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# Systematic Contributions to Taxa *Dorycnium hirsutum* (Fabaceae) in Turkey

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**Abstract:** Some interesting plant samples collected from Samandağ district of Hatay province were examined and it was determined that these specimens belong to *Dorycnium hirsutum* var. *syriacum*. Its status in the Flora of Turkey is mentioned as suspicious. In this study, it is stated that the *Dorycnium hirsutum* species should be divided into two distinct varieties as *Dorycnium hirsutum* var. *hirsutum* and *Dorycnium hirsutum* var. *syriacum* to investigate the morphological, taxonomic and palynological features of these taxa. Diagnostic characters and detailed descriptions of taxa and species identification key are given and IUCN categories are proposed.

**Keywords:** *Dorycnium*, Fabaceae, taxonomy, Turkey.

## Türkiye'deki *Dorycnium hirsutum* (Fabaceae) Taksonlarına Sistematik Katkılar

**Öz:** Yapılan arazi incelemeleri sırasında Hatay-Samandağ bölgesinde toplanan bazı bitki örneklerinin, Türkiye florasında varlığından şüpheli olarak bahsedilen *Dorycnium hirsutum* var. *syriacum* olduğu tespit edilmiştir. Bu çalışmada *Dorycnium hirsutum* türünün *Dorycnium hirsutum* var. *hirsutum* ve *Dorycnium hirsutum* var. *syriacum* olmak üzere iki varyeteye ayrılması gerektiği belirtilmiş, taksonların morfolojik, taksonomik ve palinolojik özellikleri araştırılmıştır. Taksonlara ait ayırt edici karakterler, ayrıntılı betimlemeler ile tür teşhis anahtarı verilmiş ve IUCN kategorileri önerilmiştir.

**Anahtar kelimeler:** *Dorycnium*, Fabaceae, taksonomi, Türkiye.

## 1. Introduction

*Dorycnium* genus is included in the Loteae family of the Papilionoideae subfamily in the Leguminosae family (Brockwell & Neal-Smith, 1966; Duke, 1981; Sheppard & Douglas, 1986). 13 species of the genus *Dorycnium* have been described, spreading throughout the world (Allen & Allen, 1981; Slavik, 1995; Davies, Howieson, Yates, & Lane, 2005). There are 9 taxa belonging to the genus in Turkey, 4 of which are endemic (Davis, 1970; Vural, 1983; Güner, Özhatay, Ekim, & Başer, 2000). In his work titled Flora of Turkey Davis (1970) mentioned some plant specimens about this genus which are distributed in Hatay and where the indumentum is sparse and the fruit length is equal to the calyx. Moreover, he stated that detailed investigations should be carried out with more samples. During the revision of the genus *Dorycnium*, which is distributed in Turkey, some interesting plant samples collected from Samandağ district of Hatay province were examined and it was determined that these specimens belong to *D. hirsutum* (L.) Ser. var. *syriacum* (Boiss.) Boiss. (Kocabaş, 2014). This taxon is distributed in Syria but its sample was collected from Samandağ, Hatay. This taxon is clearly separated from *D. hirsutum* (L.) Ser. var. *hirsutum* by the fact that the body and part of the calyx are pink in color, the sparse indumentum and the fruit stature are almost equal to that of the calyx (Boissier, 1872; Davis, 1970). This study aims to contribute to the genus *Dorycnium*, to provide the taxonomic *D. hirsutum* species in Turkey, and to specify that *D. hirsutum* var. *hirsutum* and *D. hirsutum* var. *syriacum* should be represented by two taxa. In the study, the morphological characters of the taxa are indicated by supporting photographs; their detailed descriptions, distributions and habitats and the species identification key are arranged and the IUCN category was proposed.

## 2. Material and Methods

The plant samples evaluated in this study were collected and turned into herbarium material (herbarium number style: YZK-xxx) by the field studies carried out in 2012 in Turkey. These specimens are used for morphological and palynological studies. Detailed taxonomic studies on the samples were conducted according to the descriptions of different sources (Boissier, 1872; Davis, 1970; Güner et al., 2000) and they were compared with type specimens and with others at different herbaria (ANK, GAZI, HUB, ISTE E, BR and G, [The herbarium samples examined are marked with the abbreviation "!"]). For the morphological studies and descriptions, at least ten specimens were investigated. Palynological investigations were made by both light and scanning electron microscope (SEM). At the light microscope studies, the pollen slides were prepared according to the Wodehouse technique (Wodehouse, 1935). The pollen grains were covered with gold and photographs were taken with SEM. Palynological terminology follows Erdtman (1960) and Punt, Hoen, Blackmore, Nilsson and Le Thomas (2007). The seeds were investigated and photographed under SEM like the pollen. According to the data obtained, the ecology of the taxa and the category are also proposed (IUCN, 2011). The plant

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samples studied are preserved in Kahramanmaraş Sütçü İmam University, Türkoğlu Vocational Schools herbarium.

**3. Results and Discussion**

As a result, two taxa examined were collected from natural habitats in Turkey. Comparative and detailed taxonomic examinations were carried out on the samples. *Dorycnium hirsutum* in Turkey should be represented with the two taxa as *D. hirsutum* var. *hirsutum* and *D. hirsutum* var. *syriacum*.

3.1. *Dorycnium hirsutum* (L.) Ser. var. *hirsutum* (Fig. 1,2,3)

Perennial herb or small sub-shrub. Stems 30-65 cm long, green with pinkish and densely pubescent. The upper part of the body is more hairy than the lower part. Leaves with a short rachis, 1-4 mm; leaflets 8-20 x 3-10 mm, oblong-obovate, densely pubescent, mucronat. Internodes 1.5-5.7 cm. Inflorescence 6-11-flowered, peduncles 1.5-4 cm. Pedicels shorter than calyx-tube, 1-2 mm; calyx 6-12 mm, densely pilose, calyx teeth lanceolate-subulate somewhat longer than tube, 3.5-6.5 mm. Calyx-tube straight and pinkish, 3-5.5 mm. Flowers 9-16 mm, white or pink; banner 15-16 mm, wing 10-11 mm not united, carina 9 mm, carina ends sometimes purplish red. Ovary 4-5 mm, stylus 3 mm. Legume 6-10 x 2-4.5 mm, ovat-oblong, beak 4 mm, sometimes purplish red above, valves not contorting at maturity. Seeds 2-7, surface flat-reticulate, oblong, 1.05 x 1.63 mm. Pollen grains prolate, P x E= 28.72 x 20.87 µm.

Figure 1. *D. hirsutum* var. *hirsutum* (A), *D. hirsutum* var. *syriacum* (B)

Examined specimens: A1 Çanakkale: Erenköy, 10.5.1856, Kırk (E)!; Gelibolu, 90 m, 16.5.1923, Kett 27 (K)!; Gelibolu, Ulgardere, 28.5.1923, Irıgoldby 261 (K)!. A2 İstanbul: Büyükada, 29.05.1931, H.Demiriz 3294 (ANK)!; Şile 12,5. km, 100 m, 19.04.2004, Y.Sezer 226. B1 İzmir: Gaziemir, 15.12.1967, Peşmen 2001 (EGE, ISTF)!; Efes, 90 m, 23.5.1962, Dudley & Davis 34923 (E, ISTF, K)!; Kemalpaşa, 3.6.1966, Alava & Bocquet 4982 (E)!; Selçuk, 37 94'648'' K, 27 29'30'' D, 9 m, 10.05.2011, B.Özüdoğru 2935 HUB)!. B2 Manisa: Avdal, 140 m, 18.05.2002, D.Sarı; Manisa mountain 400 m, 9.5.2005, C.Durmuşkahya; Beydere, 19.05.2007, Y.Metin. C1 Aydın: Efes to Söke, 90 m, Dudley (Davis 34923) (E)!. C2 Muğla: Marmaris, 250 m, 27.06.1997, H.Şağban 1841 (GAZI)!; Marmaris to Muğla 3. km, 150 m, Dudley (Davis 35488) (E)! C3 Antalya: Adrasan, 27.05.1950, Heilbornn & Attila. C5 Mersin: Kuzucubelen road, Demiriz 965 (ISTF)!; Adana: Karataş, 1 m, 19.04.1998, H.Şağban 2058 (GAZI)!; Kadirli to Andırın, 431 m, K:37 25'091'', D:36 09'598'', 05.05.2013, YZK 952 (KSUH). C6 Osmaniye: Gavur mountain, 18.05.1956, Hub.-Morath 47 (ANK)!; Hatay: İskenderun, Nergislik, Amanos mountain, 700 m, 08.06.1967, Y.Akman 46 (ANK)!; Batıayaz to Samandağ 2. km, 270 m, K:36 08'056'', D:35 58'316'', 06.05.2012, YZK 885 (KSUH); Between to Erikli and Batıayaz, 464 m, K:36 09'344'', D:35 59'201'', 06.05.2012, YZK 886 (KSUH); Arsuz, 164 m, K:36 19'475'', D:35 48'436'', 06.05.2012, YZK 887 (KSUH); Batıayaz to Yoğunoluk road seperation, 291 m, K:36 08'149'', D:35 58'260'', 06.05.2012, YZK 888 (KSUH); Arsuz output, roas sides, 293 m, K:36 23'228'', D:35 51'412'', 06.05.2012, YZK 889 (KSUH); Arsuz to Çevlik, 1 m, K:36 14'127'', D:35 49'432'' , 06.05.2012, YZK 890 (KSUH) (Fig. 2).

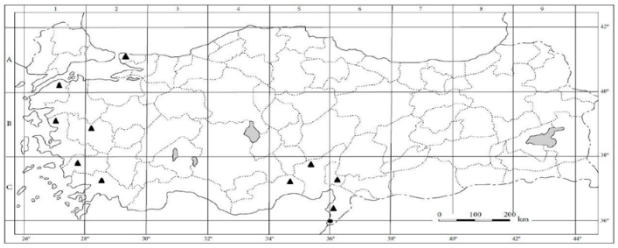

Figure 2. Geographical distribution of *D. hirsutum* var. *hirsutum* (▲) and *D. hirsutum* var. *syriacum* (●) in Turkey.

Flowering and Fruiting Time: April-June.

Distributions and Habitats: Calcareous and steep slopes, dry hills, scrubs and *Pinus brutia* forests (Fig. 1).

Conservation Status: This taxon has a very wide distribution with different natural habitats in Turkey. We recommend the protection status of this taxon as Least Concern (LC), (IUCN, 2011) (Fig. 2).

Pollen Morphology: Pollen grains are of radial symmetry and isopolar. Polar axis (P), 28.72 µm (27.78-29.93 µm) equatorial axis (E), 20.87 µm (19.2-21.87 µm). Pollen shape tricolporate - prolate (P/E:1.37). Colpuses are slender-long (Clg), 20.70 µm (19.1-21.57 µm); (Clt), 0.76 µm (0.71-0.86 µm), their borders are prominent, their types are tapering. Pores spheroid (Plg:4.70 µm, Plt:4.55 µm, Plg/Plt:1.03). The ornamentation is tectate - faveolate and slightly rugulate. Exine: 1.10 µm (Table 1 and Fig. 3).

Seed Characteristics: Seeds; 1.05 x 1.63 mm in size, oblong, reniform shape, surface ornamentation is reticulate and the upper part of the seed, which is close to the hilum, is quite broadly flat and has deep folds (Table 1 and Fig. 3).

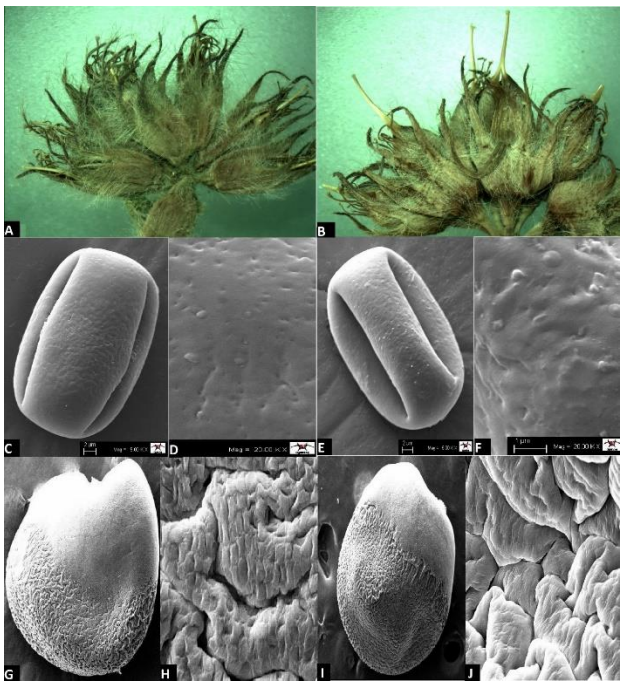


Figure 3. *D. hirsutum* var. *hirsutum*, A.Calyx, C. Pollen, D. Pollen ornamentation, G. Seed, H. Seed ornamentation; *D. hirsutum* var. *syriacum*, B. Calyx, E. Pollen, F. Pollen ornamentation, I. Seed, J. Seed ornamentation.

Table 1. Comparison of selected characters of *Dorycnium hirsutum* var. *hirsutum* (A) and *D. hirsutum* var. *syriacum* (B).

| Characters | A | B |
|---|---|---|
| Indumentum | densely pubescent with patent | sparsely pubescent or glabrescent |
| Rachis | 1-4 mm | 2-2.5 mm |
| Leaflets | 8-20 x 3-10 mm | 16-20 x 5-9 mm |
| Internodes | 1.5-5.7 cm | 1-4 cm |
| Flowers | 9-16 mm | 6-13 mm |
| Legume | 6-10 x 2-4.5 mm | 6-9 x 4-4.3 mm |
| Pollen (PxE) | 28.72 x 20.87 µm, tricolporate-prolate (P/E:1.37) | 31.52 x 21.33 µm, tricolporate-prolate (P/E:1.47) |
| Seed | 2-7,1.05 x1.63 mm, oblong-reniform | 2-6, 1.50 x1.33 mm, oblong-reniform |

3.2. *Dorycnium hirsutum* (L.) Ser. var. *syriacum* (Boiss.) Boiss., Fl. Or. 2:161 (1872) (Fig. 1,2,3)

Perennial herb or small sub-shrub. Stems 30-65 cm long, green with pinkish and sparsely pubescent with patent hairs or glabrescent. Lower parts of the stems almost naked and the upper part sparsely hairy. Leaves with a short rachis, 2-2.5 mm; leaflets 16-20 x 5-9 mm, oblong-obovate, sparsely hairy to almost naked, mucronat, internodes 1-4 cm. Inflorescence 4-11-flowered, peduncles 0.7-3.5 cm. Pedicels shorter than calyx-tube, 1-1.2 mm; calyx 6-9 mm, sparsely pilose, calyx teeth lanceolate-subulate somewhat longer than tube, 3-5 mm. Calyx-tube straight and pinkish, 3-4 mm. Flowers 6-13 mm, white or pink; banner 12-13 mm, wing 10-11 mm not united, carina 11 mm, carina ends sometimes purplish red. Ovary 4-5 mm, stylus 3 mm. Legume 6-9 x 4-4.3 mm, ovat-oblong, beak 4-4.5 mm, sometimes purplish red above, valves not contorting at maturity. Seeds 2-6, surface flat-reticulate, oblong, 1.50 x 1.33 mm. Pollen grains prolate, P x E= 31.52 x 21.33 µm.

Examined Specimens: C6 Hatay: Antakya, Süveydiye, 05.07.1846, Boiss.; Between to Arsuz, Samandağ, 4. km. roadsides, 10 m, K:36 23'543'', D:35 51'596'',YZK 883 (KSUH), (Fig. 2).

Flowering and Fruiting Time: April-June.

Distributions and Habitats: Seaside, roadside, dry hills, macchie (Fig. 1).

Conservation Status: This taxon is distributed only in Hatay (Samandağ) district in Turkey. We recommend the protection status of this taxon, which is represented by 20-30 individuals in a very narrow area near the sea in Turkey, as critical (B2a), (IUCN, 2011) (Fig. 2).

Pollen Morphology: Pollen grains are of radial symmetry and isopolar. Polar axis (P), 31.52 µm (31.4-42.1 µm) equatorial axis (E), 21.33 µm (21.29-21.69 µm). Pollen shape tricolporate - prolate (P/E:1.47). Colpuses are slender-long (Clg), 21.83 µm (21.80-21.95 µm); (Clt), 0.72 µm (0.71-0.75 µm), their borders are prominent, their types are tapering. Pores spheroid (Plg:5.33 µm, Plt:5.16 µm, Plg/Plt:1.03). The ornamentation is tectate - faveolate and slightly rugulate. Exine: 0,98 µm (Table 1 and Fig. 3).

Seed Characteristics: Seeds; 1.50 x 1.33 mm in size, oblong, round shape, surface ornamentation is reticulate and the upper part of the seed, which is close to the hilum, is quite broadly flat and has deep folds (Table 1 and Fig. 3).

*D. hirsutum* var. *syriacum* is clearly separated from its closest relative *D. hirsutum* var. *hirsutum* by the fact that the body and part of the calyx are pink in color, the fruit length is almost equal to the calyx with its sparse indumentum. Accordingly, the diagnostic key we propose to distinguish these two taxa is as follows:

1. Plant clearly densely pubescent, flowers 9-16 mm, calyx 6-12 mm longer than fruit…… **var. *hirsutum***
2. Plant sparsely indumentum, flowers 6-13 mm, calyx 6-9 mm equalling the fruit…… **var. *syriacum***

*D. hirsutum* var. *syriacum*, is distributed in Syria (Boissier, 1872; Post, 1933). Its distribution was recorded not so far from Turkey and its status in the Flora of Turkey is mentioned as suspicious (Davis, 1970). However, it is determined based on the revised study that the genus *Dorycnium* is also distributed in Turkey (Kocabaş, 2014). It is also identified by the anatomical differences between taxa (Kocabaş & İlçim, 2016). For these taxa any protection status is not specified (Ekim et al., 2000).

## 4. Conclusion

According to the results of this study, it is determined that the species *D. hirsutum* in Turkey should be represented with the two taxa as *D. hirsutum* var. *hirsutum* and *D. hirsutum* var. *syriacum*. These two taxa examined were collected from their natural habitats and their morphological and taxonomic features were investigated. Detailed descriptions of taxa and species identification key are given. *D. hirsutum* var. *hirsutum* taxon has a densely pubescent and a longer calyx than its fruit, while the *D. hirsutum* var. *syriacum* has a sparse indumentum and a calyx of the same size as the fruit. *D. hirsutum* var. *hirsutum* is proposed Least Concern (LC) as it spreads in very wide and different habitats, while *D. hirsutum* var. *syriacum* is proposed as Critically (B2a) conservation status because it is known from only one locality in Turkey.

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