A new monocotyledonous bulbous weed species was detected in Hungary: (*Allium giganteum* Regel)

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Summary

The indicated and identified plant *'Allium giganteum* Regel' known by synonym as *'Allium procerum* Trautv. ex Regel' and by common name 'Giant Onion', or 'Ornamental Onion' - is native in Central and Southwestern Asia (Pamir-Alay; Tajikistan, Kyrgyzstan and Uzbekistan and Hindu Kush; Afghanistan, Pakistan and the west part of China), but as an ornamental garden plant, it is cultivated in many countries all over the world. The biggest *Allium giganteum* bulb producer is the Netherlands, but there are smaller producers in Israel, France, Japan and Latvia. (Rabinowitch and Currah, 2002; Kamenetsky and Rabinowitch 2006). The situation was different before the middle of the 19th century when Eduard Regel and other botanists went to Central Asia and discovered many new species among which was *Allium giganteum* Regel. (Dadd, 1987). This new weed species belongs to the Amaryllidaceae family and *Allium* genus. (Li, Zhou, Yu, Zhang and Wei, 2010). This plant was used by native people as spice in cheese production and as an herb. (Kaval, Behçet and Çakilcioglu, 2015). It can be used as tonic in foods (Kamenetsky and Rabinowitch 2006). Nowadays researchers are testing its antioxidant properties. The highest antioxidant activity was observed in the leaves (Stajner, Miliç-Demarino, Çanadanoviç-Brunet, Stajner, and Popoviç, 2006) and two new steroidal saponins were found in this plant (Kawashima, Mimaki, and Sashida, Y. 1991). This absolutely useful species - in non-cultivated conditions - was detected in Sweden in 1980, in Germany and

in the Russian Federation in 2008, and in the United Kingdom in 2011. *Allium giganteum* is capable of reproducing its seed, unlike garlic, and of producing daughter bulbs. When propagated from seed, *Allium giganteum* has a juvenile phase (5-6 years) before blooming (Kamenetsky and Rabinowitch 2006). *Allium giganteum* is very cold-resistant and belongs to subgenus Melanocrommyum. The members of Melanocrommyum are spread in semi-deserts, desert and mountainous steppes. They are able to tolerate sandy and rocky grounds with low water-capacity and sunny or half shade areas (Kamenetsky and Rabinowitch 2006). Native *Allium* species are *Allium suaveolens* (protected species), *Allium victorialis* (protected species), *Allium angulosum, Allium atropurpureum, Allium vineale, Allium sphaerocephalon, Allium scorodoprasum, Allium rotundum, Allium atroviolaceum, Allium moschatum, Allium ursinum, Allium lusitanicum, Allium oleraceum, Allium carinatum, Allium flavum* and *Allium paniculatum* in Hungary. In our opinion, *Allium giganteum* can become an invasive species in agricultural areas where it is not ploughed and is a competitor to native plant species on meadow due to its low environmental demand, daughter bulb formation and seed multiplication.

Key words: Allium, giganteum, procerum, ornamental, onion, giant, plant, weed.

Taxonomy

Kingdom: Plantae
Phylum: Tracheophytes
Clade: Angiosperms
Clade: Monocots
Class: Liliopsida
Order: Asparagales
Familia: Amaryllidaceae
Subfamilia: Alloideae
Tribus: Allieae
Genus: Allium
Subgenus: A. subg. Melanocrommyum
Sectio: a sect. Compactoprason
Subsectio: A. subsect. Erectopetala
Species: *Allium giganteum*

Synonyms: *Allium procerum* Trautv. ex Regel

The genus *Allium* includes more than 800 species, this is the largest monocotyledonous genera and spreads widely across the Holarctic region (Li, Zhou, Yu, Zhang and Wei, 2010). *Allium* species are found throughout the northern hemisphere and there is a huge difference in the ecological needs of the species. There are species that live in open sunny areas, other species in wetter forests, and other species in alpine pastures or high mountains in Central Asia. Water, soil pH and their temperature requirements also exhibit a similar variability. The species' vegetation cycle reveals their ecological needs; there are spring-blooming, summer-blooming, and autumn-blooming species. Some species are green throughout the year, while others have a dormant period.

The earliest record of onion production in Egypt dates back to 3500 BC. (Mehta, 2017). The cultivation purposes of the species are very different and are used as a spice, an herb, an ornamental plant, a cut flower and, of course, not as spice for edible purposes. Useful species include species that appear as weeds in agricultural fields (e.g. Allium fragrans). (Kamenetsky and Rabinowitch 2006).

Description of *Allium giganteum* Regel

Bulb: ovoid or subglobose shape with 2-10 cm diameter and 3-12 cm long. Inner tunic is thin with dirty white colour. Outer tunic sometimes builds many-layered shell, initially gray, later black or blackish black-carmine color.

Scape: straight, strong and smooth, 50-150 cm long, at the base 1-2,5 cm in diameter, green or aquamarine color. The upper side is smooth or has some coarse furrows, the lower side has broad and obtuse ribs.

Sheathy prophyll is very short with hyaline color.

Leaves: 4-10 pieces, laminae oblong to broadly lanceolate with short ascending and curved or with incurved apex. The margins of the leaves are smooth, basically red and later they become white. Leaves are 25-60 cm long and 1.5-16 cm broad with green or aquamarine color.

Figure 1: Allium giganteum *Regel scape and leaves in Hungary in 2019. (Photographer: Roland Szabó)*

Spathe: membranous shortly acute, later reflexed, 2-3 cm long. Spathes color is pale brown with dark veins.

Flower: It is very dense, initially 5 cm, 15 cm at the end of flowering and 20 cm in diameter at the fruiting stage. Pedicels are uneven long from 2-3 cm to 6-8 cm long with green or red color. Pedicels are partly dropping down at the fruiting stage. Flowering lasts from April to May. Tepals are oblong and spoon-shaped concave and incurved, after anthesis they are crumpled. Are 5-6 mm long and 2.5-3 mm broad with purple to deep carmine color, fading during anthesis. Filaments are 1.5 times longer than the tepals. They are straight, basally connate for 0.5 mm and short triangularly broadened. Anthers are 2 mm long from pale yellow to pink color. Pollen is yellowish gray.

Figure 2: Allium giganteum *Regel flower in Hungary in 2019. (Photographer: Roland Szabó)*

Seed: single per locule. Seeds are subglobose with one concave side. They are 2,5 mm long 2-2,5 mm broad with dull black color. (Fritsch and IPK, 2016)

Detection and spread in Europe

Allium giganteum Regel was detected several times in Europe. Based on available data, the first detection was in Sweden in 1980, the second and third detections were in Germany and in the Russian Federation in 2008, and it was also detected in the United Kingdom in 2011. These public data do not indicate whether the European detection points of *Allium giganteum* have been colonized or whether they caused any damage such as weed. Unfortunately, there is no data on the area where *Allium giganteum* was found, so we do not know if it appeared as an ornamental plant of weed in these countries.

Characteristic of the detection place in Hungary

Allium giganteum Regel is a monocotyledonous plant. It lives in areas with wide ecological tolerance, sunshine and semi-shade, as well as low nutrient and water content. A bulbous plant that does not like disturbed or uprooted areas. The place where we found the plant is near the Romanian and also the Serbian border, very close to Makó town in Kiszombor village. The first point of detection was at the intersection between roads No 43 and No 431 on a typical meadow. This area is historically famous for onion cultivation traditions that date back to the early 1500?s. The area is placed on meadow-chernozem soil with warm, sunny conditions and with little rain (cc. 500-550 mm per year).

Detection and Spread in Hungary

Allium giganteum Regel was discovered first as a weed plant and new taxa in case of Hungary on 14th May 2019. There is no data on the presence of this plant in other parts of Hungary. Its range is between 30 and 60 degrees north latitude in the world. This plant has already been found in Asia (Russian Federation) and Europe (Sweden, Germany, United Kingdom)[1]. Therefore, it was expected to appear in Hungary as well.

Figure 3: Allium giganteum *Regel plant on field in Hungary in 2019. (Photographer: Roland Szabó)*

[1] https://www.gbif.org/species/2857111

Materials and methods (Problem description mainly in terms of Nature and Plant Protection)

Allium giganteum Regel is a new species in Hungary's flora. Due to the wide ecological tolerance of the species and the 5-6 year juvenile (non-flowering) phase of seed propagation, we think that it can spread in Hungary not only in arable areas - mainly in low or no-tillage systems -, where there is mechanical and chemical weed control, where it may become a weed, but in meadows it may become a competitor of domestic species. It may even displace Hungarian native species from certain areas. A very important and dangerous opportunity is the ability of hybridization in case of the famous onion growing area.

Conclusions

This species is a gastronomically suitable herb and an economically useful ornamental plant. Recent research has shown that it is also useful for medicine. Probably not in arable fields, but in meadows it may appear as weed. That is why we think that it is important to deal with its biology, its spread and it is important to develop strategies to prevent it from becoming an invasive species in nature reserves.

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