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

Panayiotis TRIGAS¹, Gregoris IATROU² and Dimitris TZANOUĐAKIS²

¹ National Agricultural Research Foundation (N.A.G.RE.F.), Forest Research Institute, Terma Alkmanos str., Ilisia, GR-11528 Athens, Greece

² Division of Plant Biology, Department of Biology, University of Patras, GR-26500 Patras, Greece

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 pretreated 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).
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, major 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-)4.5×1.2-2.0 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-
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 Apergi, a very active Greek naturalist passed away on summer 2006.

**Distribution, habitat and ecology**


*Allium apergii* 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 apergii* is circumscribed to an area of less than 2 km² 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. apergii* 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 threat the natural environment of such area.

**Karyology**

The investigated population of *Allium apergii* 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 autopolyploid 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 submetacentric, one submetacentric, one submetacentric.
centric-subtelocentric (r-index c. 3) and one subtelo-
centric chromosomes (Table 1, Fig. 2). At least one of
the anisobrachial chromosomes of the haploid com-
plement is satellited with the nucleolar organizing re-
gion 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 me-
tacentric chromosomes or including only an aniso-
brachial one (sm or st) per haploid complement (Tza-
noudakis, 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 hap-
loid complement is about 70-80 μm. Instead, in *A. a-
pergii* the corresponding values seem to be almost
50% lower since the length of the largest chromoso-
me 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. *Codonopra-
sum* because it has simple filaments, absence of con-
spicuous nectaries in the ovary and two opposite spa-
the valves, which are unequal with at least one much
longer than the umbel. This species, for some mor-
phological features and karyotype is well differenti-
ated 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 rela-
tionships with some taxa of the *A. paniculatum* L. group.

However, for the yellow to greenish-yellow colour of

---

**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

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

---

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

<table>
<thead>
<tr>
<th>Character</th>
<th><em>A. apergii</em></th>
<th><em>A. paniculatum</em></th>
<th><em>A. luteolum</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulbs</td>
<td>0.8-1.0 cm in diameter</td>
<td>1.0-2.5 cm in diameter</td>
<td>0.5-0.8 cm in diameter</td>
</tr>
<tr>
<td>Scape</td>
<td>9-14 cm, covered by leaf sheaths for 1/2-3/4 of its length</td>
<td>30-70 cm, covered by leaf sheaths for 1/3-1/2 of its length</td>
<td>3-20 cm, covered by leaf sheaths for 1/4-1/3 of its length</td>
</tr>
<tr>
<td>Spathe</td>
<td>Longer valve 4.5-7.0 cm</td>
<td>Longer valve 5.0-14.0 cm</td>
<td>Longer valve up to 3.0 cm</td>
</tr>
<tr>
<td>Pedicels</td>
<td>0.7-1.7 cm long</td>
<td>1.0-7.0 cm long</td>
<td>Up to 1.0 cm long</td>
</tr>
<tr>
<td>Tepals</td>
<td>(3.7-) 4.0-4.5 mm long, yellow to greenish-yellow</td>
<td>4.5-7.0 mm long, brownish, lilac-pink or white</td>
<td>3.0-4.0 mm long, yellowish</td>
</tr>
<tr>
<td>Ovary</td>
<td>Elliptic to obovate, truncate above</td>
<td>Elliptic, narrowed above</td>
<td>Subglobose, narrowed at base</td>
</tr>
</tbody>
</table>
perigon, never occurring in any other known species of this group. *A. apergii* 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 exerted from perigon) is totally different from *A. apergii*. Another species of *A.* sect. *Codonoprasum*, characterized by yellow tepals, is *A. luteolum* Halácsy (endemic to the Cyclades), but it differs from *A. apergii* 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. apergii* 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.

**REFERENCES**


