

*Research article***Rediscovery of *Gundelia purpurascens* (Bornm.) Firat (Asteraceae) rare to Kuh-Sefin Mountain, Erbil (North Iraq)****Mehmet FIRAT** Van Yüzüncü Yıl University, Faculty of Education, Department of Biology, TR-65080 Van, Turkey
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Abstract: *Gundelia purpurascens* (Bornm.) Firat is rare to Kuh-Sefin mountain “Şaqlawa and Koya/Erbil (North Iraq) and Cudi mountain Silopi/Şırnak (Turkey). First collected in 1893 from one locality by J. Bornmüller from Schaklava (Şaklaw) ditionis Erbil, but not collected until 2017. Recently it was recollected for the second time from its type locality and Cudi mountain from Şırnak (Turkey). In addition to the re-expanded description, Synflorescences normally, Bracts spiny, cephaloid (in the middle of the synflorescence), color of corolla externally and internally, Fruit complex (disseminule) size and spines given, photos habit, habitat and distribution map of this species has been given.

Keywords: Asteraceae, *Gundelia purpurascens*, Rediscovery, Iraq.

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Introduction

Gundelia L. belongs to the tribe Lactuceae according to the chloroplast *ndhF* gene (Karis et al., 2001). The recent taxonomical studies based on morphological data as well as ITS based molecular data suggested that the genus *Gundelia* L. (Asteraceae) should be divided into two subgenera; *Gundelia* subgen. *Gundelia* and *Gundelia* subgen. *Anatolia* Firat. Additionally, morphological data suggest that there should be two sections within the subgenus *Gundelia*; *Gundelia* L. subgen. *Gundelia* sect. *Gundelia* and *Gundelia* subgen. *Gundelia* sect. *Komagenenses* Firat (Firat, 2021a). Karyotype data for 12 taxa are reported in Genç and Firat (2019). According to the molecular dating the distinction of the genus *Gundelia* from the relative genera was around 14.1 million years ago (mya) (Tarikahya Hacıoğlu and Firat, 2017).

Gundelia tournefortii was described by Linne (1753) Type: Habitat in Armenia, Syria. Lectotype (Vitek and Jarvis, 2007): (Aleppo) Rauwolf (1583), Epitype (selected by Vitek and Jarvis, 2007): (Aleppo), Rauwolf. To recent years, *Gundelia* genus evaluated as monotypic, and many described taxa after *G. tournefortii* were assesment under

this species as synonymous (e.g. Rechinger, 1989; Kupicha, 1975; De Candolle, 1836).

In order of, *Gundelia glabra* Mill. (1768), Type: near Baibout (Bayburt) in Armenia. *Gundelia tournefortii* L. var. *glabra* (Mill.) DC. (1836). *Gundelia tournefortii* L. var. *araneosae* DC. (1836), nom. illegit. effectively based on *Gundelia tournefortii* L. *Gundelia tournefortii* L. [unranked/var.] β *tenuisecta* Boiss., Boissier (1875). Type: Turkey in monte Berytdagh Cataoniae. *Gundelia tournefortii* L. var. *asperrima* Trautv. (1876). Type: In Turciae districtu Erzerum, in montibus Palanteken, *Gundelia asperrima* (Trautv.) Firat, is taxon raised to the rank of species by Firat (2017a, b, c). *Gundelia tournefortii* L. var. *armata* Freyn & Sint. (1892). Type: Armenia turcica. Egin in monte Hodschadur-Dagh. *Gundelia armata* (Freyn & Sint.) Firat, is taxon raised to the rank of species by Firat (2019). *Gundelia tenuisecta* Freyn & Sint. (1892), Type: Armenia turcica, Egin: prope Szanduk. *Gundelia tournefortii* var. *microcephala* Bornm. (1906) Type: Inter Kermanschahan et Bagdad, prope Khanegyn (Chanekin) ad fines Persiae, Grenzstation. *Gundelia microcephala* (Bornm.) Vitek, is taxon raised to the rank

of species by Vitek (2018). *Gundelia tournefortii* L. f. *purpurascens* Bornm. (1936) Type: Iter Persico-turcicum, Kurdistania, (Assyria orient.), in montis Kuh-Sefin reg. infer. ad pagum Schaklava ditionis Erbil (*Gundelia purpurascens* Bornm. (1939) is actually published in synonymy only (as a nom. in sched.) and thus not validly published at the rank of a species, is taxon raised to the rank of species by Firat (2017). *Gundelia rosea* (M.Hossain & Al-Taey, 1984). Type: Kurdistan region of Iraq.

Respectively, taxa defined in recent years *Gundelia aragatsi* Vitek, Fayvush, Tamanian & Gemeinholzer (2010) Type: Armenia, Aragatsotn province, Mt. Aragats SW-slope, track between Avtona water reservoir and Kakavadzor, *Gundelia aragatsi* subsp. *steineri* Vitek, Fayvush, Tamanian & Gemeinholzer (2010) Type: Armenia, Vayots Dzor province, mainroad to south Armenia, W of Yeghegnadzor, SE of crossroad to Erechgnadzor, slope S of river. *Gundelia armeniaca* Nersesyan (2014) Type: Armenia, Abovian region, surroundings of Geghadir village. *Gundelia dersim* Vitek, Yüce & Ergin (2014) Type: Turkey. Province Tunceli (Dersim): Ovacık, c. 11.7 km WWSW Ovacık, 1.9 km Ene Ziyaret (fountains of river Munzur). *Gundelia munzuriensis* Vitek, Yüce & Ergin (2014) Type: Turkey. Province Tunceli (Dersim): Ovacık, c. 2 km WWSW Ovacık. *Gundelia vitekii* Armağan (2016) Type: Turkey, province Tunceli (Dersim), Tunceli Merkez, c. 8 km N of Tunceli, mountain slope nw of Tüllük Bucağı. *Gundelia komagenensis* Firat (2016) Type: Turkey. C7 Adıyaman: Kahta Province, Nemrut mountain. *Gundelia colemerikensis* Firat (2016) Type: Turkey. C9 Hakkâri: Hakkâri Province (Colemerik) from Karadağ hill to Berçelan plateau, open erode region and steppe. *Gundelia cilicica* Firat (2016) Type: Turkey. C5 Mersin: Erdemli province, Tozlu village, open forrest. *Gundelia anatolica* Firat (2016) Type: Turkey. B4 Kırıkkale: Delice province, Tuzkayası region. *Gundelia mesopotamica* Firat (2017) Type: Turkey. C8 Mardin: 2-3 km from Mardin to Nusaybin, eroded slopes. *Gundelia tehranica* Vitek & Noroozi (2017) Type: Iran, Tehran, Tuchal Mt., above Velenjak. *Gundelia siirtica* Firat (2019a) Type: Turkey. C8 Siirt: Kurtalan District, 12 km from Kurtalan to Batman. *Gundelia cappadocica* Firat (2021b) Turkey. B5 Nevşehir: Avanos district, around of Bozca village, rocky limestone and igneous slopes.

According to Firat (2016), important diagnostic characters in the genus *Gundelia* are the number of flowers

forming one cephaloid (= flower complex, heads of second order, pseudocephalia) in the synflorescence the size and shape of the fruit complex (disseminule), the color of the flowers, the indumentum in the synflorescence, the habitat, and flower closure at \pm noon, opening in \pm late afternoon.

Gundelia species are known by the local people under many names in Kurdish; e.g. "Kênger", "Qorav", "Kereng", "Kerenk", "Keven", "Kengel", and in Turkish; e.g. "Has kanger", "Acı kenger", "Eşek diken", "Kenger" (Firat, 2013).

Materials and Methods

During floristic surveys in north Iraq/Erbil (Saqlawa, Koye/Kuh-Seffin mountain) from May to June 2017-2020 and Turkey/Şırnak (Silopi/Cudi mountain) (Figure 1), from May to June 2017, some interesting *Gundelia* specimens were collected, therefore I decided to analyze the morphological characters of the species using a wide range of literatures for identification. Then collected some other specimens and examined using a wide range of literature; In the flora books (Nikitin, 1960; Sofieva, 1961; Vasilchenko, 1961; Kupicha, 1975; Feinbrun-Dothan, 1978; Rechinger, 1989; Avetisian, 1995 etc.). *Gundelia tournefortii* Linnaeus (1753) is the only species of the genus *Gundelia* and all other names were recorded as synonyms. However, several new species have recently been published included *Gundelia aragatsi* Vitek, Fayvush, Tamanyan & Gemeinholzer (2010), *Gundelia armeniaca* Nersesyan (2014) from Armenia, *Gundelia dersim* Vitek, Yüce & Ergin (2014), *Gundelia munzuriensis* Vitek, Yüce and Ergin (2014), *Gundelia vitekii* Armağan (2016), *Gundelia komagenensis* Firat (2016), *Gundelia colemerikensis* Firat (2016), *Gundelia cilicica* Firat (2016), *Gundelia anatolica* Firat (2016), *Gundelia mesopotamica* Firat (2017), *Gundelia siirtica* Firat (2019a) and *Gundelia cappadocica* Firat (2021b) from Turkey, *Gundelia tehranica* Vitek and Noroozi (2017) from Iran, and a *Gundelia rosea* M.Hossain & Al-Taey Firat (2017b), *Gundelia armeniaca* Nersesyan Firat (2018a), and *Gundelia purpurascens* (Bornm.) Firat (Firat, 2018b) have been added to the Flora of Turkey as new records. The resurrection and a new status of *Gundelia asperrima* (Trautv.) Firat (Firat, 2017c), *Gundelia armata* (Freyn & Sint.) Firat (Firat, 2019b). As a result of this effort and taking into account the new diagnostic characters, the unidentified species is described here as *Gundelia purpurascens* (Bornm.) Firat.

Photos of the living material were taken with a Sony DSCR1 digital camera. Geographical positions were identified using a Magellan eXplorist 710 GPS. A total of 10 herbarium specimens of the new species were collected from three adjacent localities and deposited in the herbaria VANF (acronyms according to Thiers 2016), and in the personal herbarium of the author (Herb. Firat). The conservation status of the new species was assessed according to the IUCN criteria (IUCN, 2017).

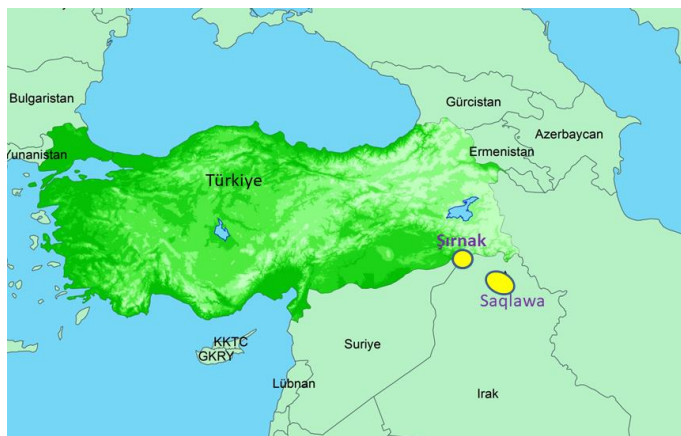


Figure 1. Distribution map of *Gundelia purpurascens* (marked yellow) in the World

RESULTS

Taxonomy

Gundelia purpurascens (Bornm.) Firat (Figures 2–4) \equiv *Gundelia tournefortii* forma *purpurascens* Bornm., Beih. Bot. Centralbl., B, 60: 197 (1939).

Type: Kurdistania (Assyrien), Erbil (Arbela) in montis Kuh-Sefin reg. infer. ad pagum Schaklava (ditionis Erbil), 900 m, 16. 05. 1893, J. Bornmüller 1407, Isotype: W!.

Description: Perennial lactiferous herb with branched stem 20–45 cm, glabrous, greenish-yellow. Leaves coriaceous, alternate, pinnatisect or pinnatipartite, spiny. Both side sparsely short \pm arachnoid hairs, especially on or besides the veins. Synflorescences normally 3–15, globose, ovoid or sometimes copressed, 15–45 mm long and 20–40 mm in diameter (excluding bractes), consisting of 8–30 cephaloids. Synflorescence less arachnoid hairy (when young more arachnoid hairs). Bracts spiny, normally less exceeding cephaloids, with a strong terminal spine and 3–6 lateral spines, dark purple or maroon, Cephaloid (in the middle of the synflorescence) compound of (6-)7 flowers. Flowers campanulate to widely spreading, corolla externally redish-brown to purplish or maroon, with gland; internally yellow, 7–9 mm long

(usually central sorter than lateral). Cephaloids glabrous or squamulose \pm hairy. Fruit complex (disseminule) normally obconical, greyish-brown, 8–11 mm long (without spines), in upper part 6–8 mm in diameter (when ripe); central and lateral flowers surrounded by spines originated from the involucels, spines of the central flowers 2–5 mm, of the lateral flowers 1–5 mm, obtained from 25 fruit of average weight 0.2084 g (when ripe).

Phenology: Flowering time from April to May and fruiting time from July to June

Distribution: *Gundelia purpurascens* is growing type locality Shaqlawa (Iraq) and Cudi mountain (Turkey).

Habitat and ecology: *Gundelia purpurascens* grows in mountain steppe, openings Oak, and lowland at c. 700–1000 m, with other interesting plants such as; *Lens* sp., *Quercus* sp., *Bromus* sp., *Poa* sp., *Erysimum* sp., *Astragalus* sp.

Ethnobotanical usage: *Gundelia purpurascens* is known to be the tastiest and most consumed species. It is cooked as stew or egg-vegetable, obtained gum is chewed.

Red list assessment: The distribution area of: *Gundelia purpurascens* is less than 500,000 km². The species was collected from two localities, and where it occurred, ca. 10,000 individuals were counted. It grows in steppe. Most consumed by the local people, some anthropogenic or grazing effects were observed on the population. Based on the above data and observations, the IUCN (2017) red list category of *Gundelia purpurascens* is suggested as “Vulnerable”, VU.

Other specimens examined: *Gundelia purpurascens* Turkey. C9 Şırnak, Silopi district, Cudi mountains Hessena region, mountain steppe, openings Oak, and lowland, 871 m, 37°20'34" N, 42°25'32" E, coll. 08.05.2017, *M. Firat 33741* [(VANF, Herb. M. Firat), (in flower)]; *ibid.* 15.07.2017, *Firat 33891* [(VANF, Herb. M. Firat), (in fruit)]; Turkey. C9 Şırnak, Silopi distric, Cudi mountains, Slip region, mountain steppe, openings Oak, and lowland, 966 m, 37°19'56" N, 42°37'30" E, coll. 09.05.2017, *M. Firat 33742* [(VANF, Herb. M. Firat), (in flower)]; *ibid.* 16.07.2017, *Firat 33892* [(VANF, Herb. M. Firat), (in fruit)]. **Topotype;** North Iraq (Kurdistan), Erbil, nearly Şaqlawa district, mountain steppe, 807 m, 36°27'10" N, 44°21'22" E, coll. 03.05.2017, *M. Firat 33695* [(VANF, Herb. M. Firat), (in flower)]; *ibid.* 10.07.2017, *Firat 33886* [(VANF, Herb. M. Firat), (in fruit)], North Iraq (Kurdistan), Erbil, from Erbil to Koya district, Dlopa region, steppe, 730 m, 36°13'16" N,

44°11'00" E, coll. 27.04.2019, Mustafa A. Shaban (in flower); North Iraq (Kurdistan), Erbil, from Erbil to Koya district, Dlopa region, steppe, 730 m, 730 m, 36°13'16" N,

44°11'00" E, coll. 16.05.2020, Mustafa A. Shaban (early stage in fruit).



Figure 2. *Gundelia purpurascens*; **A.** habit, **B.** flower, **C-D.** habit at synflorescence in early stage fruits (individual with 6-7 fruits), **E.** habitat (Kuh-Seffin Mountain in Şaqlawa) and **F.** habitat in Koya (Kurdistan region) in North Iraq (Photo: By Mustafa A. Shaban).



Figure 3. *Gundelia purpurascens*; **A,B,D**, variability of early stage fruits (disseminules with 6-7 fruits), **C**, early fruits (disseminules) compound six and seven hole, **E**, compound seven hole of early stage fruits (disseminules), (Kuh-Seffin Mountain in Şaqlawa and Koya (Kurdistan region) in North Iraq (Photo: By Mustafa A. Shaban)



Figure 4. *Gundelia purpurascens* **A**, habitat, **B**, habit (Cudi Mountain, Silopi/Şırnak in Turkey (Firat, 2018a).

Taxonomic relationships: *Gundelia purpurascens* differs from all *Gundelia* species with stem colour, synflorescence, color of corolla and fruit complex (disseminule). The species is morphologically close to

cephaloid (in the middle of the synflorescence) compound of 6 flower groups. The species differs from *G. mesopotamica* with stems colour (greenish-yellow *versus* stems colour green); flower color (corolla externally red-brown to purplish or maroon, with gland; internally yellow *versus* corolla externally purplish to reddish-brown, internally white to cream); synflorescence (less arachnoid hairy *versus* completely dense arachnoid hairy); bracts (normally less exceeding cephaloids, with a strong terminal spine and 3–6 lateral spines, dark purple or maroon *versus* bracts, more exceeding cephaloids "especially uppermost bracts very long", with a strong terminal spine and 2 lateral spines); fruit complex (disseminule) (normally obconical, greyish-brown, 8–11 mm long "without spines" *versus* normally obconical to obovate, greyish brown, 10–13 mm long "without spines"). This species differs from *G. colemerikensis* with stem high (20–45 cm *versus* 50–80 cm); synflorescence number (3–15 *versus* 15–50); cephaloid (in the middle of the synflorescence) (compound of 6–7 flowers *versus* (3-)5(-6) flowers); flower colour (corolla externally red-brown to purplish or maroon, with gland; internally yellow *versus* corolla externally dark purple, maroonish or deep reddish, internally reddish-maroon or pinkish-maroon; fruit complex "disseminule" (normally obconical, greyish-brown, 8–11 mm long "without spines" *versus* normally obconical, greyish-green, 5–9 mm long "without spines", obtained from 25 fruit of average weight (0.2084 g "when ripe" *versus* 0.112 g "when ripe").

Comments

Flowers colour, flowers number and indumentum of *Gundelia* spp. should be carefully observed and noted while it is fresh in the field. It is difficult to diagnose from dry material after it turns into an herbarium sample. Şaqlawa (North Iraq) type sample of *Gundelia purpurascens* is taken from is a known place. And, only a species of *Gundelia* grows this area. After my detailed researches on *Gundelia* species in recent years, taking the colour of corolla and number of cephaloid (in the middle of the synflorescence) compound of 6 flower groups into consideration, it has been decided to resurrect the taxon of "*Gundelia tournefortii* L. forma *purpurascens* Bornm., and to increase its status from variety to species *Gundelia purpurascens* (Bornm.) Firat (Firat 2018a). The species is morphologically close to Cephaloid (in the middle of the synflorescence) compound of 6 flower groups Firat

(2017b), for this reason its a member of *Gundelia* L. subgen. *Gundelia* sect. *Gundelia* (Firat, 2021b).

Total number of *Gundelia* is twenty-two (Firat, 2021b). The *Gundelia* taxa are currently distributed in the East Mediterranean region, Asia Minor, Transcaucasia, Iran and Afghanistan. Their distribution areas are as follows: Cyprus, Lebanon, Jordan, Turkey, Israel and Syria: *Gundelia tournefortii*; Armenia: *Gundelia aragatsi* and *Gundelia armeniaca*; Nakhchivan: *Gundelia aragatsi*; Iraq: *Gundelia microcephala*, *Gundelia rosea* and *Gundelia purpurascens*; Iran: *Gundelia microcephala*, *Gundelia rosea*, and *Gundelia tehranica*; Turkey: *Gundelia anatolica*, *Gundelia armata*, *Gundelia armeniaca*, *Gundelia asperrima*, *Gundelia cappadocica*, *Gundelia cilicica*, *Gundelia colemerikensis*, *Gundelia dersim*, *Gundelia glabra*, *Gundelia komagenensis*, *Gundelia mesopotamica*, *Gundelia munzuriensis*, *Gundelia purpurascens*, *Gundelia rosea*, *Gundelia siirtica*, *Gundelia tenuisecta*, *Gundelia tournefortii*, *Gundelia tournefortii* var. *tenuisecta* and *Gundelia vitekii*. On the basis of current studies and taking newly described species into account, it is possible to claim that the genus still deserves much attention in order to clarify its taxonomy. Variations in *Gundelia* taxa are high (especially bracts, flowers number, leaf and indumentum) and also mutant forms are common. Moreover, some hybrids occur between some species. Hybridization should be consider when defining new species. In the current knowledge of the genus *Gundelia*, the diversity center of the genus seems to be the mountainous dry steppes of the eastern and southeastern Anatolia region (Firat, 2021a).

Finally, in this study, the species that grows is known as *Gundelia tournefortii* forma *purpurascens* which was collected in 1893, and published by J. Bornmueller in 1939. The species was recollected 124 years later and photos of this species were taken for the first time in their natural environment and type locality.

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Conflicts of Interest

No potential conflict of interest was reported by the author.

Ethical approval

No need to ethical approval.

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