

## ***Allium apergii* sp. nov. (Alliaceae, A. sect. *Codonoprasum*) from Evvia Island, Greece**

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Received: 6 November 2009

Accepted after revision: 4 February 2010

*Allium apergii* Trigas, Iatrou & Tzanoudakis, a new species of *A. sect. Codonoprasum* from Evvia Island (Greece) is described and illustrated. On the basis of morphological and karyological characters it is well distinct from all other related species of *A. sect. Codonoprasum*. The new species –until now– is known only from the summit area of Mt Ochi in southern Evvia. It is characterized by a tetraploid chromosome complement ( $2n = 4x = 32$ ) with a well differentiated karyotype.

**Key words:** chromosome number, conservation, Flora Hellenica, karyology, taxonomy.

### INTRODUCTION

Greece is considered as a secondary distribution and evolutionary centre for the genus *Allium*, since more than the 50% of the European species and the majority of the Balkan ones have been registered from the country (Stearn, 1981). More recent studies lend support to the above statement by increasing not only the number of *Allium* species known from Greece (85 species) but also the whole diversity of the genus including distribution patterns, ecological requirements and karyotype variation (Tzanoudakis & Vosa, 1986; Tzanoudakis, 1992, 2000a, 2001; Brullo *et al.*, 2003; Biel *et al.*, 2006). Among the sections of the genus *Allium* represented in the Greek flora, sect. *Codonoprasum* Reichenb. is the richest one, including 36 species, that is almost twice as much than those cited by Stearn (1980) in Flora Europaea. Among the recently described species, seven autumn flowering and four polyploid endemic species are included (Tzanoudakis, 2000b, 2001; Brullo *et al.*, 2003; Biel *et al.*, 2006; Tzanoudakis & Kypriotakis, 2008).

In this paper an *Allium* species, collected in the framework of our floristic investigations on Evvia

(Euboea) Island, is described as new to science. The new species is a member of *A. sect. Codonoprasum*, and it is well distinguishable from other related species of the section by morphological and karyological characters.

### MATERIAL AND METHODS

During the field works both living material and herbarium specimens have been collected for taxonomic studies and comparative purposes. The collected specimens were compared with reference material kept in the Herbarium of the University of Patras (UPA) and with living collections existing in the corresponding experimental botanical garden. The comparison of the new species with its closest relatives was also based on data derived from the available literature. Living plants were cultivated for three years in the experimental botanical garden, in order to examine morphological stability, to check chromosome number and to describe chromosome morphology.

For karyological investigations, root tips from potted bulbs, collected from the type locality, were pre-treated in colchicine (0.3%) for ~5 hrs at room temperature. Fixation, staining, chromosome measurements and construction of the karyogram followed the protocol of Tzanoudakis (1983).

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## RESULTS AND DISCUSSION

*Allium apergii* Trigas, Iatrou & Tzanoudakis sp. nov. (Fig. 1)

*Bulbus subglobosus vel ovoideus 0.9-1.3×0.8-1.0 cm, bulbilliferus, tunicis externis coriaceis cinereo-fuscis, internis membranaceis albidis. Scapus curvatus 9-14 cm altus, glaber, 1.3-2.0 mm diametro, vaginis foliorum per 1/2-3/4 ejus longitudinis tectus. Folia 3-5, semicylindrica, glabra, 9-15 cm longa. Spatha bivalvis, persistens, glabra, valvis inaequalibus, longe appendiculatis, majorre 4.5-7.0 cm longa, minore 2.5-5.0 cm longa. Inflorescentia laxa multiflora, floribus 12-25, pedicellis inaequalibus 0.7-1.7 cm longis, reflexis per anthesin, erectis in fructo. Perigonium campanulatum, tepala oblongo-elliptica, concava, (3.7)-4-4.5×1.2-2.0 mm, flava vel virido-flava, venis medianis viridibus. Stamina inclusa vel antheris tantum exsertis, filamentis subaequalibus,*

*inferne cum tepalis per 0.8-1.2 mm annulatim connatis. Antherae flavae. Ovarium ellipticum vel obovatum, 2.0-2.7 mm longum. Stylus albus, 2.6-3.2 mm longus. Capsula trivalva, suborbiculata, 2.7-3.6×2.8-3.8 mm. Semina nigra.*

*Type:* Greece, Island of Evvia, municipality of Karistias, Mt Ochi, summit of Profitis Ilias, 38° 03' N, 24° 28' E, open rocky habitats with low vegetation cover, alt. 1200-1300 m. 23.VII.2000, leg. P. Trigas 4359 (Holotype: UPA).

*Description:* Bulb subglobose to ovoid 0.9-1.3×0.8-1.0 cm, bulbilliferous, with outer tunics coriaceous, greyish-brown, the inner ones membranous, whitish. Scape strongly curved, glabrous, 9-14 cm long, covered by leaf sheaths for 1/2-3/4 of its length. Leaves 3-5, semi-cylindrical, 9-15 cm long, glabrous. Spathe 2-valved, glabrous persistent; valves opposite, un-

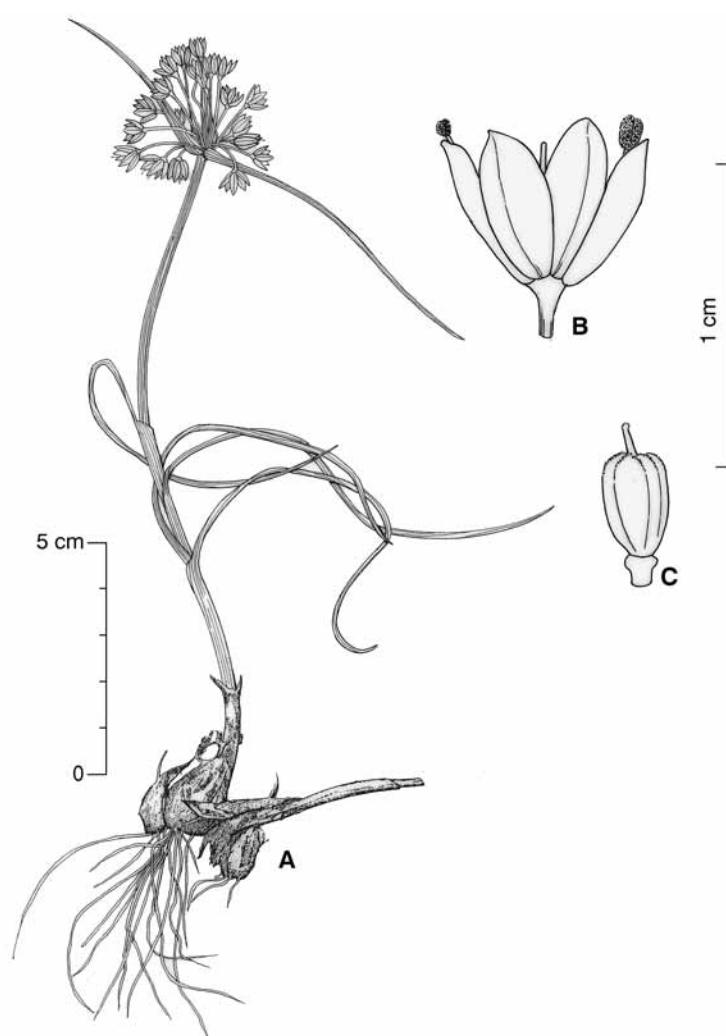


FIG. 1. *Allium apergii* sp. nov. (A) habit, (B) detail of tepals, (C) ovary.

equal with a long appendage, the longer 4.5-7.0 cm long, the shorter 2.5-5.0 cm long. Inflorescence lax, 12-25 flowered; pedicels unequal, 0.7-1.7 cm long, reflexed at flowering, erect at fruiting time. Perigon broadly campanulate; tepals subequal, oblong-elliptic, concave, (3.7-)4-4.5 mm long, 1.2-2.0 mm wide, slightly apiculate, yellow to greenish-yellow with a greenish midrib. Stamens included or sometimes with anthers slightly exserted; filaments subequal, connate at the base into an annulus 0.8-1.2 mm high; anthers yellow. Ovary elliptic to obovate, 2.0-2.7 mm long, truncate and papillose above; style white, 2.6-3.2 mm long. Capsule 3-valved, suborbicular, broadened above the middle, 2.7-3.6 × 2.8-3.8 mm. Seeds black.

**Etymology:** The name of the new species refers to Myrto Aperi, a very active Greek naturalist passed away on summer 2006.

#### Distribution, habitat and ecology

*Allium apertum* is known only from the summit area of Mt Ochi in the southernmost part of Evvia Island, at an altitude of 1200-1300 m of Profitis Ilias and Nerai-dorachi peaks. The species grows on small patches between the rocks, stabilized scree and rocky slopes covered by dwarf shrubby vegetation on schists and micaceous marbles. In this habitat *A. apertum* is associated with *Anthemis wiedemanniana* Fisch. & C.A. Mey., *Centaurea raphanina* subsp. *mixta* (DC.) Runemark, *Cerastium candidissimum* Correns, *Cerastium comatum* Desv., *Crocus cancellatus* subsp. *mazziaricus* Mathew, *Genista acanthoclada* DC. subsp. *acanthoclada*, *Moenchia graeca* Boiss. & Heldr., *Phleum exaratum* Griseb. subsp. *exaratum*, *Poa bulbosa* L., *Ranunculus paludosus* Poir., *Scabiosa argentea* L., *Scleranthus perennis* subsp. *marginatus* (Guss.) Nyman, *Sedum amplexicaule* subsp. *tenuifolium* (Sm.) Greuter, *Sideritis euboaea* Heldr., *Thymus longicaulis* subsp. *chaubardii* (Rchb. f.) Jalas, *Trifolium uniflorum* L., *Viola euboaea* (Halász) Halász, etc.

*Allium apertum* flowers from late July to August. The first mature seeds appear about one month later. The species shows also a vegetative propagation through bulblets, usually growing crowded in groups of five or more. It usually forms small sub-populations of 50-200 individuals, although larger sub-populations with more than 500 individuals have been observed.

#### Conservation status

*Allium apertum* is circumscribed to an area of less than 2 km<sup>2</sup> and counts few (2-3) thousands individuals. Consequently, following the guidelines for using the IUCN red list categories and criteria (Standards and Petitions Working Group, 2006), the new species should be classified as Vulnerable (VU). It would be useful to implement a plan of population monitoring in order to verify its viability. Although the area of Mt Ochi is heavily grazed, especially in summer and mainly by goats, *A. apertum* is not significantly affected, since no signs of herbivory were found on the examined plants. Notwithstanding, Mt Ochi and its surroundings (Cape Kafireas and Dimosari gorge) falls into Natura 2000 site (GR2420001), it is, at the same time, also candidate for the construction of an extensive wind generators park which could seriously threaten the natural environment of such area.

#### Karyology

The investigated population of *Allium apertum* shows a chromosome complement of  $2n = 32$ . Like all Greek species belonging to the *A. sect. Codonoprasum* (Tzanoudakis, 1992), it is characterized by a basic chromosome number  $x = 8$ , and therefore it is a tetraploid ( $2n = 4x = 32$ ) with a probably autoploid origin. In particular, a group of 20 isobrachial (metacentric) and 12 anisobrachial chromosomes can be recognized in the metaphasic plates (Fig. 2). On the whole, the karyotype analysis suggests a haploid arrangement of five metacentric, one submetacentric, one submeta-



FIG. 2. Karyogram of *A. apertum*,  $2n = 4x = 32$ .

TABLE 1. Haploid complement of *Allium apergii* ( $2n = 4x = 32$ ). Mean arm ratio, length and relative length values obtained from drawing and measurements of individual chromosomes from five metaphase plates

Chromosome number	Chromosome type	Arm ratio	Length (μm)	Relative length
1	m	1.09	5.50	15.15
2	m	1.14	5.15	14.20
3	m	1.22	4.80	13.35
4	m	1.05	4.50	11.45
5	m	1.40	3.60	9.50
6	sm	2.26	4.65	13.10
7	sm/st	3.00	4.25	12.30
8	st	3.78	4.05	11.65

centric-subtelocentric (r-index c. 3) and one subtelocentric chromosomes (Table 1, Fig. 2). At least one of the anisobrachial chromosomes of the haploid complement is satellites with the nucleolar organizing region located proximally to the telomere of the short arm. According to literature, this karyotype is very different from that observed in the other known Greek species of *A.* sect. *Codonoprasum* where it appears more symmetric, consisting of either exclusively metacentric chromosomes or including only an anisobrachial one (sm or st) per haploid complement (Tzannoudakis, 1992; Brullo *et al.*, 2003). Moreover, in the other Greek species of *A.* sect. *Codonoprasum* the smallest chromosomes are usually anisobrachial, while in *A. apergii* they are metacentric.

In *A. apergii*, the length of each chromosome, as well as the total length of the haploid complement seem to be evidently shorter than in the other related Greek species of *A.* sect. *Codonoprasum*. According to literature, the length of each chromosome in the other species of *A.* sect. *Codonoprasum*, is usually be-

tween 7 and 14 μm, while the total length of the haploid complement is about 70-80 μm. Instead, in *A. apergii* the corresponding values seem to be almost 50% lower since the length of the largest chromosome does not exceed 6 μm, whereas the total length of the haploid complement is about 40 μm (Table 1).

#### Taxonomic relationships

*Allium apergii* clearly belongs to *A.* sect. *Codonoprasum* because it has simple filaments, absence of conspicuous nectaries in the ovary and two opposite spathe valves, which are unequal with at least one much longer than the umbel. This species, for some morphological features and karyotype is well differentiated from other allied taxa of this section.

On the base of the size and morphology of the spathe valves, as well as the morphological perigon and ovary features this species shows close relationships with some taxa of the *A. paniculatum* L. group. However, for the yellow to greenish-yellow colour of

TABLE 2. Main differential characters of *A. apergii*, *A. paniculatum* and *A. luteolum*

Character	<i>A. apergii</i>	<i>A. paniculatum</i>	<i>A. luteolum</i>
Bulbs	0.8-1.0 cm in diameter	1.0-2.5 cm in diameter	0.5-0.8 cm in diameter
Scape	9-14 cm, covered by leaf sheaths for 1/2-3/4 of its length	30-70 cm, covered by leaf sheaths for 1/3-1/2 of its length	3-20 cm, covered by leaf sheaths for 1/4-1/3 of its length
Spathe	Longer valve 4.5-7.0 cm	Longer valve 5.0-14.0 cm	Longer valve up to 3.0 cm
Pedicels	0.7-1.7 cm long	1.0-7.0 cm long	Up to 1.0 cm long
Tepals	(3.7-) 4.0-4.5 mm long, yellow to greenish-yellow	4.5-7.0 mm long, brownish, lilac-pink or white	3.0-4.0 mm long, yellowish
Ovary	Elliptic to obovate, truncate above	Elliptic, narrowed above	Subglobose, narrowed at base

perigon, never occurring in any other known species of this group, *A. apertum* is similar to *A. flavum* L. s.l. Nevertheless, the latter, due to the ovary (short and more or less stipitate) and stamens (yellow, and long exserted from perigon) is totally different from *A. apertum*. Another species of *A.* sect. *Codonoprasum*, characterized by yellow tepals, is *A. luteolum* Halász (endemic to the Cyclades), but it differs from *A. apertum* in having small flowers and shorter ovary narrowed at the base (Table 2) (see Brullo *et al.*, 2001).

Based on some morphological features and karyotype arrangement, *A. apertum* seems to be a species quite isolated within *A.* sect. *Codonoprasum*. Moreover, it is exclusively localized in the mountain top of Evvia, similarly to many other endemic species of this island.

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