



A new *Allium* species from section *Molium* from Israel: *A. akirense* (Amaryllidaceae)

NIKOLAI FRIESEN^{1*} & ORI FRAGMAN-SAPIR²

¹Botanical Garden, University of Osnabrueck, Albrechtstrasse 29, 49076 Osnabrück, Germany; e-mail: friesen@biologie.uni-osnabrueck.de

²Jerusalem Botanical Gardens, The Hebrew University, Giv'at Ram, Jerusalem, 9190400, Israel. E-mail: fragman@botanic.co.il

*Author for correspondence

Abstract

As part of the phylogenetic revision of the Eurasian representatives of the subgenus *Amerallium* we have discovered a new *Allium* species (section *Molium*) in Israel, related to *A. qasyunense*. It is described here as *Allium akirense*, based on living plants and recent herbarium specimens. Independence of the new species is confirmed by morphological and ecological features, and also by molecular ones. To learn more about the phylogenetic relationships within a group of closely related species of section *Molium*, we used maximum parsimony and Bayesian analyses of combined nuclear (ITS—internal transcribed and ETS—external transcribed spacers of rRNA genes) and chloroplast (*rpl32–trnL* intergenic spacer) dataset of 7 taxa. Discussion on geographic distribution, conservation status and habitat is provided, as well as an identification key including the closest related species.

Key words: *Allium*, *Allium akirense*, *Molium*, plant taxonomy, ITS, ETS, *rpl32–trnL*

Introduction

In the treatment of the genus *Allium* Linnaeus (1753: 143) in “Flora of Palaestina” (Kollmann 1986), eight species and subspecies from section *Molium* G. Don ex Koch (1837: 715) were listed: *A. trifoliatum* Cirillo (1788: 11) subsp. *hirsutum* (Regel 1875: 221) Kollmann in Kollmann & Steran (1975: 204), *A. erdelii* Zuccarini (1843: 236), *A. qasyunense* Mouterde (1953: 348), *A. carmeli* Boissier (1854: 28), *A. negevense* Kollmann (1969: 69), *A. roseum* Linnaeus (1753: 296) var. *tourneuxii* Boissier (1882: 274), *A. papillare* Boissier (1854: 27) and *A. neapolitanum* Cirillo (1788: 13). Kollmann (1971) affiliated all local species of section *Molium* into two (not validly published) series: “*Patentes*” (*A. neapolitanum* and *A. trifoliatum* subsp. *hirsutum*), and “*Campanulatae*” (*A. carmeli*, *A. erdelii*, *A. qasyunense*, *A. papillare*, *A. negevense* and *A. roseum* var. *tourneuxii*).

Later, some new *Allium* species were described (Brullo *et al.* 1991, Brullo *et al.* 2008, Fragman-Sapir & Fritsch 2011, Brullo *et al.* 2014).

A few years ago another *Allium* taxon was found in the southern Coastal Plain of Israel in the hills near Kibbutz Giv'at Brenner. These plants differ from the closely related *A. qasyunense* in many characters such as petal color, smaller flowers, and a stronger growth potential. In spring of 2011 and 2013, we collected some of these plants and other species from “series *Campanulata*” sensu Kollmann (1971) for a taxonomical study and analyzed molecular characters: DNA sequencing of non-coding sequences from two nuclear ribosomal RNA regions (ITS and ETS) as well as a chloroplast region (*rpl32–trnL*). DNA sequencing of non-coding fragments has been widely employed in *Allium* phylogenetic studies and has proven very useful in taxonomic investigations (Dubouzet & Shinoda 1999, Friesen *et al.* 2000, 2006, Klaas & Friesen 2002, Nguyen *et al.* 2008; Li *et al.* 2010; Wheeler *et al.* 2013, Mashayekhi & Columbus 2014).

Material and methods

Bulbs and leaf samples for DNA isolation were collected in spring 2011 in Israel and grown in the Botanical Gardens in Jerusalem and Osnabrück. Fourteen accessions of seven species (*A. akirense*, *A. qasyunense*, *A. papillare*, *A. erdelii*, *A. negevense*, *A. neapolitanum* and *A. longisepalum* Bertoloni (1842: 429) of section *Molium* were included in analysis (see Table 1). Bulbs were planted in pots and growing roots were used for the chromosome studies. The leaves for DNA isolation were dried with silica gel.

Ecology:—*Allium akirense* grows on coastal calcified sandstone, locally known as “kurkar”. The vegetation of the sites is primarily Mediterranean batha and garique (phrygana) dominated by *Thymbra capitata* (Linnaeus 1753: 568) Cavanilles (1803: 37), *Cistus salviifolius* Linnaeus (1753: 524), and *Hyparrhenia hirta* (Linnaeus 1753: 1046) Stapf (1918: 315). *A. akirense* is a good example of an arid taxon that penetrated the Mediterranean Coastal Plain on sandy soils and evolved here into a new narrow endemic. Other desert species or those of arid origin in the coast are *Retama raetam* (Forsskal 1775: 214) Webb & Berthelot (1842: 56), *Salvia lanigera* Poir. in Lamarck (1817: 49), *Asparagus horridus* Linnaeus (1774: 274), and *Allium tel-avivense* Eig in Eig *et al.* (1931: 75).

Conservation:—The rich habitat of *Allium akirense* together with other coastal sandy habitats in the coastal plain were assigned to the list of the most vulnerable areas in Israel, suffering from heavy urban, industrial and agricultural developments (Shmida *et al.* 2011). Specifically, all *A. akirense* sites are under immediate danger, as not even one of these sites is to be found within a nature reserve. Thus, there is a real threat to the survival of the species in nature. In three sites there are hundreds of plants, but in the other five just a few. It is estimated that there is a total of around 3000 plants all together. The species range sums up to less than 3 sq. km. Thus, based on the IUCN criteria (2014), it is proposed to include it in the following category: critically endangered CR B2 b(II, III). Due to the vulnerability of the plant, an ex situ conservation program has begun in the Jerusalem Botanical Gardens, where reproduction under cultivation is being tested. Reproduced plants will be dispersed in several botanical gardens and plant shelter gardens in order to back up the few wild populations.

Identification key to *Allium akirense* and its close relatives

1. Flowers narrow campanulate, sometimes constricted in the upper part.....2
- Flowers broad campanulate, not constricted in the upper part.....4
2. Leaves with long soft hairs, inflorescences narrowly fastigiate; lower arid parts of Mediterranean zone to semi-desert.....*A. erdelii*
- Leaves short-haired, inflorescences not narrow3
3. Flowers 10–15 mm long.....4
- Flowers shorter than 7 mm.....5
4. Pedicels 15–25(–30) mm long, flowers rose to pink or pure white..... *A. longisepalum*
- Pedicel 10–15 mm long, flowers white-yellowish; rocky semi-desert highlands.....*A. negevense*
5. Flowers 3–5 mm long, white-pinkish; coastal hills.....*A. akirense*
- Flowers 5–7 mm long cream coloured6
6. Leaf sheaths and part of blades covered by thick edged, backwards pointed tiny hairs, perigone segments blunt with a prominent purplish midvein; desert sands*A. papillare*
- Leaf sheaths and blades covered by erect very short hairs, perigone segments pointed, without a prominent midvein; Med.-desert transition zone to lowland semidesert*A. qasyunense*

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