

A New Hybrid Clover from Türkiye with Evidence From Morphological Data and a New Combination

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Abstract: In this article, a hybrid clover species collected from Bursa in the Edinburgh herbarium is introduced to the scientific world as *Trifolium x severoglui*. This hybrid species is morphologically similar to *T. ochroleucon* and *T. elongatum*. Natural hybridization is rare in the genus *Trifolium*. For this reason, this situation is briefly discussed, and the hybrid clover species previously reported in the world are listed. A taxon previously recognized as a subspecies (*Trifolium aureum* subsp. *barbulatum*) was transformed into a variety level.

Morfolojik kanıtları ile Türkiye'den yeni bir melez yonca türü ve yeni bir kombinasyon

Anahtar Kelimeler

Bursa,
endemizm,
melez,
sistematik,
yonca

Öz: Bu makalede, Edinburgh herbaryumunda Bursa'dan toplanan melez bir yonca türü *Trifolium x severoglui* olarak bilim dünyasına tanıtılmaktadır. Bu melez tür, morfolojik olarak *T. ochroleucon* ve *T. elongatum* türlerine benzer. *Trifolium* cinsinde doğal melezleşme nadirdir. Bu nedenle, bu durum kısaca tartışılmış ve dünyada daha önce bildirilen melez yonca türleri listelenmiştir. Daha önce bir alt tür olarak tanınan bir takson (*Trifolium aureum* subsp. *barbulatum*) varyete seviyesine dönüştürülmüştür.

1. Introduction

Trifolium is one of the best-known genera of the Fabaceae family. Its importance is evident in its number of species and economic value. It is a high-quality fodder for livestock and decorates meadows as a good source of honey [1, 2].

The clover species of the Near East were reviewed by Hossain [3]. Although 90 species were reported in this article, there is no record of any hybrid species. When the most comprehensive publication of recent years, the *Trifolium* Monograph [4], is included, no hybrid species is recorded among 239 species. Similarly, Gillet and Taylor [5] did not record hybrid clovers in their study reporting *Trifolium* worldwide. Later, when the Flora of Turkey is examined, we again do not see the term hybrid species among the 94 species reported to exist [6]. Finally, when the Turkish Plant List is examined, there is no record of a hybrid species [7].

Furthermore, there is no information about hybrids in any of the author's articles on clover [8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21]. No hybrid clover species were found in the honey and pollen association studies [2, 22].

Hybrid species are interesting. They can often be confused with the related species they form in nature. It is safe to say that all extant species result from this hybridization.

Hybrid species are usually produced by mating two separate species with similar characteristics. They are naturally sterile and cannot produce a seed or create a new individual. Hybrid species occur in the natural

environment under certain conditions, but the natural mechanisms are not yet understood. If the hybrid individual is not perennial, it may not be possible to see it again in the same environment.

Common characteristics of hybrids are as follows:

- 1) They carry dominant characteristics from two ancestors.
- 2) Hybrids do not form large populations
- 3) Reproductive organs are absent or sterile.
- 4) Seed formation is absent or inefficient.
- 5) Pollen is usually of different types and adherent, and the number of fertile pollen is deficient.

Although clover species are commonly encountered plants worldwide, the number of known natural hybrid species is relatively small. The article by Hendrych [8] mentions all known hybrid species. This article provides information on 12 scientifically named and 10 unnamed hybrid species whose existence has been previously reported. The named hybrid species are summarised in Table 1.

Table 1. Known hybrid clovers worldwide.

Hybrid species	Parents
<i>Trifolium</i> × <i>adulterinum</i> Beyerin in Verh. Bot. Vereins Prov. Brandenburg 1914, lvi. 127 (1915).	<i>T. campestre</i> × <i>T. patens</i>
<i>Trifolium</i> × <i>bertrandi</i> Rouy in Fl. France 5: 125 (1899).	<i>T. medium</i> × <i>T. rubens</i>
<i>Trifolium</i> × <i>charrieri</i> H.J. Coste in Bull. Acad. Int. Géogr. Bot. 27: 1 (1917).	<i>T. squamosum</i> × <i>T. pratense</i>
<i>Trifolium</i> × <i>jankae</i> Soó in Acta Bot. Acad. Sci. Hung. 10: 370 (1964).	= <i>Trifolium</i> × <i>neyrautii</i> Rouy
<i>Trifolium</i> × <i>joachini</i> Sennen & Mauricio in Cat. Fl. Rif. Or. 33 (1933).	<i>T. ochroleucum</i> × <i>T. pratense</i>
<i>Trifolium</i> × <i>neyrautii</i> Rouy in Fl. France 10: 374 (1908).	<i>T. medium</i> × <i>T. montanum</i>
<i>Trifolium</i> × <i>permixtum</i> Neuman in Bot. Not. 1894: 104 (1894).	<i>T. medium</i> × <i>T. pratense</i>
<i>Trifolium</i> × <i>prostii</i> Chass in Encycl. Biogeogr. Ecol. 12(2): 130 (1957).	<i>T. pratense</i> × <i>T. rubens</i>
<i>Trifolium</i> × <i>retyezaticum</i> Nyár. in Acta Bot. (Szeged) 1: 37 (1942).	<i>T. aureum</i> × <i>T. badium</i>
<i>Trifolium</i> × <i>schwarzii</i> Wein in Allg. Bot. Z. Syst. xv. 35 (1909).	<i>T. alpestre</i> × <i>T. medium</i>
<i>Trifolium</i> × <i>meduanense</i> Mercier & Lév. in Bull. Acad. Int. Géogr. Bot. sér. 3, 13(177-179): 287 (1904).	<i>T. repens</i> × <i>T. pratense</i>
<i>Trifolium</i> × <i>traplii</i> Domin in Klíč Květ, Českoslov. 200 (1928).	<i>T. alpestre</i> × <i>T. pannonicum</i>

The status of some taxa that have only been reported as hybrids but have not been named is unclear. Some of them are not hybrid species but different ecotypes of a known species [8]. Incidentally, if we look at the publication dates of the hybrid species, we see that the oldest specimen is from 1894, and the latest is from 1957. These species need to be lectotyped. This will undoubtedly lead to more accurate naming of newly identified hybrid species.

This article is the first regarding hybrid clovers worldwide after a long time.

2. Materials and Methods

Herbaria in Türkiye and abroad were visited at different times to provide the basis for the "Illustrated Flora of Türkiye," which is still in progress. In one of the herbaria visited, in the Edinburgh Herbarium, a specimen

that could not be named and had a hybrid character was found. Various drawings were made in the workbook, and a long description was written. The specimen was examined under a microscope and photographed. The data obtained was compared with information from other herbaria visited simultaneously and later over a long period. (E, G, AEF, ANK, ANKO, EGE, ESSE, GAZI, HARRAN, HUB, ISTE, ISTF, ISTO, KNYA, MARE, MUFE, NGBB, and VANF).

3. Results

3.1. A New Hybrid

Trifolium x severoglui M. Keskin, nothosp. nov. (Fig.1-2).

Type: Türkiye: Bithynia, supra Brussa (Bursa), in reg. inferiorie montis Olypi (Uludağ), 300-500 m. s.m., 18 v 1899, J. Bornmüller 4320 (holo.: E 00338757!).

Diagnose: A perennial plant in the form of an intermediate between parents. *T. x severoglui* M. Keskin is close to the *T. elongatum* Willd. species in general appearance, flowering state and the standart 6-8 mm longer than keel and wings. Leaf structure and stipule characteristics are similar to those of *T. ochroleucon* Hudson.

Perennial plants. Stems 25–45 cm long, a few branched from base; spreading hairy in the lower part and adpressed hairy on leaves, stipules, and the upper parts. Stipule tube 10–15 mm long, free part 20–25 mm long. Petiol 10–30 mm. Leaflets 15–25 x 04–08 mm, emarginate. Inflorescence 20–40 x 11–20 mm long, ovoid to oblong, 10–25 mm pedunculated and adpressed hairy. The flowers are probably light yellow. Sepals 12–14 mm long, one tooth is much longer than the others, with spreading hairy, acute; tube 10-nerved, more or less spreading hairy. Petals 18–20 mm long, vexillum 6–8 mm longer than other parts. Ovarium distorted. No fruit and seed formation.

Flowering time: May.

Etymology: This new species is named after Ass. Prof. Dr. Zeki Severoğlu (Marmara University) who is the author's doctoral advisor. The proposed new Turkish scientific name is Zeki Yonca, according to the guidelines of Menemen et al. [23, 24].

Taxonomic Relationship: The parental species of this hybrid is *Trifolium elongatum* Willd. x *T. ochroleucon* Hudson.

Examined parent species from Bursa:

Trifolium elongatum Willd., Sp. Pl., ed. 4, 3(2): 1368 (1802).

Merkez, 05 vi 1889, E. Burnat (G!); Uludağ, 300-500 m, 18 v 1899, J. Bornmüller (E 00338757!); Uludağ, Aras slopes, Karçukuru, 03 vii 1944, M. Başarman (ISTF 3942!); Uludağ, meadow, vi 1874, T. Pichler (G!); Uludağ, Diktekir, 05 vii 1944, M. Başarman (ISTF 4147!); Uludağ, garig vegetation, xi 1964, J.J.F.E. De Wilde (E 00338741!); Uludağ, GB slopes, on main road, *Castanea sativa-Fagus orientalis-Pinus nigra* forest, 840-860 m, 22 v 1990, R. Lampinen 7702 (E 00338748!); Uludağ, Kirazlı yayla, 1450 m, 21 vi 1990, A. Baytop (ISTE 61886!); Uludağ, Kirazlı yayla, 21 vi 1990, A. Baytop and T. Baytop (ISTE 61886!); Uludağ, Soğukpınar, 03 vii 1980, M. Nydegger 15081 (G!); Uludağ, Soğukpınar, 04 vii 1944, M. Başarman (ISTF 4065!); Uludağ, şoşe, 14 v 1955, M. Heilbronn (ISTF 14055!); Uludağ, on road peak, viii 1945, M. Başarman (ISTF 5752!).

Trifolium ochroleucon Huds., Fl. Angl. (283). (1762).

Uludağ, Diktekir, 05 vii 1944, M. Başarman (ISTF 4150!); Uludağ, Elma çukuru, 28 vi 1944, M. Başarman (ISTF 3525!).



Figure 1. The general appearance of the new hybrid species and the ancestral species: A. *Trifolium elongatum* (GAZI 1116); B. *T. x severoglui* (E 00338757, type); C. *T. ochroleucon* (G).

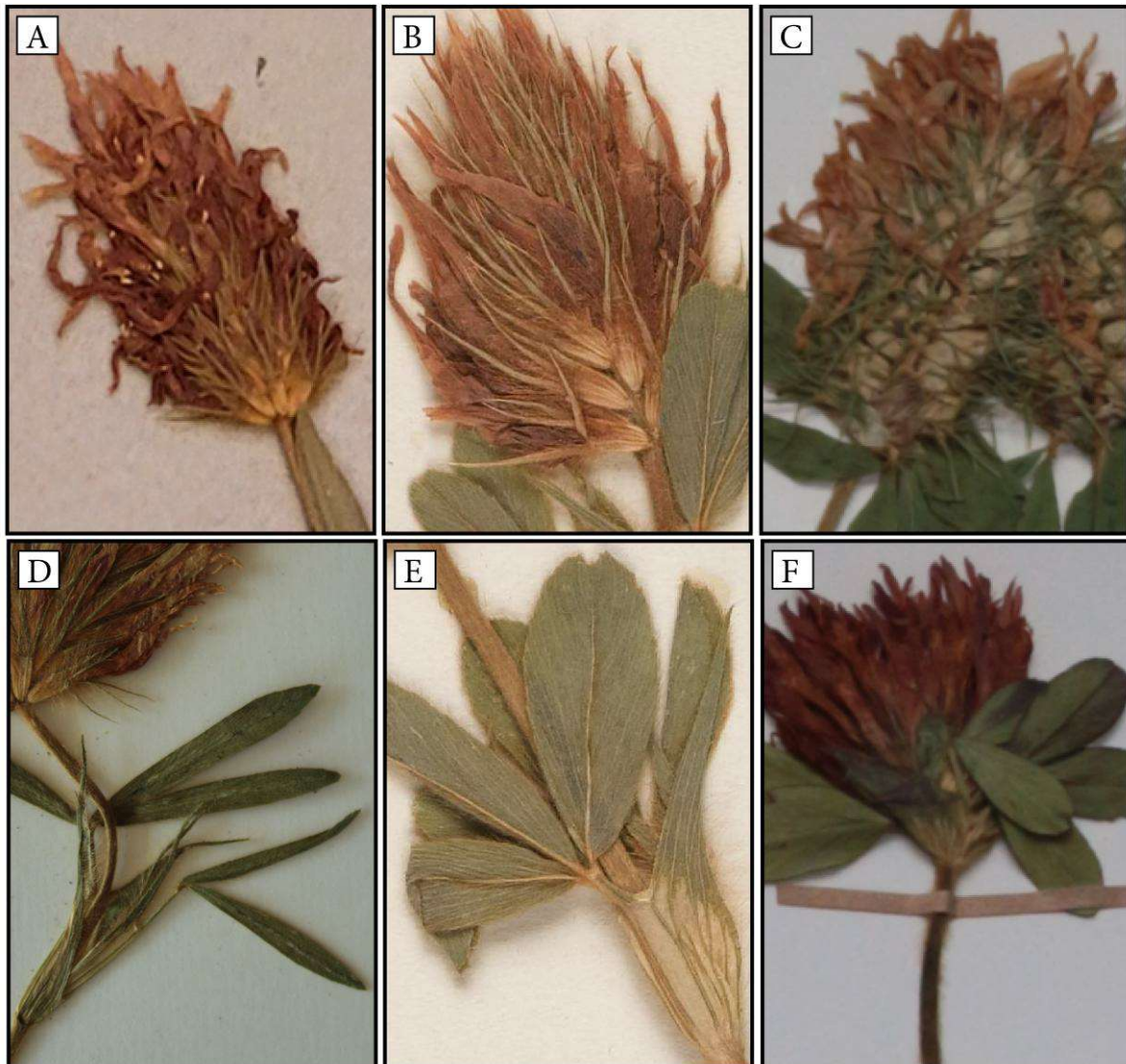


Figure 2. Flower status of new hybrid species and ancestral species: A. *Trifolium elongatum* (G); B. *T. x severoglui* (E 00338757, type); C. *T. ochroleucon* (ISTE 48382) and Uppermost leaves of new hybrid species and ancestral species: D. *Trifolium elongatum* (ANK 8909); E. *T. x severoglui* (E 00338757, type); F. *T. ochroleucon* (ANK 583).

3.2. A New Combination

The taxon *Trifolium aureum* subsp. *barbulatum* differs from the parent species in that the calyx teeth are hairy. Both taxa grow in similar geographical areas and habitats. It is not easy to distinguish them externally; therefore, it does not have the characteristics of a subspecies. Therefore, it would be more correct to analyze it as a variety.

Trifolium aureum Pollich var. *barbulatum* (Freyn & Sint.) M. Keskin, comb. nov. (Fig. 3).

Syn.: *T. aureum* subsp. *barbulatum* Freyn & Sint., Oesterr. Bot. Z. 43: 377 (1893). *T. barbulatum* Freyn & Sint. ex Freyn, Oesterr. Bot. Zeitschr. 43: 377 (1893). *T. barbulatum* (Freyn & Sint.) Zohary, P.H. Davis, Fl. Turkey 3: 404 (1970). *Chrysaspis barbulata* (Freyn & Sint.) Hendrych, Preslia 48: 219 (1976).

Lectotype: [Türkiye], Kastamonu, Tosia in pratiss subalpinis montes Giaurdagh, 29 vii 1892, Sintenis 4835 (P), by Zohary and Heller in Gen. Trif. 336 (1984).

Examined Specimens: **Amasya:** Merzifon, Tavşan mountain, vi 1903, Manissadjian (G!); Merzifon, vi 1903, Manissadjian (E 00339264!). **Ankara:** Beypazarı, Eğriova, meadow, 1600 m, 27 v 1972, Y. Akman (ANK 8894!); Beypazarı, Horhor fountain, Abies, 1700 m, 1 v 1971, Y. Akman (ANK 898!); Beypazarı, Karaşar, *Pinus sylvestris* forest, 1600 m, 1 v 1971, Y. Akman (ANK 6290!); Beypazarı, Mahya, sandy creek, 20 vii 1972, Y. Akman (ANK 6291!); Işık mountain, moist meadows, 28 vi 1975, Y. Akman (ANK 6437!). **Bolu:** Aladağ, Kartalkaya hill, rocky areas, 1750 m, 12 vii 1962, P.H. Davis 37415 and M.J.E. Coode (E 00339260!); Gerede, Aktaş forest, Sarıçam, Aşağı Ovacık, 1600 m, 3 vii 1976, O. Ketenoğlu (E 00339262!); Kale, Tekneci creek, clearing in the forest, creek, roadbreak, 300-1000 m, 12 vii 1950, İ. Kılınc (ANKO 1209!); Köroğlu, black pine, volcanic bedrocks, 27 vi 1975, Y. Akman (E 00339263! and ANK!); Mudurnu to Abant lake, *Fagus-Abies* forest boundary, 1100 m, 9 vii 1962, P.H. Davis 37124 and M.J.E. Coode (E 00027522!); Yedigöller National Park, 11 vii 1977, R. İlarıslan 157 (ISTE 48255!). **Çorum:** Bayat, Yukarılapa Village, Midwife's position, *Pinus sylvestris* and *Abies* forest, 1750 m, 16 ix 1976, M. Kılınc (ANK 6180!); Kuş mountain, Hacıhamza'nın KD, Pine forest, 2000 m, 3 vii 1967, Watson ve ark. 3507 (E 00339266!). **Kastamonu:** Pınarbaşı, Kurtgirmez Mount, forest clearing, 1200 m, 26 vi 2003, M.U. Özbek 1686 (GAZI!); Tosya, Gavur Mount, 1700 m, 25 vii 1988, M. Nydegger 43877 (G 466921!). **Rize:** Çamlıhemşin, Amlakıt Plateau, Kahveden Arkovit through, Büyükbahçe, *Picea* forest and *Rhodendron* thickets, granite rocky terrain, 2000-2400 m, A. Güner 1190 (HUB 13103!); Çamlıhemşin, Hisarcık to Sıraköy, high mountain meadows, 1600-2000 m, 9 viii 1981, A. Güner 4092 and B. Yıldız (HUB!); İkizdere, Gölyayla to Cihantepe, wet meadow, 2500 m, 25 vii 1985, A. Güner 6603, M. Vural (HUB 131101). **Sivas:** Yıldız mountain, alpinic meadows, 1700 m, 14 viii 1967, C. Tobey 2359 (E 00338261!).



Figure 3. *Trifolium aureum* var. *barbulatum* (E 00339260).

4. Discussion and Conclusion

One hundred six species have been reported in the book of Turkish plants, some questionable [7]. *Trifolium elazizense* M. Keskin, Sonay, and Balos species identified from Elazığ province were recently added to this number [20]. Türkiye is like a clover paradise with its net 105 species [21].

This article adds a new hybrid to the genus *Trifolium*, which can be considered quite rare. This article introduced this hybrid species to the botanical community under *Trifolium x severoglui* M. Keskin. This hybrid is derived from the species *T. elongatum* Willd. and *T. ochroleucon* Hudson. It is exciting that no hybrid species have been reported within the borders of Türkiye. A large number of similar species can often coexist. However, hybrid species are scarce in the natural environment. The flower shape is of great importance. In other words, the pollination mechanism is of great importance.

Trifolium aureum is a clover species generally grown in the Black Sea region. The endemic subsp. *barbulatum* taxon, which was previously introduced to the scientific world as a subspecies, was decided to be examined as a variety because it differs from the central taxon by a tiny feature (hairy teeth) and grows in almost the same areas with each other: *T. aureum* subsp. *barbulatum* (Frey & Sint.) M. Keskin.

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