# On the identity and distribution of the alien *Acalypha* species (*Euphorbiaceae*) in Bulgaria

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**Abstract.** In 2016, in the Botanical Garden of the Bulgarian Academy of Sciences in Sofia, a population of the alien species *Acalypha australis* (*Euphorbiaceae*) was found. During a subsequent study, it was found out that the formerly reported for Bulgaria *A. virginica* was misidentified and the only *Acalypha* species registered in the country is *A. australis.* The species was collected for the first time in Bulgaria in the 1960s. The article provides a brief morphological description of the species, comments on the distinguishing characters from similar species, data and discussion on the phenology and distribution in the country.

**Key words:** Bulgarian alien flora, *Acalypha australis*, *Acalypha virginica*

## Introduction

In a very short communication, Koceva & Dimitrov (1997) reported *Acalypha virginica* L. as a new species for Bulgaria. The report was based on the herbarium specimens collected in Sofia in 1968. Ever since, *A. virginica* has been considered an alien species to the Bulgarian flora (Dimitrov 2001; Delipavlov 2003; Petrova & al. 2012). Also, on the basis of a specimen collected many years ago, Asenov (2010) reported *A. virginica* as a new species for Mt. Zemenska.

A population of *Acalypha* species found in 2016 in the Botanical Garden of BAS in Sofia proved to be *A. australis* L. The study reveals that all specimens from Bulgaria stored in the Bulgarian herbaria (SO, SOM) belong to *A. australis*, reported erroneously as *A. virginica*.

## Material and methods

Material was collected in 2016. Identifications were done using different literature and other sources: Poyarkova (1949), Hauxing & Gilbert (2008), Sagun & al. (2010), etc. The herbarium materials of *Acalypha*, stored in the Bulgarian herbaria SOM and SO, were also examined.

Morphological characters of the species were noted from the collected plant material and compared with literature data (Hauxing & Gilbert 2008; Sagun & al. 2010, etc.). A short description of the species is given, with notes on the key characters. The specimens gathered were deposited in the Herbarium (SOM) of the Institute of Biodiversity and Ecosystem Research. Data about the populations, habitats and phenology of the species are based on personal observations and are compared with those from the relevant literature.

## Results and discussion

### *Euphorbiaceae*

***Acalypha australis*** L. Sp. Pl. 2: 1004, 1753 (Fig. 1)

An annual herb, monoecious. Stems branched, erect or procumbent, slender, 20–60 cm, adpressed hairy. Leaves

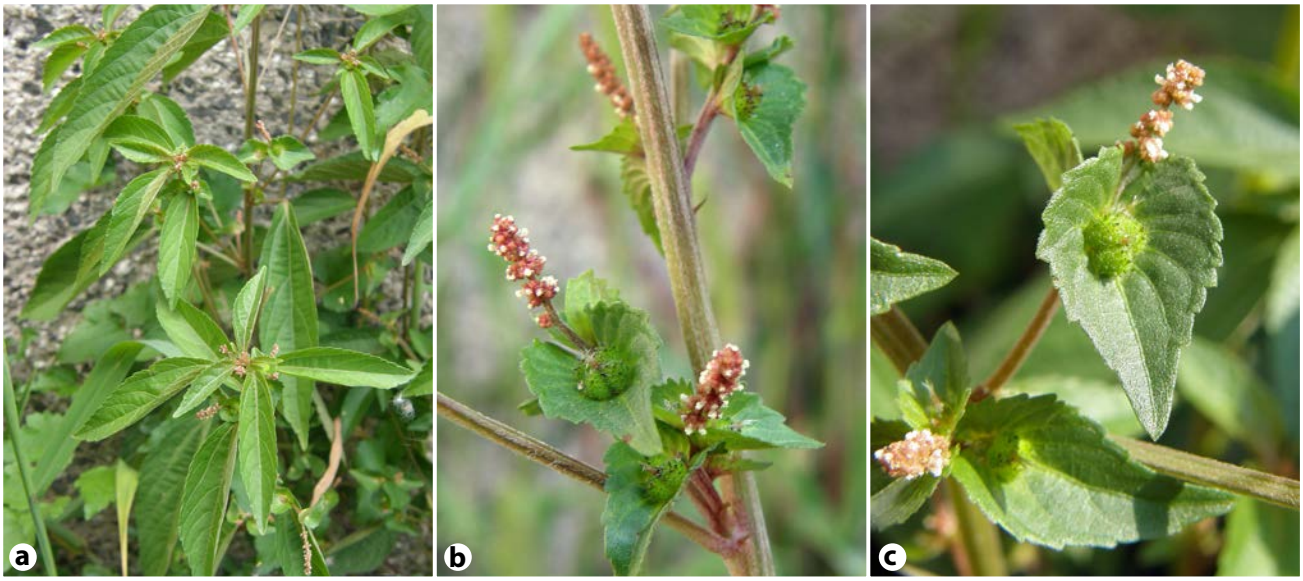


**Fig. 1.** *Acalypha australis:* **a**. plant habit; **b**. inflorescences; **c**. bracts of the female portion of the inflorescences (photos A. Petrova).

alternative, shortly stipulate, petiole 2–5 cm; leaf blade oblong-ovate to broadly lanceolate, 2.5–9 cm, with prominent veins, crenate, apex shortly acuminate. Inflorescences axillary, 1.5–5 cm, bisexual, pedunculated, with 1–2(3) ovate to cordate pistillate bracts at the base, 0.9–1.8 × 0.7–1.3 cm (at flowering time), with crenate margins; groups of (1)2–3 female flowers form the female portion; male portion distal, spike-like, slender, bracts small, with groups of 5–7 male flowers. Flowers inconspicuous; male with 4, female with 3 sepals, ovary pilose. Capsule 3-locular, *ca.* 4 mm, pilose and tuberculate.

The genus *Acalypha* is among the largest in the family, with more than 450 species and pantropical distribution (Webster 1994). Only a small number of species is distributed in the temperate regions. One of those is *A. australis*, native to East Asia: the Russian Far East, Japan, Korea, China, Vietnam, Philippines. As an alien plant, it is known from the European part of Russia, Ukraine, Italy, Caucasus, Australia, USA, India, and the Asiatic part of Turkey (Poyarkova 1949; Randall 2007; Hauxing & Gilbert 2008; Celesti-Grapow 2009; Duman & Terzioğlu 2009; Egoshin 2014; etc.). In most of those areas it is considered naturalized.

Determination of unintentionally introduced species from remote areas is often a difficult task, as they are not included in the local and regional floras. Incorrect identifications make no exception. This has happened a few times with *A. australis*. Its main distinguishing feature are the large (usually longer than 1 cm) ovate to cordate bracts at the base of female flowers (Fig. 1c). The species with similar, but much smaller pistillate bracts (less than 0.5 cm) is *A. indica* L. It was *A. indica* that was first reported for the Caucasus (Poyarkova 1949) and Italy (Zanotti 2007), instead of *A. australis*.

A possible explanation why Koceva & Dimitrov (1997) had misidentified the Bulgarian specimens is that in a situation of limited information only *Flora Europaea* was used for identification. The single *Acalypha* included there is *A. virginica*. It is native to North America and has deeply lobbed pistillate bracts (Tutin 1968; Levin 1999).

## *Distribution in Bulgaria*

***Personal collections*:** Bulgaria, Sofia region, Sofia, Botanical Garden of the Bulgarian Academy of Sciences, at the basement of glasshouses, FN92, 42.64496°N, 23.30081°E, 28.08.2016, with flowers and unripe fruits, coll. *A. Petrova* (SOM 172910); Sofia, 49 Moskovska Str., Faculty of Journalism and Mass Communication, in crevices of the pavement in front of the building, 42.69761°N, 23.33428°E, 19.10.2016, with flowers and fruits, coll. *A. Petrova* (SOM 173092).

***Other specimens examined*:** Bulgaria, Sofia, in the yard of the former Faculty of Biology (presently, Faculty of Journalism and Mass Communication), 49 Moskovska Str., in the cracks of the asphalt and near the walls, 31.08.1968, with fruits, coll. *N. Vichodcevsky*, det. *D.S. Dimitrov* (SOM 152918; SO 98411 & 98432) sub *A. virginica*, rev. *A.S. Petrova*; Sofia, next to the central staircase of the Faculty of Pharmacy, 49 Moskovska

Str., 23.07.1997, coll. *D.S. Dimitrov* (SO 98902) sub *A. virginica*, rev. *A.S. Petrova*; Znepole region, Mt. Zemenska, 800 m, in Mechka foothills, on limestone, 23.04.1961, coll. *D. Yordanov* & *A. Janev*, det. *A. Asenov* (SO 106399) sub *A. virginica*, rev. *A.S. Petrova*.

***Populations*:** The population in the Botanical Garden, BAS, numbered 21 individuals. Of them, 17 grew grouped together in a spot approx. 1.8 × 0.6 m. Three more individuals grew at a distance of 3–4 m along the same basement, and one at a distance of approx. 10 m in a crevice of the pavement of the inner yard. All but two individuals were eradicated completely two days after the identification. The two remaining plants were cut off near the base. They developed short secondary branches (6–10 cm) that formed inflorescences at the end of September and continued the vegetation till the first frost at the end of October. The accompanying species were *Amaranthus retroflexus* and *Setaria pumila*. Considering the number of individuals and their spacious structure, it has been assumed that this population was possibly started in (2014) 2015 by a single seedling. As the place of the main group of individuals is just were the office car used to park, possibly that car is the vector that has driven the seed precursor there.

The population at 49 Moskovska Str., where the Faculty of Journalism and Mass Communication, Faculty of Pharmacy and University Botanical Garden are situated and share a common yard, numbered only four individuals at the time of the author's visit (October 2016). Of those, two were flowering and two were small vegetative ones. This population at 49 Moskovska Str., apparently has survived at least since 1968. The neighbouring streets were searched for the species with negative results. Dimitrov (2004) reported that the species was observed in 2 map's grids in Sofia (in the Centre).

***Habitats and phenology*:** Within its vast native range, *A. australis* inhabits grasslands, riverbeds and slopes, forest glades and cultivated areas, in sunny to semi-shaded places, at altitudes up to 1900 m, and apparently is adapted to different climatic conditions. It used to grow on humid soils. Flowering and fruiting takes place in April–December in China and in July–August in the Russian Far East (Poyarkova 1949; Hauxing & Gilbert 2008; Kravchenko 2010).

As an alien plant, it is found as a weed in arable lands, gardens, waste places, and at the roadsides. Soil humidity is regarded as an important factor (Duman & Terzioğlu 2009; Egoshin 2014). Reports from the temperate zone in Europe (Duman & Terzioğlu 2009; Senator & al. 2013; Lisovets 2016) are for a flowering season in July–September (October) and fruiting in August–October (November).

On the basis of some reliable existing data, the flowering in Bulgaria is from July to September (October) and fruiting in September–October.

***Distribution in the Znepole floristic region*:** Asenov (2010) reported *A. virginica* for Mt. Zemenska. He gave two localities on the basis of one voucher: "close to peak Tichak, on the ridge in open rocky places, on limestone, 1000 m, … 800 m, at Mechka foothills, 23.04.1961, coll. *D. Jordanov* & *A. Janev* (SO 106399)". This was the only information. The check in the Herbarium of Sofia University (SO) has revealed that on the sheet with this number there are two plants, 22 and 35 cm high, with many well developed inflorescences. The locality (according to the sheet's label) is "Mechka foothills, on limestone".

Some facts are questionable about this voucher. First, *A. australis* is an annual plant and it is unrealistic for it to reach the flowering state in April. Lisovets (2016) reported that germination takes place at the end of April in Dnipropetrovsk. A comparison with other samples has shown that the phenological phase is very similar to that of specimen SO 98902 collected in late July. Second, dry habitats that are typical for Mechka foothills are not suitable for the species which grows on damp to wet soils.

According to Asenov (pers. comm.), he has found this herbarium material in a group of specimens (of different taxa) kept in the Herbarium (where he serves as Curator) with a single accompanying data note. He has not observed the species in nature, although he worked on the flora of Mt. Zemenska for eight years (Asenov 2015). Considering the above notes, it is logical to assume that the herbarium specimen was neither collected at that date, nor in that locality. Quite possibly, the sample was collected also in the 49 Moskovska Str. locality, as one of the collectors, A. Janev, used to work at the Botanical Garden there.

## Conclusion

According to DAISIE (2016), five species of *Acalypha* are registered in Europe as aliens. The existing data show that only *A. australis* has been collected in Bulgaria. It should be considered naturalized, for at least

one population has survived since the 1960s and other populations were also observed. So far, only the distribution in Sofia floristic region has been confirmed; the report for Mt. Zemenska, Znepole floristic region (Asenov 2010) is probably a mistake.

*Acalypha virginica* should be excluded from the lists of the Bulgarian flora.

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