aken morfolojisi ve involucrum, spinule ve gövde yaprak boyutları ile diğer morfolojik ve anatomik farklılıklar nedeniyle **C. ptosimopappa**'dan farklılıklar gösterir. Varyeteler arasındaki farklılıkları ortaya çıkarmak için detaylı morfolojik, karpolojik ve elektron mikroskobu analizleri yapılmıştır. Ayrıca, **C. ptosimoppa var. ptosimopappus bracteatus** basioniminin izotiplerine dayalı olarak **Ptosimopappus bracteatus**'a lektotip atanmıştır. Yabani flora elemanları ile ilgili taksonomik çalışmalar, dünya tür envanterini çıkarmamıza yarayacakları gibi, kültür çeşitlerimizin bugünü ve geleceğine dair önemli ipuçları da barındırırlar.*

***Anahtar kelimeler: Centaurea, Ptosimopappus,** yeni variyete, endemik flora, lektotipifikasyon.*

INTRODUCTION

Centaurea L. (Linneaus, 1753: 909) is one of the largest genera in the ***Asteraceae***. In the Flora of Türkiye, the genus was classified by Wagenitz into 34 sections (Wagenitz, 1975). Recently, some of these sections were separated to split the genus into four genera: *Centaurea* L., *Psephellus* Cassini (1826), *Rhaponticoides* Vaillant (1754), and *Cyanus* Miller (1754) (Wagenitz and Hellwig, 2000; Greuter 2003). Subsequently, the number of *Centaurea* sections for Turkish flora decreased to 27. However, the genus remains one of the largest genera of Turkish flora with a continually increasing number of species, reaching almost 200 by 2017 (Dinç and Dogu, 2012; Güner *et al*., 2012; Köse and Alan, 2013; Bona, 2015a; Bona, 2015b; Negaresh *et al.*, 2015; Yüzbaşıoğlu *et al*., 2015; Kültür, 2010; Uysal *et al.*, 2016; Uysal and Hamzaoğlu, 2016; Uysal *et al*., 2017). Türkiye is the main centre of *Centaurea* diversity (Wagenitz, 1986), with a 54% rate of endemism that continues to increase as new species are discovered.

Ptosimopappus is an unusual, two membered (*C. ptosimopappa* and *C. ptosimopappoides*) small group of *Centaurea* that is characterized by phyllaries that do not have appendages, ends with much-reduced mucros, with achenes that have indistinct inner row of pappus, and firm (in *C. ptosimopappoides*) to leathery leaves (in *C. ptosimopappa* and its new variety here described). As indicated by Wagenitz (1975), members of the section are in close affinity with section *Microlophus*, especially with *C. behen* and *C. polypodiifolia*, but differ from them by indistinct inner row of pappus (vs. distinct but short) and by firm to leathery leaves (vs. firm but not leathery). Both members of this local endemic section, namely C. *ptosimopappoides* Wagenitz (1974) and *C. ptosimopappa* are distributed in the Southeast Mediterranean ranges of the Taurus Mountains (Figure 1). The new variety is also distributed in the East Mediterranean region, in the Amanus Mountains. It has all the typical features of section *Ptosimopappus.*

Taxonomic studies about wild flora members, serve the purposes of making a world species inventory, understanding species diversity and dynamics, as well as conserving the gene resources of wild ancestors and relatives of cultivated plants. The world is facing a serious climate and therefore, water crisis. It is certain that in the future we will need agricultural varieties that are resistant to drought, heat and other extreme ecological conditions that will change depending on these factors. All kinds of biological studies on wild flora elements, which are much more resistant to

Figure 1. Distribution map of Sect.: *Ptosimopappus* taxa based on localities of herbarium specimes and field observations. Oval: *C. ptosimopappoides*; Rectangular: *C. ptosimopappa* var. *elegans*; penta/hexagonal: *C. ptosimopappa* var. *ptosimopappa*. Map provided from Google Earth on December 2, 2022. Şekil 1. Sect.: *Ptosimopappus taksonlarının* herbaryum örneklerinin lokalitelerine ve saha gözlemlerine dayalı dağılım haritası. Oval: *C. ptosimopappoides*; Dikdörtgen: *C. ptosimopappa* var. *elegans*; beşgen/altıgen: *C. ptosimopappa* var. *ptosimopappa*. 2 Aralık 2022'de Google Earth'ten sağlanan harita.

different ecological conditions than cultivated plants, are the keys that can enable us to develop different agricultural varieties that we may need in the future. Speciation in plants is a gradual event. As in the example in this article, new taxa emerge as a result of the differentiation of geographically partially or completely isolated populations that have adapted to different ecological conditions such as altitude, therefore temperature, and soil structure, to a degree that reduces and eventually ends the gene flow between them. Adaptation of plants to different ecological conditions and genetic differentiation are undoubtedly examples that can inspire us in our agricultural production.

MATERIALS and METHODS

Plant specimens were collected from type localities and from additional localities described below and compared with each other in terms of morphological and anatomical aspects. All collections were also compared with digitalized holotypes and isotypes of *Centaurea* section *Ptosimopappus* species at G, K, E, GOET, NY and P (acronyms according to Thiers, 2016). Relevant literature was also consulted (Boissier, 1849; Bentham *et al*., 1893; Hayek, 1901; Holub, 1975; Wagenitz, 1975). Nomenclatural data on the species were checked using the International Plant Names Index (IPNI, 2017), as well as the abovementioned literature and from the labels of specimens. Vouchers were deposited in the Herbarium of Mustafa Kemal University, Herbarium of Hacettepe University (HUB) and also the Herbarium of Ankara University (ANK).

Anatomical and morphological studies were conducted on 25 achenes from each original specimen gathered. Light Microscopy (LM) and Scanning Electron Microscopy (SEM) were used for morphological and ultrastructural investigations, respectively. A Boeco stereo microscope was used for morphological investigations and measurements. Carpological investigations were performed with an Olympus-BX50 binocular light microscope and with a JEOL JSM-5500LV Scanning Electron Microscope. Samples were coated with gold-palladium prior to SEM observation.

RESULTS

Taxonomy

Centaurea ptosimopappa* var. *elegans Güzel var. nov. (Figs 2a, 3a, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11a):

Diagnosis: *Centaurea ptosimopappa var. elegans* (Figs. 2a, 3a, 4a, 5a) is similar to *Centaurea ptosimopappa var.* ptosimopappa (Figs. 2b, 3b, 4b, 5b). with its fertile and sterile basal rosettes which exist throughout the winter also with branching, shrubby habit and leathery leaves. The variety differs from it by oblong, slightly heteromorphic achenes (vs. linear to elliptic, clearly heteromorphic) and linear-lanceolate, 0.2–0.4 cm wide, acute cauline leaves that have no ruff collar-like apearance (vs. elliptical to broadly ovate, (0.5) 1–2.5 cm wide, obtuse, with ruff collar-like apearance). The variety differs from *C. ptosimopappoides* (Figs. 2d, 3c, 5c) by its shruby 60–200 cm habitus (vs. sub-shruby, 20–65 cm. habitus) and evergreen basal rosettes (vs. without basal rosettes)

Type: - TÜRKİYE C6 Osmaniye: Amanus Mountains, Zorkun Plateau, 36°59’55.22”N; 36°18’33.03”E, 1239 m elevation, 2 September 2017, *Y. Güzel-915* Holotype: ANK, Isotype: HUB.

Description: Perennial tall shrub 100–220 cm. Width in base is 3-5 mm. Erect, many branched in upper half with secondary or more branching. Branches slender, 1-2 mm wide ın the middle. Bluish-grey glaucous and occassionally purple sprinkled in general appearance (Figure 2a). Basal leaves leathery. Forms sterile and fertile rosettes (Figure 2c). Persisting through winter. Veins not pronounced except for central vein. Leaf shape is lanceolate-spathulate with 5–13 × 1.5–2.5 cm dimensions (including petiole). All basal leaves are glabrous with only floccose-tomentose strip at the margin. Cauline leaves are linear-lanceolate, 1–5 × 0.2–0.4 cm, flat, sessile with acute base, apex acute with 0,5 mm mucro. All cauline leaves are similar in shape and dimensions. Leaf margins entire with floccose-tomentose strip. Leaves small but dense on the stem with one leaf or cluster of leaves at each internode. There are 1–6 leaves just below the capitula, with no ruff collar-like apearance (Figure 3a, 4a, 5a). Capitulum is always solitary at the top

of the slender branches. Peduncle is slightly inflated and hollow, 2–5 mm just below the capitula (Figure 6a). Involucre, 1.3–2 × 0.6–1.3 cm, ovoid, rounded at base strongly contracted towards apex (Figure 6a). Phyllaries are very numerous. Glabrous with scattered, decidious short cilia at the margins first (at the early stages of flowering), then becoming completely glabrous. Inner phyllaries lanceolate 8-10 x 2-3 mm. Median phyllaries ovate 6-8 x 2-3 mm. Outer phyllaries 1.5-2.5 x 1-2 mm. Appendage nonexistent (Figure 7a). There are only minute spinule at the tip of the phyllary. Spinule 0.1–0.2 mm. Florets yellow to pale orange. Marginal floret number is 6-12, almost equal to inner ones, 11-14 mm, not radiant, narrowly infundibular with 5 equal 6-7 mm linear lobes. Inner hermaphrodite florets numerous. Tubular with 4-7 mm equal linear-lanceolate lobes. Style extruded 3-7 mm over the lobes. Anthers yellow to pale orange, slightly exerted. Achenes compressed. Unripe achene cream coloured and with pappus. Becomes brown and lacks the pappus as ripened. Ripe achenes slightly heteromorphic. Peripheral and central ones are almost same in length, central ones slightly wider. 4–5.5 × 2–2.3 mm (Figure 8a, very sparsely tomentose, oblong, brown with straw-coloured stripes of varying thickness. More than 2 thin or thick stripes on the each side of the compressed achene. Apex truncate. Hilum lateral. Eliosome exists. Pappus 4–5 mm, scabrous-barbellate, straw colored, decidious both in the peripheral and central achenes. Receptacular bristles are straw-coloured, 0.8–1 cm, indistinctly twisted (Figure 9a).

Comparisons between capitulas, phyllaries, achenes and receptacular bristles of *C. ptosimopapa* var. *elegans* and *C. ptosimopappa* var. *ptosimopappa* are given in Figs. 6a, 6b; 7a, 7b; 8a,8b and 9a,9b and Table 1

Carpology: Pericarp of the achene: Epidermis is one-layered with cells that have extensively thick, anticlinal, and outer periclinal walls. Sub-epidermal region consists of schlerenchymatic cell layers and conscipuous vascular bundles. The bundles are found under the light-coloured stripes of the achenes. The bundles and surrounding light-colored schlerenchimal and epidermal tissues form the outer apearance stripes of the achenes (Figure 10a)**.** There are at least 3 vascular bundle at each side of the compressed achene. Microsculpture of the achene surface is rough, ornamentation sulcate. Cell boundaries appear raised above the distinct, flat cell centres (Figure 11a).

Comparisons between carpology and achene microsculpture of *C. ptosimopapa* var *elegans* and *C. ptosimopappa* var *ptosimopappa* are given in Figs. 10b and 11b and Table 1

Flowering time: From July to September.

Examined samples: TÜRKİYE **C6** Osmaniye: Amanus Mountains, Zorkun Yaylası, 36°59’48.79”N; 36°18’51.34” E, 1245 m elevation, 2 September 2017, *Y. Güzel-916*; **C6** Hatay: Vicinity of St. Simeon monastery, Samandağ. 36°5’50.2” N; 36°2’19.4” E, 430 m elevation. 25 August 2017, *Y. Güzel-910*; **C6** Hatay: Erzin, above Kuyuluk village, 36° 54.31.69’ N; 36°17.03.49’ E, 724 m, 05 August 2017, *Y. Güzel-909*

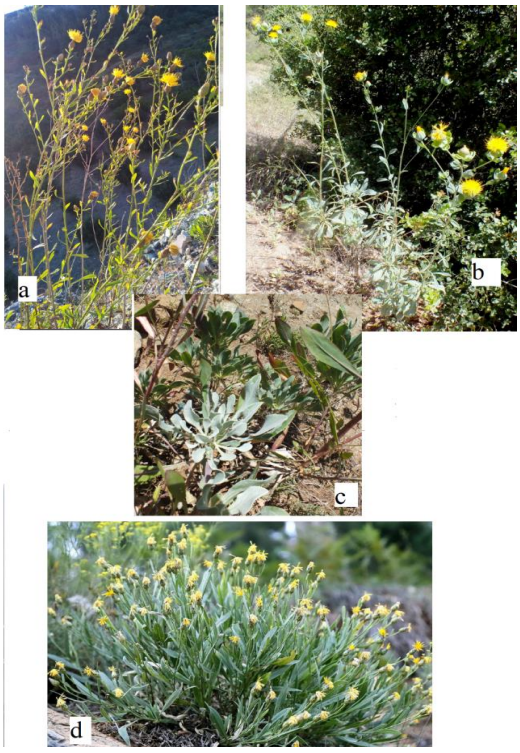

Figure 2. Habitus of the Sect. Ptosimopappus taxa. a. *C. ptosimpappa* var. *elegans*. b. *C. ptosimopappa* var. *ptosimopappa*. c. Basal leaves of *C. ptosimopappa* var. *elegans*. d. *C. ptosimopappoides* (Photo of *C. ptosimopappoides* was obtained from Prof. Dr. Ahmet Duran) Şekil 2. Sect. Ptosimopappus taksonlarının habitusları. a. *C. ptosimpappa* var. *elegans*. b. *C. ptosimopappa var. ptosimopappa*. c. *C. ptosimopappa* var. *elegans*’ın taban yaprakları d. *C. ptosimopappoides* (*C. ptosimopappoides* fotoğrafı Prof. Dr. Ahmet Duran’dan temin edilmiştir).

Figure 3. a. Holotype of *C. ptosimopappa* var. *elegans* (ANK); b. Lectotype (designated here) of *C. ptosimopappa* (*Ptosimopappa bracteata*) (G); c. Holotype of *C. ptosimopappoides* (E)
Şekil 3. . a. *C. ptosimopappa* var. *elegans*'ın holotipi (ANK); b. *C. ptosimopappa* (*Ptosimopappa bracteata*)'nın lektotipi (G) (burada düzenlenmiştir); c. *C. ptosimopappoides* 'in holotipi (E)

Figure 4. Close view of; a. *C. ptosimopappa* var. *elegans*; b. *C. ptosimopappa* var. *ptosimopappa*. Background columns: 5 mm
Şekil 4. a. *C. ptosimopappa* var. *elegans*; b. *C. ptosimopappa* var. *ptosimopappa*'nın yakından görünüşleri. Arka plandaki sütunların eni: 5 mm

Figure 5. General appearance of; a. C. *ptosimopappa* var. *elegans*; b. *C. ptosimopappa* var. *ptosimopappa;* c. C. *ptosimopappoides* (Photo of *C. ptosimopappoides* was obtained from Prof. Dr. Ahmet Duran).
Şekil 5. a. C. *ptosimopappa* var. *elegans*; b. *C. ptosimopappa* var. *ptosimopappa;* c. C. *ptosimopappoides*'in genel görünüşleri (*C. ptosimopappoides* fotoğrafı Prof. Dr. Ahmet Duran'dan temin edilmiştir).

Figure 6. Outside and inside appearance of capitula of; a. *C. ptosimopappa* var. *elegans* and b. *C. ptosimopappa* var. *ptosimopappa*. Background lines: 5 mm.
Şekil 6. Kapitulaların içten ve dıştan görünümleri. a. *C. ptosimopappa* var. *elegans* b. *C. ptosimopappa* var. *ptosimopappa*. Arka plandaki satırların eni: 5 mm.

Figure 7. Phyllaries of; a. *C. ptosimopappa* var. *elegans* and b. *C. ptosimopappa* var. *ptosimopappa*. Lines on the edge: 5 mm.
Şekil 7. Fillariler. a. *C. ptosimopappa var. elegans* b. *C. ptosimopappa* var. *ptosimopappa*. Kenardaki satırların eni: 5 mm.

Figure 8. Achenes of; a. *C. ptosimopappa* var. *elegans.b. C. Ptosimopappa* var. *ptosimopappa,* Left: Peripheral achenes. Right: Central achenes.
Şekil 8. Akenler; a. *C. ptosimopappa* var. *elegans.b. C. Ptosimopappa* var. *ptosimopappa,* Soldakiler: Çevresel akenler. Sağdakiler: Merkezi akenler.

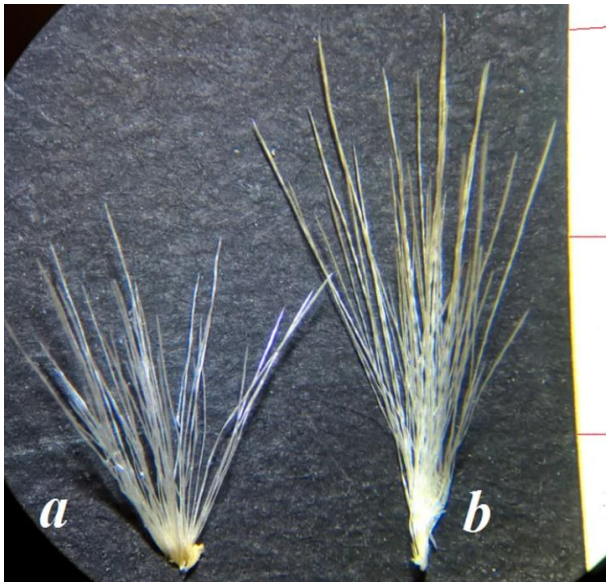

Figure 9. Receptacular bristles of; a. *C. ptosimopappa var. elegans* and b. *C. ptosimopappa* var. *ptosimopappa*. Lines on the edge: 5 mm. Şekil 9. Reseptakular kıllar. a. C. ptosimopappa var. elegans and b. C. ptosimopappa var. ptosimopappa. Kenardaki satırların eni: 5 mm.

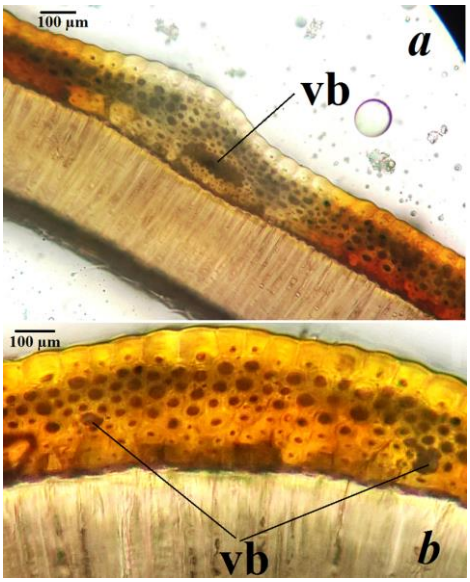

Figure 10. Cross sections of achenes; a. *C. ptosimopappa var. elegans*and b. *C. ptosimopappa* var. *ptosimopappa.* Vb: Vascular bundle. Şekil 10. Akenlerin enine kesiti. a. *C. ptosimopappa* var. *elegans* b. *C. ptosimopappa* var. *ptosimopappa*. Vb: Vascular bundle.

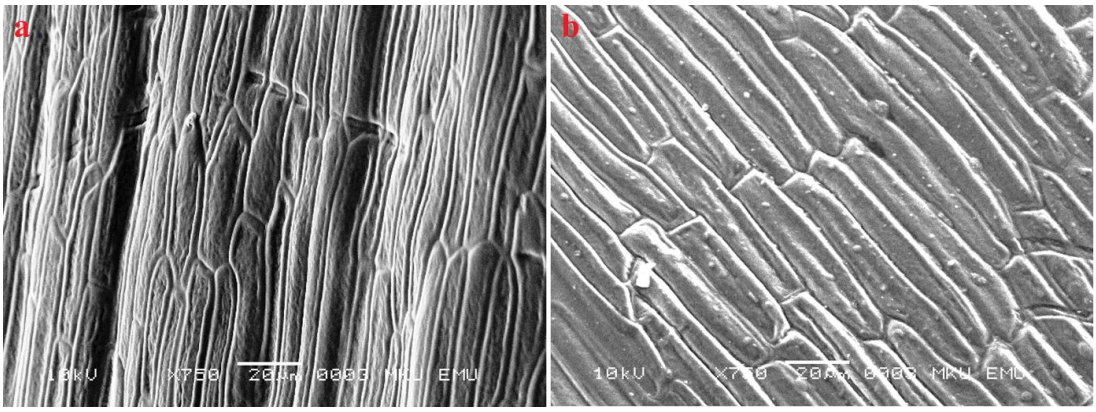

Figure 11. Microsculpture of achene surfaces; a. *C. ptosimopappa* var. *alegans* and b. *C. ptosimopappa.*
Şekil 11. Aken yüzeylerinin inceyapısı. a. *C. ptosimopappa* var. *alegans* and b. *C. Ptosimopappa.*

Distribution and proposed conservation status: This new variety is endemic to the Amanus Mountains in southeast Türkiye (Figure 1). It is known from three populations. The IUCN Red List criteria B1a (IUCN, 2017) suggests 'Vulnerable' status for populations that are 'severely fragmented or known to exist at no more than 10 locations'; therefore, I propose categorizing *C. ptosimopappa* var. *elegans* as Vulnerable (VU).

Habitat observation: 400–1250 m. Clearings of *Pinus brutia* forests, serpentine soils

Eponymy: The specific epithet is given to the slender, delicate habitus of the variety.

DISCUSSION

C. ptosimopappa var. *elegans* differed from C. *ptosimopappa* var. *ptosimopappa* by its much smaller cauline leaves, especially uppermost ones. Uppermost cauline leaves of *C. ptosimopappa* var. *ptosimopappa* make clusters below the capitula that conceal it, thus, having a ruff collar-like apearance around the capitula. Upper leaves that conceal the capitula are also mentioned in delimitation of the varieties of *Centaurea polypodiifolia.* However this character is much more specific and stable in *C. ptosimopappa* var. *ptosimopappa* because the concealing leaves make a cluster distanced from other cauline leaves that gives them bract like appearance. The specific epithet of basionym of *C. ptosimopappa* var. *ptosimopappa*, *Ptosimopappus bracteatus*, emphasizes this bract-like upper cauline leaves. This feature was referred by Holub (1975) also as an important taxonomic character in describing monotypic genus *Petrodavisiana* based on *Ptosimopappus bracteatus* = *Centaurea ptosimopappa*. *C. ptosimopappa* var. *elegans* has also one or a cluster of 2-5 leaves below the capitula but because they are much narrower than those of the other variety, there is not such a pronounced bract-like appearance as in *C. ptosimopappa* var. *ptosimopappa*. *C. ptosimopappoides* lack such leaf clusters below the capitula.

The other important difference of the new variety was observed in achenes. Although achenes of both varieties are heteromorphic in color, pattern and shape, this heteromorphy is much clearer in C. *ptosimopappa* var. *ptosimopappa.* Achenes of this variety can be grouped in two groups as peripheral and central ones. Peripheral ones are short, oblong and brown with cream stripes and have semidecidious pappus, i.e. ripened ones have a pappus but it easily falls. On the other hand, central ones are much longer and slender, linear to oblanceolate, plain, brown to black and with very decidious pappus so ripened ones can not be with a pappus (Figure 8a). Such a dimorphy was previously reported in *C. solstialis* (Wagenitz, 1975). On the other hand, although they also have heteromorphy in the achenes, it is hard to group them as central and peripheral in C. *ptosimopappa* var. *elegans.* Both peripheral and central achenes of this variety are of the same length but central ones are slightly wider. All of them are oblong and brown with straw-coloured stripes of varying thicknesses. Pappus is straw colored and decidious both in the peripheral and central achenes (Figure 8b). In both species, unripened achenes are cream-colored.

Table 1. Comparison of species of the section *Ptosimopappus.*
Çizelge 1. *Ptosimopappus* sect. türlerin karşılaştırılması.

	C. ptosimopappa var. ptosimopappa	*C. ptosimopappa var. elegans*	*C. ptosimopappoides*[*]
Stem	60–110 cm long, width in the base is 3-8 mm, erect or ascending, few branched shrub. Branched in upper half. Each branch ends with a capitula ocassionally makes secondary branching	100–220 cm long, width in the base is 3-5 mm, erect, many branched shrub. Branched in upper half with secondary or more branching	Sub-shrub 20–65 cm. Simple or with few branches
Basal leaves	Leathery leaves make fertile or sterile evergreen rosettes Veins not pronounced except for central vein Lanceolate-spathulate to obovate. Apex oblong, margin entire (6) 10–18 × (1.5) 3–5 cm Two types of indumentum: Completely floccose-tomentose or glabrous with only floccose-tomentose strip at the margin	Leathery leaves make fertile or sterile evergreen rosettes Veins not pronounced except for central vein Lanceolate-spathulate Apex oblong, margin entire 5–13 × 1.5–2.5 cm Glabrous with floccose-tomentose strip at the margin.	Has no rosettes Basal leaves are firm but not leathery, dried at winter. Veins pronounced Petiolate, lanceolate-obovate Apex acute, margin entire 11–15 × 2–5 cm Glabrous with floccose-tomentose strip at the margin.
Cauline leaves	All cauline leaves are similar in shape and dimensions Elliptical to broadly ovate, concave 2–5 × (0.5) 1–2.5 cm Apex obtuse with 0.3 mm mucro Sessile with truncate base Leaf margins entire there are floccose-tomentose strip Leaves big but scattered on the stem. Always one leaf at each internode 2–8 leaves concealing the capitula with ruff collar-like apearance. This crown of leaves is also at the top of the sterile branches. Cauline leaves glabrous with floccose-tomentose strip at the margin	All cauline leaves are similar in shape and dimensions Linear-lanceolate, flat 1–5 × 0.2–0.4 cm Apex acute with 0,5 mm mucro Sessile with acute base Leaf margins entire there are floccose-tomentose strip Leaves small but dense on the stem. One leaf or cluster of leaves at each internode 1–6 leaves just below the capitula, have no ruff collar-like apearance. Cauline leaves glabrous with floccose-tomentose strip at the margin	Lower cauline leaves are same as the basal ones. Upper ones smaller. Upper cauline leaves sessile 3–5 × 0.3–0.5 cm Apex acute Sessile with acuminate base Sessile with truncate base Leaves very dense on the short and non-branched stem No leaves below the capitula. Leaf margins entire there are floccose-tomentose strip at the margin
Width and shape of peduncle just below the capitula	Capitula is on the inflated peduncles Peduncle is hollow, ± inflated and wide, 4–12 mm just below the capitula	Capitula is on the slightly inflated peduncles Peduncle is slightly wide and hollow, 2–5 mm just below the capitula	Not inflated or widened, almost same as the rest of the peduncle.
Involucre	1.8–3 × 1–1.8 cm, widely ovoid truncate at base contracted towards apex	1.3–2 × 0.6–1.3 cm, ovoid, rounded at base strongly contracted towards apex	1.4–2.5 × 9–1.6 cm, narrowly ovoid.

Table 1. Continued.
Çizelge 1. Devamı.

Phyllaries	Very numerous Inner phyllaries: linear (innermost row), 22-24 x 2 mm and lanceolate 17-18x 5 mm Median phyllaries ovate 7–14 × 4–5 mm Outer phyllaries ovate 3-4 x 2-3 mm Spinule minute, deciduous, 0.3–0.5 mm	Very numerous Inner phyllaries lanceolate 8-10 x 2-3 mm Median phyllaries ovate 6-8 x 2-3 mm Outer phyllaries 1.5-2.5 x 1-2 mm Spinule minute, decidious 0.1–0.2 mm	Very numerous 6–9 × 3–5 mm Spinule, 0.5–1.5 mm
Florets	Bright yellow Marginal floret number is 10-15, almost equal to inner ones, 15-17 mm not radiant, infundibular with 5 equal 5-7 mm linear lobes. Inner hermaphrodite florets numerous. Tubular with 5 equal 4-6 mm linear-lanceolate lobes. Style excluded 4-6 mm over the lobes Anthers shiny yellow, slightly exerted	Yellow to pale orange Marginal floret number is 5-8, almost equal to inner ones, 11-14 mm not radiant, narrowly infundibular with 5 equal 6-7 mm linear lobes Inner hermaphrodite florets numerous. Tubular with 4-7 mm equal linear-lanceolate lobes. Style excluded 3-7 mm over the lobes Anthers pale orange, slightly exerted	Yellow Marginal not radiant
Peduncle (branch?)	Thick. 2-3 mm in the middle	Slender. 1-2 mm in the middle	
Achenes and pappus	Compressed. Clearly heteromorphic. Central ones longer: 5.5–6 × 1.5–2 mm, very sparsely tomentose. Linear to elliptic. Dark brown, plain colored. Apex slightly rounded Hilum lateral, eliosome exist. Pappus of the central achenes 5-6 mm very decidious. Achene lacks the pappus while still unripe. Scabrous-barbellate, cream Peripheral ones shorter: 4.2-5 x 1.8-2 mm, very sparsely tomentose. Elliptic. Brown with 1-2 straw coloured strips on each side of the compressed achene Apex truncate to rounded Hilum lateral, eliosome exist. Pappus of the peripheral achenes 5–7 mm. Unripe achene have pappus but ripe achene copletely lacks it. scabrous-barbellate, cream Color of the unripe achenes cream	Compressed. Slightly heteromorphic. Peripheral and central ones are in some length, central ones slightly wider. Both are, 4–5.5 × 2–2.3 mm, very sparsely tomentose, oblong, brown with straw-coloured stripes of varying thickness. More than 2 thin or thick stripes on the each side of the compressed achene. Apex truncate Hilum lateral. Eliosome exist. Pappus 4–5 mm, scabrous-barbellate, straw colored, decidious both in the peripheral and central achenes. Unripe achene have pappus but ripe achene copletely lacks it. Color of the unripe achenes cream	5.6–7.5 x 3.4-4 mm Rectangular Pappus 5-11 mm, semi-deciduous

Table 3. Continued.
Çizelge 3. Devamı.

Indumentum of stem, leaves and capitula	Rosette forming basal leaves can be completely floccose-tomentose or glabrous with only floccose-tomentose strip at the margin Cauline leaves glabrous with floccose-tomentose strip at the margin Phyllaries glabrous with scattered, decidious short cilia at the margins first (at the early stages of flowering), becomes completely glabrous then. General appearance is green glaucous and occassionally purple sprinkled except for floccose-tomentose basal rosettes which looks grey.	Rosette forming basal leaves glabrous with only floccose-tomentose strip at the margin Cauline leaves glabrous with floccose-tomentose strip at the margin Phyllaries glabrous with scattered, decidious short cilia at the margins first (at the early stages of flowering), becomes completely glabrous then. General appearance is bluish-grey glaucous and purple sprinkled	All leaves glabrous slightly tomentose at margin. green-grey glaucous
Receptacular bristles	Straw-coloured, 1.3–1.7 cm, obviously twisted	Straw-coloured, 0.8–1 cm, indistinctly twisted	-
Pericarp of the achene	Peripheral achenes: There are one or two vascular bundles on the each side of the achene. Central achenes: No conscipuous vascular bundles in the sub-epidermal region.	Very conscipuous vascular bundles in the sub-epidermal region. At least three vascular bundle on the each side of the achene	-
Microsculpture of the achene surface	± smooth ornamentation, finely sulcate. Cell boundaries appear raised above the centres. Topography of the cell centres is irregular with very narrow and sinking or convex areas.	Rough ornamentation, sulcate cell boundaries appear raised above the distinct, flat cell centres	Smooth ornamentation, finely sulcate.
Flowering time	5–7	6–10	6–7

*Based on Wagenitz (1975), Çelik *et al.* (2006), Çelik *et al.* (2008), E00383957 coded holotype and photographs shared with me by Prof. Dr. Ahmet Duran

Achene microsculpture is an important taxonomical character that shows interspecific variation in *Centaurea* (Çelik *et al*., 2008; Bona, 2015c; Candan *et al.*, 2016). In addition to morphological differences, ultrastructural differences between the achenes of the two varieties were also found. It seems that, achene microsculpture is an distinguishing character at the variety level.

The whole comparison of section *Ptosimopappus* taxa is given in Table 1. Also, the compared features can be seen in Figures 2-11.

These three taxa of section *Ptosimopappus* have similar habitat characteristics: serpentine soils of *Pinus brutia* clearings at about 300-1300 elevation. Flowering time of *C. ptosimopappa var. elegans* is much longer than the other two taxa at all elevations. *C. ptosimopappa* starts to flower in May at low altitudes and finishes in July at higher altitudes. Similarly *C. ptosimopappoides* also flowers between June and July. On the other hand, the earliest flowering of *C. ptosimopappa var. elegans* is in July at the lower altitudes and continues until October at the higher altitudes. This difference of *C. ptosimopappa* var. *elegans*, together with morphological and ultrastructural differences of achenes are in favor of it as a separate taxon. On the other hand, the existence of some intermediate populations between Southeast and Northest populations of the species represent *C. ptosimopappa* var. *ptosimopappa* and *C. ptosimopappa* var. *elegans* respectively (Figure 1), brings to mind the continuing gene flow between these extreme populations. Also, the whole distribution range of the species is not very wide. Although there is the Asi (Orontes) Plain between the mountainous main *C. ptosimopappa var. ptosimopappa* and *C. ptosimopappa var. elegans* populations (Figure 1), scattered populations of both at lower altitudes indicate that this geographical isolation is not yet effective enough for speciation or subspeciation.

It is observed that, although they have labels clearly emphasizing that they are isotypes of *Ptosimopappus bracteatus*, all *C. ptosimopappa* samples at P (P00703879, P00703880, P00703881) are stored under the name *Centaurea bracteata* Scopoli (1787: 17) which in not related with Sect. *Ptosimopappus. C. bracteata* is defined by Scopoli from Appennine Mountains (Italy). There is a clear definition and figure (tab. IX) in the protologue indicating that it is a member of Sect.: *Jacea*. Dayton (1893), indicated that it is a synonym of *Centaurea amara* Linnaeus (1763: 1292) which is also a member of Section *Jacea*. This confusion will be corrected by notifying the Herbarium.

There are 10 isotypes of *Ptosimopappus bracteatus* at G, GOET, K, NY and P. There is no holotype indicated so one of these isotypes at G, **G00223040** is here designed as Lectotype (figure 3b)**.**

From the samples in the Edinburgh Herbarium, it seems the new variety was previously collected from the type locality Osmaniye by Wagenitz who revised genus Centaurea for Flora of Türkiye. The specimen was identifed as *C. ptosimopappa* and referenced within *C. ptosimopappa* in Flora of Türkiye (**E00475650**). Two recent collections by J. Darrah **(E00475652-**Erzin**)** and by R. D. Reeves, N. Adıgüzel and Ö. Bingöl (**E00267619-**Osmaniye**, E00267632**-Erzin) were also identified as *C. ptosimopappa*, probably by following the samples of Wagenitz. Samples were collected and examined from all of the abovementioned localities besides detailed population observations (*Y. Güzel-916*-Osmaniye type locality*, Y. Güzel-909*-Erzin, see the examined samples section for GPS coordinates of this collections). As a result, it was concluded that these four samples obviously belong to *C. ptosimopappa* var. *elegans* which should be considered as a variety of *C. ptosimopappa* in the light of evidence presented here. These misidentifications will be corrected after publication.

Key to species of *Centaurea* section *Ptosimopappa*

1. Sub-shrub, 20–65 cm. Without basal rosettes.....*C. ptosimopappoides*

1. Shrub, 60–200 cm. With basal rosettes……..*C. ptosimopappa*

2. Cauline leaves elliptical to broadly ovate 2–5 × 1–2.5 cm……..*C. ptosimopappa* var. *ptosimopappa*

2. Cauline leaves linear-lanceolate 1–5 × 0.2–0.5 cm ……..*C.* var. *ptosimopappa elegans*

Additional specimens examined

***Centaurea ptosimopappa* var. *elegans*: E00475650** *C6* Adana/Hatay: Amanus S.E. of Osmaniye (Nur Da., Gavur Da.), 1000-1350 m, 11.10.1957, *Wagenitz & Beiig* 385; **E00267619** C6 Osmaniye: Osmaniye- Zorkun yayla 17-18 km from Osmaniye 1200 m serpentine soil along roadside banks and edge of Pinus brutia forest, 1.August.2001 R.D.Reeves 2128, N. Adıgüzel & Ö. Bingöl (NA3994); **E00267632** Hatay: Erzin Kuyuluk village to koyunbeyli yayla 36° 54.668' N; 36° 16.820' E, Pinus brutia forest on serpentine, 3.August.2001 R.D.Reeves 2148, N. Adıgüzel & Ö. Bingöl (NA4016); **E00475652** Above Yeşilkent. 305 m. Pine woods, steep dry bank. 10.08.1969, J. Darrah 563

***Centaurea ptosimopappa* var. *ptosimopappa*:** (Basionym: *Ptosimopappus bracteatus*) Türkiye C5/6 or Syria?: In tota regione inferiori montis Cassii (Akra Da.) Syriae borealis ad margines sylvarum, vi.1846, *Boissier*. Isotypes of *Ptosimopappus bracteatus* at G, GOET, K, NY and P were examined: **G00223040** (lectotype here designed)**, G00223041, G00223042, GOET001308, K000794162, NY00232715**, **NY00232716, P00703879, P00703880, P00703881.** Other species examined: **E00475651** C6 Hatay Belen/Soğukoluk, Pinus brutia forest, 14.7.1973, 620 m, F. Holtz 00.667, P. Hanel, T. Kesercioğlu**; E00475653** Belen (Amanus)/ Soğukoluk, forest on metamorphic substrate, 23.4.1957, 500 m, Davis & Hedge (D. 26999); **E00475656** Iskenderun-Latakia South of Yayladagi, Near Turkish frontier, open spur of serpentine hill in pine forest. 17.4.1965, Lamond, J.-29 (leaves and ruins of capitula remain from the previous year); C6 Hatay, Antakya Karaali town, 36°18'.31.18''N; 36°9'.8.20''E, 400 m, 06.06.2016, *Y. Güzel-904*. C6 Hatay, Yayladağ, Keldağ (Mountain Cassius-Akra Dağ), 35°56'15.5"N; 35°56'32.8"E, 832 m, 25.06.2016, *Y. Güzel-906*. C6 Hatay, İskenderun, Belen, 36°25'56.06"N; 36°13'38.51"E, 488 m, 27.06.2016, *Y. Güzel-907*

Centaurea ptosimopappoides: E00383957 C5 Adana: Karsanti, Pos - Sofulu, 13 vii 1972, *E. Yurdakulol* 78 (Holotype).

Acknowledgements

I would like to thank Prof. Dr. Ahmet Duran for sharing *Centaurea ptosimopappoides* photographs with me and giving me permission for publishing. I would like to thank also to Mehmet Çelik for detailed information about Osmaniye populations.

REFERENCES

Bentham G., J. D. Hooker, B. D. Jackson. 1893. Index Kewensis Plantarum Phanerogamarum, 1 (1): 472. http://www. biodiversity library.org/item/133989# page/490/mode/1up

Boissier, E. 1849. Diagnoses Plantarum Orientalium novarum. 1(10): 104. Lipsiae. Leipzig] http://bibdigital.rjb. csic.Es/ing/ Libro.php?Libro=1397

Bona, M. 2015a. *Centaurea amanosensis* (Asteraceae), a new species from Turkey. Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology 1-9.

Bona, M. 2015b. *Centaurea goksivriensis* (Asteraceae), a new species from Turkey. Phytotaxa 203(1): 63-68.

Bona, M. 2015c. Systematic implications of achene characteristics in genera Centaurea L., Cyanus Mill., Psephellus Cass. and Rhaponticoides Vaill. (Asteraceae). Bangladesh Journal of Plant Taxonomy 22(2): 125.

Candan F., T. Uysal, O. Tugay, M. Bozkurt, K. Ertuğrul, and H. Demirelma. 2016. The examinations of achene ultrastructural features of section Acrolophus (Centaurea, Asteraceae) via scanning electron microscopy. Turkish Journal of Botany 40(2): 147-163.

Cassini, A. H. G. 1826. Dictionnaire des Sciences Naturelles, dans lequel on traite méthodiquement des différens êtres de la nature, considérés soit en eux-mêmes, d'aprés l'état actuel de nos connoissances, soit relativement à l'utilité quén peuvent retirer la médecine, l'agriculture, le commerce et les arts. Strasbourg. Edition 2. 43: 488.

Çelik, S., I. Uysal, and Y. Menemen. 2008. Morphology, anatomy, ecology and palynology of two *Centaurea* species from Turkey. Bangladesh Journal of Botany 37(1): 67-74.

Dayton, J. B. 1893. Index Kewensis Plantarum Phanerogamarum, 1(1): 472. https://www. biodiversitylibrary.org/item/133989#page /490/ mode/1up.

Dinç, M., and S. Dogu. 2012. *Centaurea dumanii* comb. & stat. nov. (Asteraceae). In Annales Botanici Fennici 49(2): 87-90.

Gonella, P. M., F. Rivadavia, and A. Fleischmann. 2015. *Drosera magnifica* (Droseraceae): the largest New World sundew, discovered on Facebook. Phytotaxa 220(3): 257-267.

Greuter, W. 2003. The Euro+Med treatment of Cardueae (Compositae) generic concepts and required new names. Willdenowia 33: 49-61.

Güner, A., S. Aslan, T. Ekim, M. Vural, and M.T. Babaç. 2012. Türkiye bitkileri listesi (damarlı bitkiler). s. 47-83. Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. İstanbul.

Hayek, A. 1901. Denkschriften der Kaiserliche Academie der Wissenschaften, Wien. Mathematisch-Naturwissenschaftliche Klasse. LXX. 590 (1901). http://www.biodiversitylibrary.org/item/89426#page/834/mode/1up.

Holub, J. 1975. Petrodavisia, a new genus in Centaureinae (Asteraceae). Folia Geobotanica 10(2): 191-196.

IPNI. 2017. The International Plant Names Index. Published on the Internet: http://www.ipni.org.

IUCN. 2017. IUCN Red List categories and criteria. Version 3.1. IUCN Red List Unit, Cambridge U.K. Available from: http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria.

Köse, Y. B., and S. Alan. 2013. *Centaurea baseri* (Compositae), a new species from Turkey. Phytotaxa 117(1): 23-29.

Kültür, Ş. 2010. *Centaurea nerimaniae* sp. nov. (Asteraceae) from south Anatolia, Turkey. Nordic Journal of Botany 28(5): 613-616.

Linnaeus, C. 1753. Species plantarum. *In*: L. Salvius (Ed). Stockholm.

Linnaeus, C. 1763. Species plantarum, *In*: L. Salvius (Ed). Ed.2. Vol. 2. Stockholm.

Miller, P. 1754. The Gardeners Dictionary. Ed. 4. Vol. 3. John & James Rivington, London. DOI: 10.5962/bhl.title.79061

Negaresh, K., Z. Kaya, and M. R. Rahiminejad. 2015. *Centaurea sennikoviana* (Asteraceae, Cardueae), a new species from central Anatolia, Turkey. In Annales Botanici Fennici 52(5-6): 321-327).

Scopoli, J. A. 1787. Deliciae Florae et Faunae Insubricae seu Novae, aut Minus Cognitae Species Plantarum et Animalium quas in Insubria Austriaca tam Spontaneas, quam Exoticas Vidit, Descriptit, et Aeri Incidi Curavit Joannes Antonius Scopoli. Ticini [Pavia] 2: 17.

Thiers, B. 2016. Index Herbariorum: A global directory of public 22 herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih/.

Uysal, T., and E. Hamzaoğlu. 2016. A new Centaurea L.(Asteraceae) species from Turkey. Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology 1-9.

Uysal, T., E. Hamzaoğlu, K. Ertuğrul, and M. Bozkurt. 2016. A New Species of *Centaurea* (Asteraceae) from Turkey. Phytotaxa 275(2): 149-158.

Uysal, T., H. Dural, O. Tugay. 2017. *Centaurea sakariyaensis* (Asteraceae), a new species from Turkey. Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology 151(1): 126-130.

Vaillant, S. 1754. Physische Abhandlungen. Königlichen Akademie der Wissenschaften in Paris. Breslau 5: 165.

Wagenitz, G. 1974. Notes from the Royal Botanic Garden, Edinburgh. 33(2): 225.

Wagenitz, G. 1975. Centaurea L. pp. 465-585. In: P.H. Davis (Ed.). Flora of Turkey and the East Aegean Islands 5.

Wagenitz, G. 1986. Centaurea in South-West Asia: patterns of distribution and diversity. Proceedings of the Royal Society of Edinburgh, Section B: Biological Sciences 89: 11-21.

Wagenitz, G. and F. H. Hellwig. 2000: Psephellus Cass. (Compositae, Cardueae) revisited with a broadened concept. Willdenowia 30: 29-44.

Yüzbaşıoğlu, İ. S., M. Bona, and İ. Genç. 2015. A new species of Centaurea sect. *Pseudoseridia* (Asteraceae) from north-eastern Turkey. Phytokeys 53: 27-38.