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A synopsis of the genus *Pulsatilla* (Ranunculaceae) in Turkey

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Abstract: In this study, *Pulsatilla* Mill., which was considered a subgenus of the genus *Anemone* L. in *Flora of Turkey*, is accepted as a separate genus. *Pulsatilla albana* (Steven) Bercht. & J.Presl subsp. *albana* and *P. violacea* Rupr. subsp. *violacea* are declared as new records for the flora of Turkey. *Anemone albana* Steven subsp. *armena* (Boiss.) N.Busch, which was already known from Turkey, is accepted as a synonym of *Pulsatilla violacea* subsp. *armena* (Boiss.) Luferov. Descriptions, distribution maps, and identification keys are provided for these taxa in order to aid in the distinguishing of the genera *Anemone* and *Pulsatilla* as well as for species and subspecies of *Pulsatilla* in Turkey.

Key words: *Pulsatilla*, Ranunculaceae, Turkey, taxonomy

Türkiye'de *Pulsatilla* (Ranunculaceae) cinsinin sinopsisi

Özet: Türkiye Florasında *Anemone* L. cinsinin bir alt cinsi olarak değerlendirilen *Pulsatilla* Mill. cinsi ayrı bir cins olarak değerlendirilmektedir. *Pulsatilla albana* (Steven) Bercht. & J.Presl subsp. *albana* ve *P. violacea* Rupr. subsp. *violacea* taksonları Türkiye Florası için yeni kayıt olarak verilmiştir. Türkiye Florasında bulunan *Anemone albana* Steven subsp. *armena* (Boiss.) N.Busch, *P. violacea* Rupr. subsp. *armena* (Boiss.) Luferov taksonunun sinonimi olarak kabul edilmiştir. Bu taksonların tanımlamaları ve dağılım haritaları, *Anemone* ve *Pulsatilla* cinslerini ayırt eden anahtar ve *Pulsatilla* cinsinin tür ve alttür anahtarı verilmiştir.

Anahtar sözcükler: *Pulsatilla*, Ranunculaceae, Türkiye, taksonomi

Introduction

The circumscriptions of the genera *Anemone* L. and *Pulsatilla* Mill. have been controversial; while some authors consider *Pulsatilla* to be a separate genus (Miller, 1754; Starodubtsev, 1991; Tamura, 1993), others consider it a subgenus of the genus *Anemone* (Hoot et al., 1994; Ehrendorfer & Samuel, 2001). Even though recent molecular studies have advocated subsuming it within the genus *Anemone* (Hoot et al., 1994; Ehrendorfer & Samuel, 2001), most taxonomical studies and flora accounts consider it as a separate genus (Yuzepchuk, 1937; Tutin, 1964; Starodubtsev, 1991; Akeroyd, 1993; Tamura, 1993; Luferov, 2002). The molecular taxonomical studies (Hoot et al., 1994; Ehrendorfer & Samuel, 2001) are based on a very limited number of taxa, whereas the morphological differentiation of *Anemone* and *Pulsatilla* is clear and based on reliable floral characters. For this reason, we have considered *Pulsatilla* as a separate genus.

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In Turkey, *Anemone albana* Steven subsp. *armena* (Boiss.) N.Busch is the only recorded taxon of the genus *Pulsatilla*, which was considered to be *Anemone* subgen. *Pulsatilla* in the work *Flora of Turkey* (Davis et al., 1965). After the publication of *Flora of Turkey*, however, taxonomical studies of the genus were largely neglected in Turkey and neighbouring countries. Fortunately, this has begun to change recently with the publication of Luferov's taxonomical study of *Pulsatilla* in Caucasia (2002). In this work, the author recognised 3 species and 3 subspecies from Caucasia, namely *P. aurea* (Somm. & Lev.) Juz., *P. albana* (Steven) Bercht. & J.Presl subsp. *albana*, *P. albana* (Steven) Bercht. & J.Presl subsp. *andina* (Rupr.) Zamels, *P. violacea* Rupr. subsp. *violacea*, *P. violacea* Rupr. subsp. *armena* (Boiss.) Luferov., and *P. violacea* Rupr. subsp. *georgica* (Rupr.) Luferov.

In the present study, *Pulsatilla* is considered as a separate genus; *P. albana* subsp. *albana* and *P. violacea* subsp. *violacea* are recorded as new records for the flora of Turkey; and *A. albana* subsp. *armena*, which was already known from Turkey, is accepted as a synonym of *P. violacea* subsp. *armena*. Descriptions and distribution maps (Figure) of these taxa are provided, as is an identification key for *Anemone* and *Pulsatilla* and the species of *Pulsatilla* found in Turkey.

The study is based on the herbaria materials deposited in ANK, AEF, GAZI, HUB, ISTE, ISTF, and KATO and on the plant sample collected from Posof by the first author and deposited in ANK. Examined materials are cited below under each species name.

Results

With the addition of *Pulsatilla*, the number of genera in the family Ranunculaceae becomes 18 for *Flora of Turkey* (Davis, 1965; Davis et al., 1988; Guner et al., 2000; Ozhatay & Kultur, 2006; Ozhatay et al., 2009).

Identification Key for Genera: *Anemone* and *Pulsatilla* in Turkey

1. Style strongly elongate and plumose in fruit, outermost whorl of stamens in the form of staminodial glands.....**Pulsatilla**
1. Style not elongate in fruit, all stamens are fertile.....**Anemone**

***Pulsatilla* Mill.**

Perennial herbs, covered with long soft hairs. Rhizome erect. Leaves basal, rosulate; petiole long; leaf palmately or odd pinnately divided; veins palmate. Scape with 3 bracts forming a bell-shaped involucre; involucral bracts basally connate, apically and more or less deeply divided into numerous lobes.

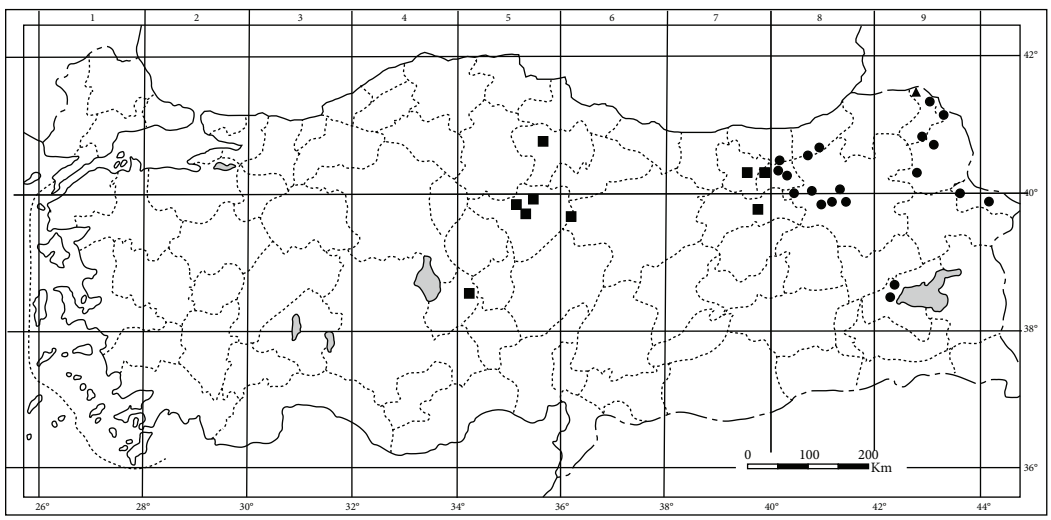

Figure. The distribution of *Pulsatilla albana* subsp. *albana* (▲), *P. violacea* subsp. *armena* (■), and *P. violacea* subsp. *violacea* (●) in Turkey.

Flowers solitary, bisexual. Sepals 5-7. Petals absent. Stamens numerous, outermost whorl in the form of staminodial glands; anthers yellow or purple, oblong, narrowly ellipsoid, filiform, or linear, with a longitudinal vein. Pistils numerous; ovule 1 per ovary. Styles long, linear, pilose, strongly elongated and plumose when mature. Infructescence globose. Achenes small, spindle-shaped, pilose, with a long plumose beak formed by persistent style.

Identification Key for the Species of *Pulsatilla*

1. Flowers yellow.....*P. albana* subsp. *albana*

1. Flowers violet

2. Flowers erect or suberect; tepals with flat apex .....*P. violacea* subsp. *armena*

2. Flowers nodding; tepals with recurved apex .....*P. violacea* subsp. v*iolacea*

P. albana (Steven) Bercht. & J.Presl, Rostl. Ranuncul.: 22 (1820).

Subsp. *albana*

≡ *Anemone albana* Steven, Mém., Soc. Nat. Mosc. 3: 264 (1812).

= *A. albana* var. *flavescens* Smirn., Enum. Plant. Vasc. Cauc.: 934 (1887).

= *A. albana* subsp. *flavescens* (Smirn.) N.Busch, Fl. Cauc. crit. 3, 3: 102 (1903).

= *Pulsatilla albana* var. α. *floribus flavis* Ledeb., Fl. Ross. 1: 22 (1841).

= *P. albana* subsp. *flavescens* (Smirn.) Zamels, Acta Hort. Bot. Latv. 2: 157 (1927).

Perennial herb 5-30 cm tall, rootstock vertical. Leaf blade 2.5-4.5 cm long, oblong in outline, bipinnatisect, segments of the second order deeply pinnately parted into small lanceolate, acute entire or slightly dentate lobes, villous particularly when young mainly beneath; involucral leaves sessile, 1.5-3 cm long with linear acute-acuminate entire or slightly incised lobes, flowers solitary, nutant, campanulate; tepals 18-25 mm long, oblong-elliptic with reflexed tips, yellow, with dense appressed sericeous hairs on the outside; stamens two-thirds to three-fourths the length of the tepals. Flowering 5. 2450 m, alpine slopes.

Turkey. A9 Ardahan: Posof, pasture of Baykent village, 2450 m, 20.5.2008, *A.E.Yaprak* 2008-23 & *Ş.Alan* (ANK).

P. violacea Rupr., Mém. Acad. Pétersb. (Sci. Phys.-Math.), sér. 7, 15(2): 9 (Fl. Cauc.) (1869).

≡ *Anemone albana* var. *violacea* (Rupr.) Smirn., Enum. Plant. Vasc. Cauc.: 935; Boiss. 1888, Fl. Orient. Suppl. 2 (1887).

≡ *A. albana* subsp. *violacea* (Rupr.) Zamels, Acta Hort. Bot. Latv. 1: 83 (1926).

≡ *Pulsatilla albana* subsp. *albana* var. *violacea* (Rupr.) Aichele & Schweg., Feddes Repert. 60, 1-3: 109 (1957).

Subsp. *violacea*

Perennial herb 8-27 cm tall, rootstock vertical. Leaf blade 2.5-6 cm long, oblong in outline, bipinnatisect segments of the second order deeply pinnately parted into small lanceolate, acute entire lobes, villous particularly when young mainly beneath; involucral leaves sessile, 1.5-3.5 cm long with linear acumunate, deeply parted, entire or slightly incised lobes, flowers solitary, nodding, campanulate; tepals 15-24 mm long, oblong with obtuse reflexed tips, violet or lilac, with dense appressed sericeous hairs on the outside; stamens two-thirds to three-fourths the length of the tepals; fruitlets achene with a long plumose awn 2-3 cm long, with accumbent hairs near apex, glabrous at the very apex. Flowering 5-7. Altitude 1600-3200 m. Alpine and subalpine meadows and rocks.

Turkey. A8 Rize: Çamlıhemşin, Ortayayla village, Verçembek Mountain, alpine meadow, main rock granite, 2400-2850 m, 5.7.1981, *A.Güner* 3922 (HUB); Cimil Mountain, 1.7.1959, *J.Venter* 17575 (ISTF); Erzurum, Tortum, Kargapazarı Mountains, 15.6.1970, *M.Yüksel* 1009 (ISTF); Erzurum, Kopdağı pass, 2500 m, 14.6.1981, *S.Erik* 3240 (HUB); Erzurum, Gez plateau, 2400 m, 26.5.1971, *T.Baytop* 19871 (ISTE); A9 Kars: southern side of Ardahan-Kısır Mountains, around Köroğlu peak, 2900 m, 17.7.1981, *N.Demirkuş* 1162 (HUB); Kars: Sarıkamış, Aladağ, 2100-2550 m, 18.6.1979, *O.Güneş* 1293 (HUB); Kars: Sarıkamış, 1.5 km SE of Sarıkamış, north hillside of Mevzili Hill, 2200 m, 21.5.1968, *E.Özhatay* 23135 (ISTF); Kars: Arpaçay, between Tenarlı and K.Kale, near Baha stream, 1800 m, 16.5.1984, *H.Ocakverdi* 1674 (GAZI); Kars: SW of Kısır Mountain, Kars-

Ardahan, 2200 m, 16.6.1957, *Davis* & *Hedge* 29630 (ANK); Kars: between Hazepin Lake and Çıldır, 6 km to Çıldır, rocky steep ridges, 2080 m, 16.7.1979, *A.Baytop* 43.062, *B.Çubukçu*, *E.Tuzlacı*, *M.Saraçoğlu* (ISTE). B8 Erzurum: Palandöken Mountains, north hillsides of Eğerli Mountain, 2.6.1969, *O.Akyol* 23694 (ISTF); Erzurum: Palandöken Mountains, north hillsides of Eğerli Mountain, SE of Tuzcu, stony slopes, 3.6.1969, *H.Demiriz* 23716, *O.Özbay*, *S.Özy*. (ISTF); Erzurum: Kırkdeğirmenler surroundings, 2300 m, 28.5.1969, *N.Tanker*, *K.Baykal*, *M.Yenen*, 2853 (AEF); Erzurum, Palandöken Mountains, near TV transmitter, slopes, 3000 m, 6.7.1978, *M.Koyuncu* 6467 (AEF); Erzurum: near cable car, 3200 m, 30.5.1969, *Tanker* 2862, *Yenen* & *Baykal* (AEF); Erzurum: between Bayburt and Aşkale Kopdağı pass, alpine steppe, 2400 m, 11.6.1981, *M.Koyuncu* 4418 (AEF). B9 Erzurum: between Erzurum and Çat, 30 km SW of Erzurum, Palandöken Mountains, 2100 m, 29.5.1985, *N.Sütlüpınar* 55330 (ISTE); Bitlis: Tatvan, Nemrut Mountain, steppe, 2350 m, 7.6.1978, *N.* & *M.Tanker* 9357, *M.Koyuncu*, *B.Şener*, *F.İlisulu* (AEF); Bitlis: Tatvan, Nemrut Mountain, slopes, alpine steppe, 2000-2900 m, 28.5.1972, *H.Peşmen* 2784 (HUB); Bitlis: Nemrut Mountain, 18.6.1981, *A.* & *T. Baytop*, *A.Atilla* 46584 (ISTE); Iğdır: Tuzluca, Laleli village, S of Taşdemir, 2267 m, 02.6.2007, *E.Altundağ* 385 (ISTE). B10 Kars: Ağrı Mountain, Sultantop patrol, 1600 m, 07.6.1983, *A.Kuztaş* 50587 (ISTE); Kars: Ağrı Mountain, Serdarbulak pasture, 2250 m, 18.5.1979, *T.Baytop* 41952 (ISTE).

Subsp. *armena* (Boiss.) Luferov, Turczaninowia 5(1): 28 (2002).

≡ *Anemone armena* Boiss., Fl. Orient. 1: 10 (1867).

≡ *A. albana* var. *armena* (Boiss.) Smirn., Enum. Plant. Vasc. Cauc.: 936 (1887).

≡ *A. pulsatilla* var. *armena* O.Kuntze f. *brevistaminea* O.Kuntze, Acta Hort. Petrop. 10, 1: 141 (1887).

≡ *A. albana* subsp. *armena* (Boiss.) N.Busch, Fl. Cauc. Crit. 3, 3: 105, cum auct. Comb. Smirn. (1903).

≡ *Pulsatilla armena* (Boiss.) Rupr., Mém. Acad. Pétersb. (Sci. Phys.-Math.), sér. 7, 15, 2: 9 (Fl. Cauc) (1869).

≡ *P. albana* var. *armena* (Boiss.) Trautv., Acta Hort. Petrop. 4, 1: 100 (1876).

≡ *P. albana* subsp. *armena* (Boiss.) Aichele & Schwelger, Feddes Repert. 60, 1-3: 110 (1957).

Perennial herb 4.5-20 cm tall, rootstock vertical, stem and petioles of radical leaves covered with dense white hairs; leaf blade 1.5-2.5 cm long, ovate in outline, bipinnatisect, segments of the second order pinnately divided to base, with short narrow linear-oblong subobtuse or acute lobes; involucral leaves sessile, 1.5-2.5 cm long parted to the middle with lobes frequently incised, linear subacute lobes, flowers solitary, relatively large, declinate or suberect, campanulate; tepals 20-35 mm long, oblong, apex acute and flat, purple-lilac, densely villose on the outside; stamens half to two-thirds the length of the tepals; fruitlets achene with a long plumose awn; Flowering 5-7. Altitude 1000-2910 m. Alpine and subalpine meadows and rocks.

Turkey. A5 Amasya: *Manissadjian* 743 (ANK); Amasya: Akdağ mountain, Ziyaretköy, above Saracıkağılı, İnönü surroundings, rocky place, 1000 m, 30.3.1977, *K.Alpınar* 36617 (ISTE). A7 Gümüşhane: Torul, Sarıç, 2400 m, 30.5.1980, *R.Anşin*, 4937 (KATO). A8 Bayburt: Soğanlı Mountain, Sırataş village, 1800 m, 01.5.1975, *Y.Akman* 9846 (ANK). B5 Niğde: Hasan Mountain, Taşpınar pasture, 2700-2900 m, *Davis* & *R.Çetik*, 18952 (ANK); Kayseri: Erciyes Mountain, W of ski house, steppe, 2670 m, 13.8.1989, *Aytaç* & *Metzger* 2994 (GAZI); Kayseri: Erciyes Mountain, 2000 m, 01.8.1941, *A.Heilbronn* & *M.Başarman* 1092 (ISTF); Kayseri: Koç Mountain, steppe, 2200 m, 21.5.1993, *Z.Aytaç* 5812 (GAZI); Kayseri: Erciyes Mountain, 2910 m, 28.5.2006, *K.Alpınar* 83575 (ISTE); Kayseri: Erciyes mountain, Tekir pasture, 2200 m, 16.5.1977, *T.Baytop* 36795 (ISTE). B6 Kayseri: Pınarbaşı, Çukuryurt village, Hınzır Mountain, slopes, 1950 m, 19.5.1980, *N.Çelik* 1191 (ANK). B7 Erzincan: 2500 m, 19.5.1933, *Balls* & *Gourlay* 275 (ANK).

Discussion

In this paper we have accepted and followed Luferov's (2002) classification and applied it in our study of the Turkish species of *Pulsatilla*. Luferov (2002) accepted *P. albana* and *P. violacea* as different species while Davis et al. (1965) considered *P. violacea* to be a synonym of *P. albana*. Because *P. violacea* has

violet-purple-lilac oblong tepals while *P. albana* has yellow oblong-elliptic tepals, Luferov (2002) accepted that these floral characters are adequate to separate these 2 species; after examination of the Turkish material, we are in agreement with him. *P. violacea* Rupr. subsp. *armena* differs from *P. violacea* subsp. *violacea* with its reflexed tipped tepals and declinate or suberect flowers. For this reason, Luferov (2002) proposed *P. violacea* Rupr. subsp. *armena* (Boiss.) Luferov as a new combination and, after examination of the Turkish material, we have accepted his new combination.

P. albana subsp. *albana* and *P. violacea* subsp. *violacea* are declared as new records for the flora of Turkey. These new records are not surprising since they have already been reported from neighbouring countries (Georgia, Armenia, and Azerbaijan). Specimens in the herbaria of Turkish materials are limited, and some of them were collected too late and are therefore unidentifiable. Further studies on the genus are needed for more accurate distribution maps and descriptions.

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