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***Acalypha australis* (Euphorbiaceae), a new alien species in the urban areas of Tirana (Albania)**

Abstract

Saliaj, O., Mesiti, A. & Mullaj, a.: *Acalypha australis* (Euphorbiaceae), a new alien species in the urban areas of Tirana (Albania). — Fl. Medit. 34: 5-11. 2024. — ISSN: 1120-4052 printed, 2240-4538 online.

The flora of Albania, in relation to its surface, is one of the richest in Europe. Currently, it includes more than 3629 species; 230 species belonging to 58 different families have been documented as alien species in Albania. *Acalypha* is the fourth largest genus of the Euphorbiaceae with approximately 450-570 species. *Acalypha australis* found recently in Albania, represents not only a new alien species for the Albania flora, but also a new genus (*Acalypha*). *A. australis* is native to the Russian Far East, China, Japan, and the Philippines and naturalized in Australia and other regions in Eurasia, including the Caucasus, Ukraine, Italy, Armenia, and Turkey. In Albania, *A. australis* was found in the city of Tirana with a small number of individuals (one or two), on third November 2022. In 2023 the species has reproduced successfully and is forming large populations in the new urban ecosystem, becoming potentially invasive in the next years.

Key words: xenophytes, alien flora, urban flora, biogeography.

Article history: Received 29 July 2023; received in revised form 15 January 2024; accepted 15 January 2023; published 29 January 2024.

Introduction

Alien species have been introduced intentionally or unintentionally for centuries. The alien flora of Albania is rather poorly documented. Until the middle of the 19th century, no floristic records containing alien species have been published for Albania, new alien species were reported during the communist era, but most of them had probably arrived earlier and were just detected in that period (Barina & al. 2013). The spread of invasive alien species (IAS) is now recognized as one of the greatest threats to the ecological and economic well-being of the planet. These species are causing enormous damage to biodiversity and the valuable natural agricultural systems upon which we depend (IUCN 2000). As in other parts of the world, a large number of alien species have been introduced in Albania (Mullaj & al. 2007).

According to Barina & al. (2013), 230 species belonging to 58 different families have been documented as alien species in Albania, mostly part of *Onagraceae*, *Plantaginaceae* and *Polygonaceae*.

Acalypha australis L., found recently in Albania, represents a new alien species for this country. The flora of Albania, in relation to its surface, is one of the richest in Europe. In the published editions of “Flora of Albania” (1988-2000) 3250 species are included (Paparisto & al. 1988; Qosja & al. 1992; Qosja & al. 1996; Vangjeli & al. 2000), but from that time till nowadays, a large number of new taxa have been reported (Meço & Mullaj 2015; Nobis & al. 2018).

Euphorbiaceae in the flora of Albania includes only four genera (*Chrozophora* Neck. ex A. Juss., *Euphorbia* L., *Mercurialis* L., and *Ricinus* L.) (Qosja & al. 1992), consequently the new species *Acalypha australis* L. represents not only a new alien species for Albania, but also a new genus.

Acalypha L. is the fourth largest genus of the *Euphorbiaceae* with approximately 450-570 species in the world. Several *Acalypha* species are used as medicinal plants in Africa and in the Mascarene Islands (Seebaluck & al. 2015). The genus is distributed mainly in the tropics and subtropics, with about 60% of species native to the Americas and about 30% in Africa (Duman & Terzioglu 2009).

Acalypha australis, is a weed of gardens, roadways, and waste places (Ohwi 1984; Delendick 1990; AgroAtlas 2010), but seems to be even more harmful in row crops (AgroAtlas 2010). It causes economic losses in cotton, melons, pulses, root and tuberous crops, and vegetables (Zhirong 1990), and may be a dominant weed in maize (Zuo & al. 2008).

The aim of the present paper is to report the species as a new record for the Albanian flora and to provide some data regarding its ecology and distribution.

Material and Methods

In the last three years (as part of the PhD study of the first author), we have carried out data for the urban flora of Tirana city, capital of Albania, based on literature sources and field observations. Apart the urban flora, we have been focused on alien species outside cultivation.

In the first year (2022), we have been focused more in literature review and we have visited different urban areas of Tirana (most of them close to the center) preparing new herbarium specimens.

During the second year (2023), we followed a systematic methodology for the investigation of the urban flora in Tirana city. The Skanderbeg statue in Skanderbeg square was taken as the central point. A circular area with a radius of 2 km has been selected from this statue (Fig. 1). Grids of 250 × 250 m were drawn on this layer and within these grids, 20 were selected and sampled through the random selection function in the QGIS 3.4 Madeira program. These sampling stations were visited during this year, collecting all the species of the urban flora found.

Voucher specimens are deposited in the National Herbarium of the Research Centre of Flora and Fauna, Faculty of Natural Sciences, Tirana University.

Plant nomenclature follows Flora Europaea (Tutin & al. 1972), as well as the Euro+Med PlantBase (Euro+Med 2006).

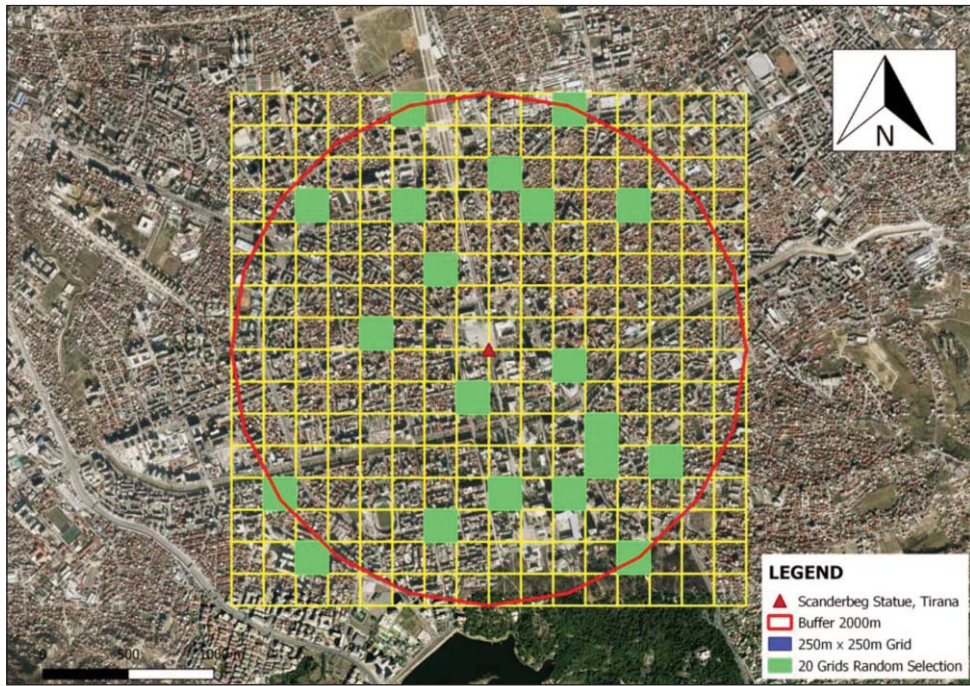


Fig. 1. The map of observation area and sampling stations.

Results and discussion

Acalypha australis, commonly known as Asian copperleaf, is native to eastern Asia (Lee 2015). It is a herbaceous annual plant, growing 20–50 centimetres tall. Its leaves are oblong to lanceolate, 3–9 cm long, 1–5 cm wide with petioles 2–6 cm long. The flowers are in axillary (sometimes terminal) panicles, forming inflorescences 15–50 mm long. There are 1–3 female flowers and 5–7 male flowers per bract; the female flowers have three sepals, whereas the male ones have four (Huaxing & Gilbert 2008).

Acalypha australis, is native to the Russian Far East, China, Japan, and the Philippines. It has naturalized in Australia (NGRP, 2010) and other regions in Eurasia, including the Caucasus, Ukraine, Italy, Armenia, and Turkey (Mulikidzhanyan 1962; Efimova & al. 1997; Berezutsky & al. 2002; Moisiienko & Vasyli'eva 2003; Alexeev & al. 2009; Duman & Terzioğlu 2009; AgroAtlas 2010; DAISIE, 2010). The species has also been introduced to New York (Delendick 1990), northern Australia (Queensland to Victoria) and eastern India (Singh 1967; Huaxing & Gilbert 2008).

In Albania, *Acalypha australis*, was found in Tirana with a small number of individuals (one or two), on third November 2022, during the first year of field survey of the urban flora. It had a very limited distribution along an alley that connects “Avni Rustemi” Square with the “Ring” Road of Tirana (Fig. 2).



Fig. 2. Surveyed area of *Acalypha australis* in Tirana.

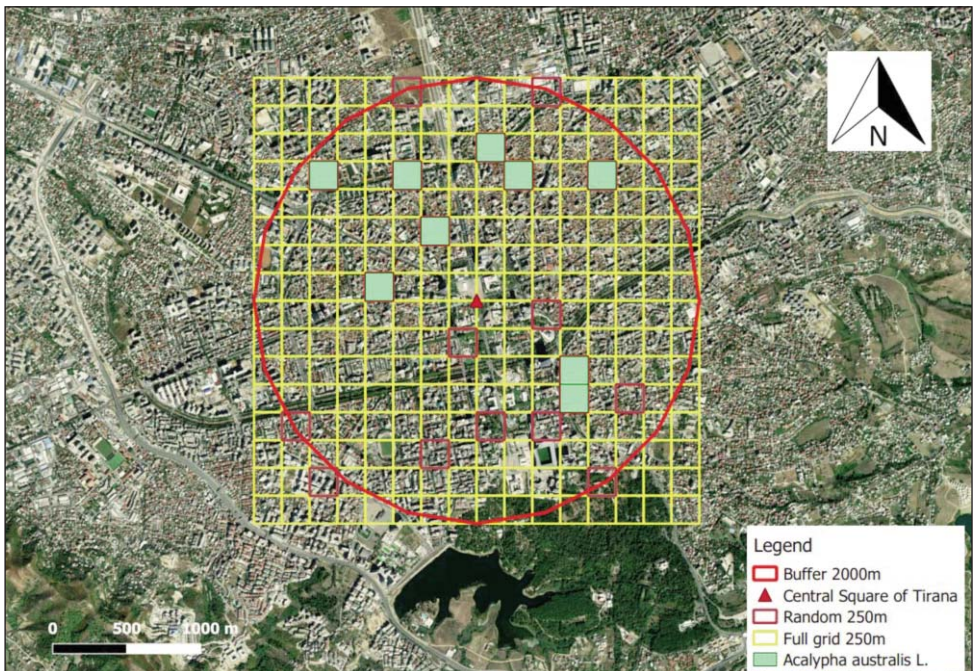


Fig. 3. Presence stations of *Acalypha australis* in Tirana city.

The study area, as part of the city of Tirana, has a typical lowland Mediterranean climate. The average temperature in the city is 15.1°C. The absolute maximum temperatures have reached 41.5°C, while the absolute minimum temperatures have reached - 10.5°C. In Tirana, an average of 1,273 mm of rain falls per year (Noti & Totoni 2012).

During this year, visiting all the 20 chosen sampling stations, we found again *Acalypha australis*, in more than 9 stations (Fig 3). In all these areas *A. australis*, was found in large populations with a number of up to 100 individuals and even in flower pots (Fig 4).

Knowing the features of the species (not being an ornamental plant) and the place where it was first found (in the corner of the wall), we can assume that this species is accidentally introduced by humans.

The results above confirm that this species has reproduced successfully and is forming big populations in this new urban ecosystem, becoming potentially invasive in the next years.

In the next years we will continue with the investigation of the urban flora of Tirana and we will complete the distribution map of *A. australis* L. with new data.

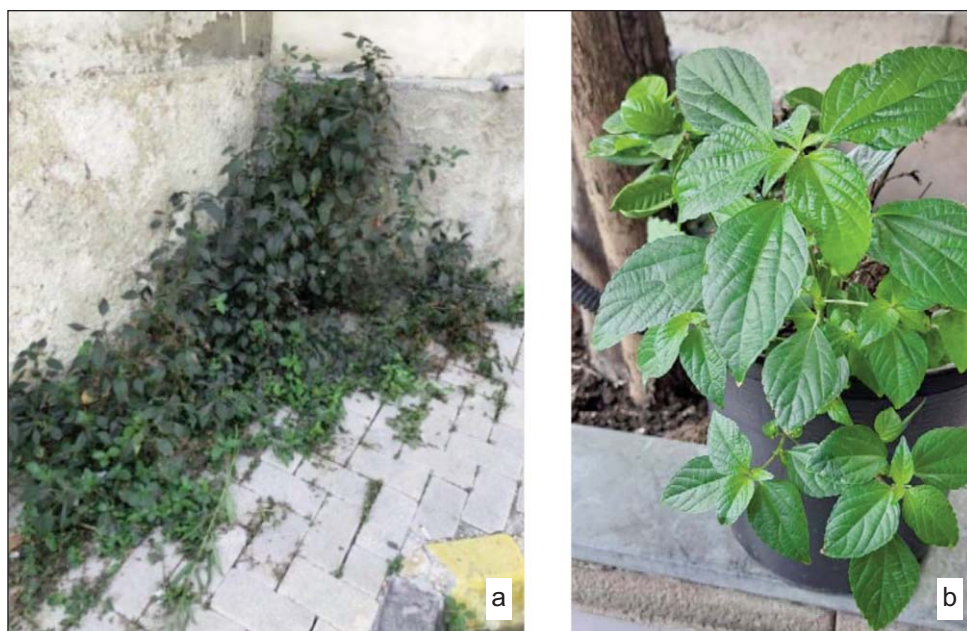


Fig. 4. Picture of *Acalypha australis* in large populations and in flower pot.

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