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## A New Species of *Gagea* Salisb. (Liliaceae) from Sivas (Central Anatolia, Turkey)

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**Abstract:** *Gagea sivasica* Hamzaoğlu (Liliaceae) is described as a new species from Sivas province (Central Anatolia, Turkey). A Latin diagnosis, a taxonomic description, an illustration of the new species, and some comments on geographical distribution and its affinity to *Gagea chlorantha* Schult.f. are given.

**Key Words:** *Gagea*, Liliaceae, Sivas, taxonomy, Turkey

### Sivas'tan *Gagea*'nın (Liliaceae) Yeni Bir Türü (Orta Anadolu - Türkiye)

**Özet:** *Gagea sivasica* Hamzaoğlu (Liliaceae) Sivas ilinden yeni bir tür olarak tanımlandı. Yeni türün Latince kısa ayrımı, taksonomik betimlemesi, resmi, coğrafik yayılışı ve *Gagea chlorantha* Schult.f. ile yakınlığı hakkında bazı yorumlar verildi.

**Anahtar Sözcükler:** *Gagea*, Liliaceae, Sivas, taksonomi, Türkiye

### Introduction

*Gagea* Salisb. (Liliaceae) is a Eurasian genus, with a few species in North Africa, and comprises between 70 and 250 species according to various authors (Stroh, 1937; Uphof, 1958-1960; Melchior, 1964; Willis, 1980; Mabberley, 1997; Levichev, 1999a, 1999b; Peruzzi, 2003). They are chiefly distributed in Europe, the Mediterranean region, and the temperate region of Asia; there are 25 species in Turkey (Grossheim, 1935; Rix, 1984; Townsend & Guest, 1985; Zarrei et al., 2007).

Some *Gagea* specimens were collected from the area near Tödürge Lake (Sivas province, Central Anatolia) during a project to revise Turkish *Senecio* L. (Asteraceae) supported by TÜBİTAK (TBAG-106T240) and Erciyes University Research Fund. After comparison with the literature (Grossheim, 1935; Rix, 1984; Townsend & Guest, 1985; Zarrei et al., 2007), the authors identified it as a new species. Thus, the number of *Gagea* species distributed in Turkey is increased to 26.

Measurements were obtained using a 0.5 mm sensitive ruler for vegetative characters and an ocular micrometer fitted to an Olympus SZ 61 model stereo zoom microscope for the floral characters. The drawings were made by the first author.

*Gagea sivasica* Hamzaoğlu, sp. nova (Figure).

Affinis *G. chlorantha* Schult.f. sed bulbis 3-9 × 2-4 mm (non 5-15 × 5-10 mm), collis 0.5-4.5 cm longis (non ad 1 cm longis), foliis caulinis infime aequantibus vel brevioribus quam inflorescentiis (non aequantibus vel longioribus), inflorescentiis 1-2(-3)-floribus (non (1)-2-5(-7)-floribus), tepalo elliptico-oblancheolato (non anguste lanceolato) differt.

**Type:** Turkey. B6 Sivas: Hafik, Tödürge Lake, around Resort of Cumhuriyet University, 1310 m, damp grassy places on gypsaceous rocks, 07.v.2006, *Hamzaoğlu, Aksoy & Budak 3832* (holotype BOZOK Hb.; isotypes BOZOK Hb., ERCIYES Hb., GAZI, ANK, HUB). Illustration: (Figure).

Plants 4-12(-15) cm tall, solitary or sometimes in clumps of a few plants. Bulbs ovoid, 3-9 mm long and 2-4 mm in diameter; tunics papery, grey to brown; neck 0.5-4.5 cm long, splitting at the top; bulbils absent. Roots thin; thickened roots occasionally present, enveloping the bulb. Stem erect; subterranean part up to 1.5 cm long; aerial part 0.5-2 cm long; glabrous to puberulous. Radical leaf solitary, linear-filiform, subequalling or longer than the inflorescence, 40-120(-140) × 0.5-1.5 mm, glabrous. Cauline leaves 2-3,

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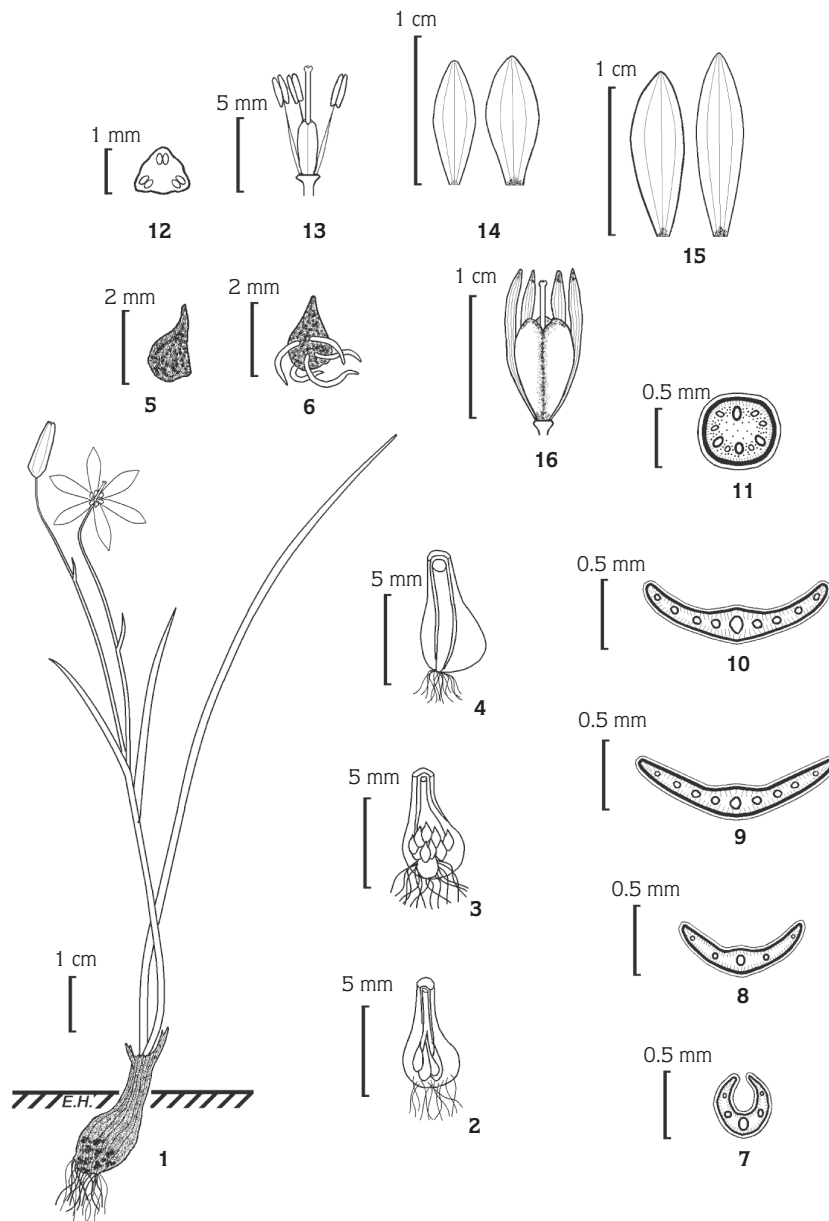


Figure. *Gagea sivasica*: General view (habitus) – 1. Bulb (external dead tunics are removed): 2 – juvenile, 3 – immature, 4 – generative. Basal vegetative bulbil with own sclerificatous roots: 5 – side view, 6 – view from attachment. Cross-section: 7 – of juvenile, 8 – of immature, 9 – of generative basal leaves, 10 – of lower subinflorescence leaf, 11 – of peduncle, 12 – of ovary. Column, ovary, anthers (on right – dehiscence [burst]) – 13. Tepals (external – on right): 14 – at beginning of flowering, 15 – at end of flowering. Capsule – 16.

alternate; the lowest one narrowly linear, 2-4.5(-5.5) × 0.5-1 mm, margins sparsely villous-ciliate or glabrous; shorter than the inflorescence; upper ones shorter, usually villous-ciliate at the margin. Bracteoles usually

present, filiform. Inflorescence cymose, 1-2(-3)-flowered; pedicels unequal, erect at flowering and in fruit, (7-)10-30(-35) mm, as long as the flowers or up to 3 times longer, elongating in fruit to 2-5 cm,

glabrous. Tepals (6-)9-10(-13) × (1.5-)2-2.5(-3) mm, elliptic-oblongate, obtuse to subacute, abaxially greenish-yellow, adaxially greenish-yellow to purplish especially at margins, glabrous. Stamens 1/2-2/3 as long as the perianth, filaments 5-6 mm long, anthers oblong-ellipsoid, yellow, 0.7-1.3 mm long and 0.4-0.6 mm in diameter. Ovary obovoid, 3-4.5 mm long and 1-2 mm in diameter, style 2.5-3.5 mm, stigma capitate; capsule oblong-obovate, 6-8 × 3-4 mm, shorter than persistent perianth.

**Habitat, life form, and suggested conservation status:** This new species is endemic to Central Anatolia (Sivas province), in the Irano-Turanian region. Tödürge Lake is between Hafik and Zara districts (Sivas), occupying approximately 10 km<sup>2</sup> area. This area is characterised by dense agricultural activities and overgrazing. *Gagea sivasica* can be found as small, separated, and few-numbered populations in the areas where gypsaceous rocks are present. The new species should be regarded as Critically Endangered (CR) based on World Conservation Union threat categories (IUCN, 2001).

*Gagea sivasica* grows as a geophyte on damp gypsaceous soils with *Achillea sintenisii* Hub.-Mor., *Allium sivasicum* Özhatay & Kollmann, *Alyssum sibiricum* Willd., *Astragalus aucheri* Boiss., *Bromus tomentellus* Boiss., *Chrysocamela noeana* (Boiss.) Boiss., *Gypsophila eriocalyx* Boiss., *Haplophyllum cappadocicum* Spach, *Lappula barbata* (M.Bieb.) Gürke, *Linum hirsutum* L.

subsp. *anatolicum* (Boiss.) Hayek var. *anatolicum*, *Minuartia anatolica* Woronow, *Ornithogalum platyphyllum* Boiss., *Scorzonera aucherana* DC., *Silene spergulifolia* (Desf.) M.Bieb., *Thesium stellerioides* Jaub. & Spach., and *Thymus cappadocicus* Boiss. var. *cappadocicus* at an altitude of ca. 1300 m. It flowers in late April and fruits in late May.

**Specimens examined:** *Gagea sivasica* – Turkey. B6 Sivas: Hafik, ibid. 22.iv.2006, Hamzaoğlu, Aksoy & Budak 3825 (BOZOK Hb.).

## Discussion

The revision of the genus *Gagea* was made by Rix in the *Flora of Turkey* and, according to that study, *Gagea chlorantha* is present in Turkey (1984). However, according to the revision of *Gagea* in Iran, which was published by a group of taxonomists including Rix, this species is not present in Turkey (Zarrei et al., 2007). In this recently published paper a detailed description of *G. chlorantha* was given. Specimens of *Gagea sivasica* are compared with the description and ecology of *G. chlorantha* given in this manuscript.

*G. chlorantha* is distributed in Cyprus, Syria, Iraq, western and south-western Iran, and Georgia. It grows in calcareous soil and is flowering and fruiting between late February and early May; elevation 200-900(-1400) m. As an ecological difference, *G. sivasica* grows on

Table. Characters used to distinguish between *Gagea sivasica* and *Gagea chlorantha*.

Characters	<i>Gagea sivasica</i>	<i>Gagea chlorantha</i>
Altitude	ca. 1300 m	200-900(-1400) m
Parent rock	gypsaceous	calcareous
Flowering and fruiting	late April-late May	late February-early May
Bulbs	3-9 × 2-4 mm	5-15 × 5-10 mm
Neck	0.5-4.5 cm long	up to 1 cm long
The lowest cauline leaf	subequalling or shorter than the inflorescence	equal to or longer than inflorescence
Bracteoles	usually present	absent
Inflorescence	1-2(-3)-flowered	(1-)2-5(-7)-flowered
Pedicels	glabrous	glabrous or villous
Tepals	elliptic-oblongate	narrowly lanceolate
Capsule	up to 8 mm long	up to 11 mm long

gypsaceous soils in ca. 1300 m. Flowering of this species is in late April and fruiting is in late May.

The diagnostic ecological and morphological characters between *G. sivasica* and *G. chlorantha* are given in the Table. *G. sivasica* can be easily distinguished from *G. chlorantha* by having bulbs 3-9 × 2-4 mm (not 5-15 × 5-10 mm), neck 0.5-4.5 cm long (not up to 1 cm long), the lowest cauline leaf shorter than the inflorescence (not equal or longer than inflorescence), inflorescence 1-2(-3)-flowered (not (1-)2-5(-7)-

flowered), and tepals elliptic-oblongate (not narrowly lanceolate).

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