

## ***Acalypha brachystachya* (Euphorbiaceae) - A New Alien Addition to the Angiospermic Flora of Türkiye**

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### **Abstract**

**Aim of study:** In the present study, *Acalypha brachystachya* Hornem. (Euphorbiaceae) is recorded to the vascular flora of Türkiye from NE Anatolia for the first time, as a neophyte.

**Area of study:** Research and application greenhouse of Forest Faculty, Karadeniz Technical University (KTU) in Trabzon province, Türkiye.

**Material and method:** Studied materials of *A. brachystachya* were collected from the pots in KTU propagation and research greenhouse in Trabzon province located in NE Anatolia. All specimens were stored at KATO (in Karadeniz Technical University, Faculty of Forestry) Herbarium.

**Main results:** *A. brachystachya* is reported from propagation and research greenhouse as a new alien species for the vascular flora of Türkiye.

**Research highlights:** A greenhouse weed, second alien species of the genus *Acalypha* in Türkiye, reported here which has not been reported yet from Türkiye prior to the present paper. It is estimated that it was unintentionally carried to Türkiye by the pot soil. Though its large natural distribution, *A. brachystachya* was only reported from Canary Islands and Europe (South Italy and Hungary) as alien species before the present report. The species has not hitherto been reported as invasive. However, it has been reported from greenhouse in Anatolia (present study), garden and nursery material in Europe. Therefore, the authors recommend monitoring the species where it has been detected in Türkiye.

**Keywords:** *Acalypha*, Alien Species, Anatolia, Greenhouse Weed

## ***Acalypha brachystachya* (Euphorbiaceae) - Türkiye Kapalı Tohumlu Bitki Florasına Yeni Bir Yabancı İlave**

### **Öz**

**Çalışmanın amacı:** Bu çalışmada, *Acalypha brachystachya* Hornem. (Euphorbiaceae), Türkiye'nin vasküler florasına ilk kez Kuzeydoğu Anadolu'dan neofit olarak kaydedilmiştir.

**Çalışma alanı:** Karadeniz Teknik Üniversitesi Orman Fakültesi Araştırma ve Uygulama Serası (Trabzon-Türkiye).

**Materyal ve yöntem:** *A. brachystachya*'nın incelenen materyalleri KD Anadolu'da bulunan Trabzon ilindeki üretim ve araştırma serasındaki saksılardan toplanmıştır. Tüm örnekler KATO Herbaryumu'na (Karadeniz Teknik Üniversitesi, Orman Fakültesi) konulmuştur.

**Temel sonuçlar:** *A. brachystachya*, Türkiye vasküler florası için yeni bir yabancı tür olarak üretim ve araştırma serasından rapor edilmiştir.

**Araştırma vurguları:** Burada bildirilen, Türkiye'deki *Acalypha* cinsinin ikinci yabancı türü olan sera otu, bu makaleden önce Türkiye'den bildirilmemişti. Türün, saksı toprağıyla istem dışı Türkiye'ye taşındığı tahmin edilmektedir. *A. brachystachya*, geniş doğal yayılışına rağmen, bu rapordan önce sadece Kanarya Adaları ve Avrupa'dan (Güney İtalya ve Macaristan) yabancı tür olarak bildirilmiştir. Tür şimdiye kadar istilacı olarak rapor edilmemiş, buna karşın, Anadolu'da seradan (bu çalışmayla), Avrupa'da ise bahçe ve fidanlık materyallerinden bildirilmektedir. Bu nedenle yazarlar, türün Türkiye'de tespit edildiği alanlarda izlenmesini önermektedir.

**Anahtar kelimeler:** *Acalypha*, Yabancı Tür, Anadolu, Sera Yabancıotu



## Introduction

Greenhouses, used for plant propagation and research, is one of the plant diaspores carrying and dispersing points. Due to artificial hot and humid climate conditions, they have been hosted many plant taxa out of target species. Contaminated equipment, organic and inorganic substances (soils, fertilizers, peats etc.) and especially uncertified seeds cause many diaspores transported to greenhouses. Diaspores carried with these elements can easily germinate and form new individuals in the suitable greenhouse environment. Later, some of these plants, mostly invasive and have wide ecological tolerance, form living cover in greenhouses, while others can literally infiltrate the natural environment and increase their populations. Although the flora of greenhouses is a very interesting, it was poorly studied subject of research (Galera & Ratyńska, 1999).

As underlined that trades of horticulture have increasing impacts on the rate of introducing alien species to the new ecosystems (Sonkoly et al., 2024). As the transfer mechanisms, vectors are responsible for the introduction (Ruiz & Carlton, 2003) and they include different physical means or agents, such as pot soils. Pathways are the routes thorough which the alien species travel from their natural range to new areas (Mack, 2003). The combination of knowledge about vectors with higher chances of transporting invasive species and the routes that they travel to and within a particular area leads to the organization of preventive actions, early detection and rapid response (Ziller & Zalba, 2007; Brancatelli & Zalba, 2018). As well, greenhouses are one of the most important places both for hosting alien species and where the movement of alien species should continuously have been monitored and early detected.

With over 246 genera and 6300 species, the Euphorbiaceae *sensu stricto* are one of the largest and most diverse plant families (Barberá et al., 2013) and subdivided into four subfamilies (Radcliffe-Smith, 2001, APG, 2009). Acalyphoideae is the largest one of Euphorbiaceae Juss. (Barberá et al., 2013). The subfamily with the highest number of taxa belonging to this family in Anatolia is Euphorbioideae. The best represented genus

of this subfamily is *Acalypha* (Barberá et al., 2013).

Furthermore, the genus *Acalypha* L. (Sp. Pl. 2: 1003. 1753) belongs to tribe *Acalypheae* Dumort. and subtribe *Acalyphinae* Griseb. (Webster, 1975, 1994). With 429 accepted species (POWO, 2025), it is the third most species-rich genus of Euphorbiaceae, after *Euphorbia* L. (ca. 2000 species) and *Croton* L. (ca 1200 species) (Cardiel & Muñoz-Rodríguez, 2015; Montero-Muñoz et al., 2020; Cardiel et al., 2023). In Turkish vascular flora, Euphorbiaceae is represented by five genera, namely; *Chrozophora* Neck. ex A. Juss., *Euphorbia* L., *Mercurialis* L., *Acalypha*\* L. and *Ricinus*\* L. (non-native genera (\*)) (Radcliffe-Smith, 1982; Duman & Terzioğlu, 2009; Güner et al., 2012). It comprises both woody (trees, shrubs and semishrubs) and herbaceous taxa which grow in a wide variety of habitats (Cardiel et al., 2023). *Acalypha* taxa grow in different habitats, especially in lowland tropical and subtropical rainforests and montane forest, and in savannahs, seasonal forests, dry forests, and shrublands, ranging from 0 to 4000 m. a.s.l. (Cardiel & Muñoz-Rodríguez, 2015).

The native range of *Acalypha brachystachya* Hornem. is Central and South China to Tropical Asia, Tropical Africa to Arabian Peninsula. The species grows mainly in tropical biomes, and introduced into Canary Islands (POWO, 2025), Southern Italy (Campania) (Del Guacchio et al., 2020) and Hungary (Sonkoly et al., 2024), (Figure 1).

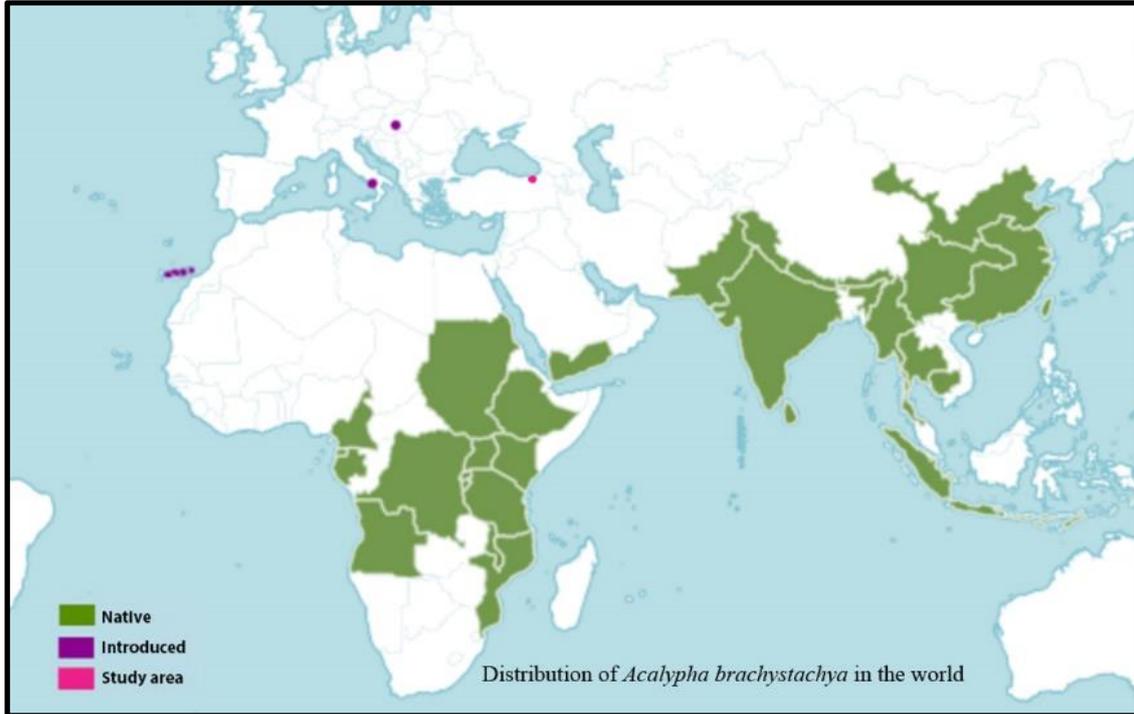


Figure 1. Distribution of *A. brachystachya* in the World (Modified from POWO, 2025; Del Guacchio et al., 2020; Sonkoly et al., 2024)

Seven taxa of *Acalypha* have been reported as aliens in Europe so far, and interestingly, all of them are annual and monoecious herbs. They are *A. indica* L., *A. mexicana* Müll. Arg., *A. ostryifolia* Riddell (synonym of *A. persimilis* Müll. Arg.), *A. rhomboidea* Raf., *A. virginica* L. (Del Guacchio et al., 2020) and *A. brachystachya* (Culiță, 2023; Sonkoly et al., 2024; POWO, 2025).

Some of the *Acalypha* species have “allomorphic female flowers”. A remarkable feature of *Acalypha* floral morphology is the presence of dimorphic pistillate flowers in many species (Sagun et al., 2010). Together with the ‘normal’ pistillate flowers, some *Acalypha* taxa, including *A. brachystachya*, has the same plant produce a second pistillate flower type, named as allomorphic (Radcliffe-Smith, 1973; Bhattacharya & Sukantamajumdar, 2015). Allomorphic female flowers are not common, but ‘normal’ types. It has only one or two carpels, and its ovary is deeply lobed. For most annual taxa of the genus *Acalypha*, allomorphic flower is one of the most important diagnostic characters together with the normal ones (Sagun et al., 2010). The presence of allomorphic flower is one of the diagnostic character can be used in identification of *Acalypha* species introduced in Türkiye as seen both in identification key

given in this article and in Figure 3. As a first member of the genus, *A. australis* has been reported from Türkiye up to now (Duman & Terzioğlu, 2009). In the present paper, *Acalypha brachystachya*, a greenhouse weed, is reported for the first time in the alien flora of Türkiye from NE Anatolia.

#### Material and Methods

Materials of the present study were collected from research and propagation greenhouse of Karadeniz Technical University, Faculty of Forestry in NE Anatolia. All specimens (KATO 24457!, 24458!) were stored at KATO Herbarium (Herbarium of Karadeniz Technical University, Faculty of Forestry) in Trabzon province. After describing *Phyllanthus tenellus* Roxb. (Phyllanthaceae) from the same greenhouse (Terzioğlu, 2024), we decided to investigate the weed flora of the present greenhouse. At the end of the study, amongst the listed taxa, some specimens were not determined using related literature on Turkish Flora (Radcliffe-Smith, 1982; Duman & Terzioğlu, 2009; Güner et al., 2012). Checking with proper literature (Poyarkova, 1974; Hauxing & Gilbert, 2008; Huang & Huang, 1990; Sagun et al., 2010), *A. brachystachya* was determined as a new alien

greenhouse vascular weed record for the flora of Türkiye. The new scientific Turkish name of the species was proposed referring to the short inflorescence of the taxon. It was suggested according to the guide of Menemen et al. (2016).

### Results and Discussion

*Acalypha brachystachya* Hornem. Hort. Hafn. 2: 909, 1807. (Figure 2).

Turkish name: Kısabaşaklı Burtam

Synonyms: *Acalypha calyciformis* Wight ex Benth., *A. conferta* Roxb., *A. elegantula* Hochst. ex A.Rich., *A. fissa* Benth., *A. supera* Forssk., *Ricinocarpus brachystachyus* (Hornem.) Kuntze., *Tragia tenuis* Benth. (POWO, 2025).

The description of the species was prepared based on our new collections from Türkiye, Huang & Huang (1990), Hauxing & Gilbert (2008) and Sagun et al. (2010).

A slender annual, monoecious herb, 20-45 cm high. Stem sulcate, sparsely hairy and pubescent. Stipules persistent, elliptic, ca. 5 mm; petiole tomentose, up to 95 mm; leaf blade ovate to elliptic, acuminate with obtuse tip, margin serrate, base cordate or rounded, 2-5.5 x 1.2-3.5 cm, membranous, sparingly pilose on both sides; basal veins 3-5. Bisexual inflorescence axillary, 1-4 per axil, very short, shorter than bracts; peduncle  $\pm$  absent; female bracts 3-5 lobed,  $\pm$  5 mm, middle lobes oblong, lateral ones smaller, 1-flowered; apex sometimes with allomorphic female flower. Staminate flowers fascicled; pedicel ca. 0.5 mm; calyx ca. 0.3 mm in diam. in bud, pilose; stamens 7 or 8, filaments 0.25 mm long. Pistillate flowers 0.5–0.75 mm in diam., 4–6 per bract, pedicel short; sepals 3, suboblong, about 0.4 mm, ciliate; ovary globose to ellipsoid, pilose and hirtellous, styles 3,  $\pm$  1.5 mm, 3-5-lacinate. Capsule 3-locular, ca. 2 mm in diam., pilose and tuberculate. Allomorphic fruits terminal, pedicel 0.5–0.75 mm long, indumentum simple, sparse; mericarp obovoid, 1–2 x 1–3 mm, ribbed. Seed 3 in each capsule, brown, ca. 1.2 mm, very minutely pitted, carunculate. *Fl.* 5-12.

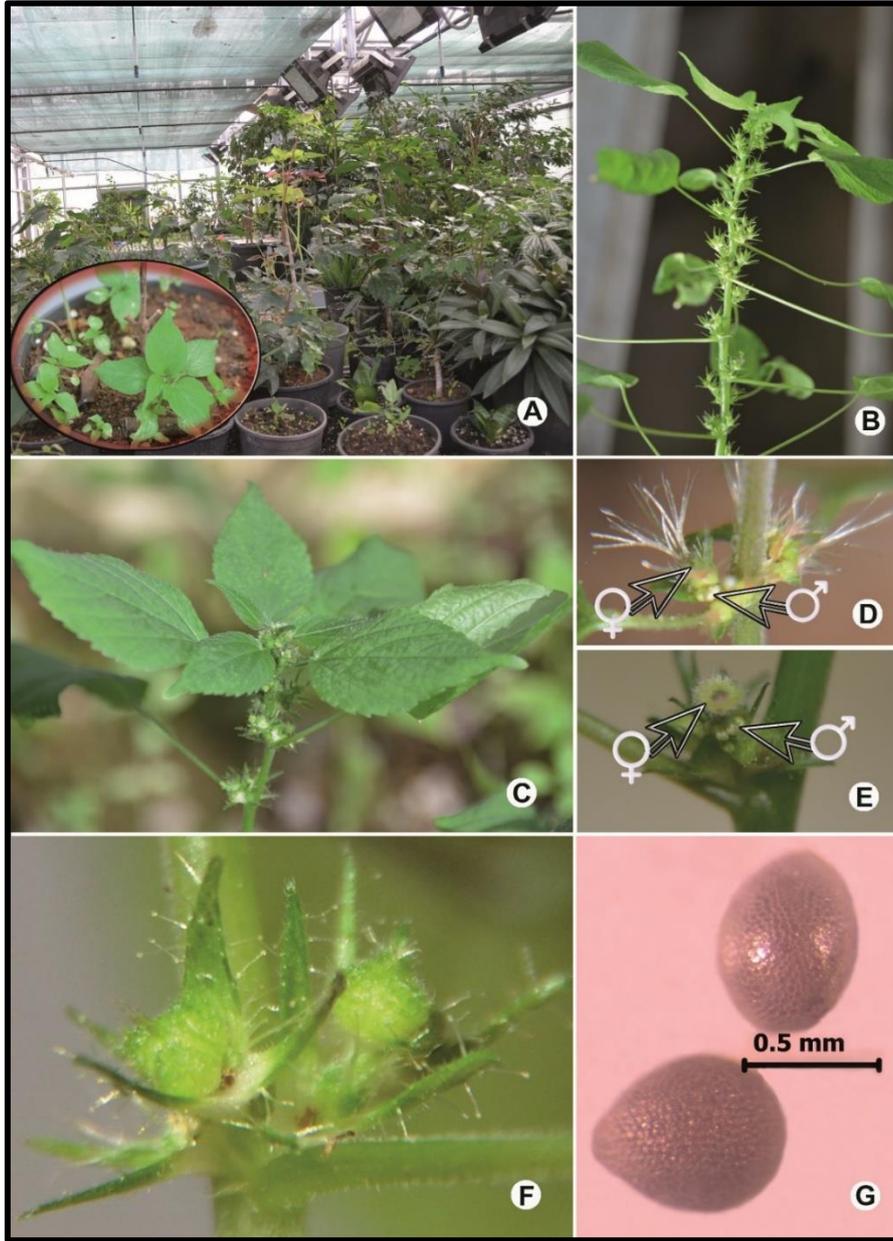


Figure 2. *Acalypha brachystachya* Hornem.

A. Individuals in the pots on greenhouse bench; B-C. Mature individuals; D. Staminate and normal pistillate flowers on the same inflorescence, female flowers with highly lacinate stigmas; E. Allomorphic female flower; F. 3-locular capsules and deeply lobed bracts; G. Seeds.

Two species of *Acalypha* have been reported as alien plants in Türkiye so far and they can be distinguished as follows:

1. Inflorescences less than 1 cm, spike sessile, bracts of female flowers deeply 3-5 lobed, allomorphic female flower present (*A. brachystachya*)

1. Inflorescences more than 1 cm, spike pedunculate, bracts of female flowers not lobed, margin crenate or denticulate, allomorphic female flower absent (*A. australis*)

Because of the distribution of *Phyllanthus tenellus* Roxb. introduced to greenhouses in Türkiye, pot soil is an important vector for easily dispersing diaspores of plants, and especially the lower altitudes of the Eastern Black Sea region of Türkiye are at risk of easy invasion (Terzioğlu, 2024). Similarly, describing *A. brachystachya*, a greenhouse weed, in the region highlighted that the process of introduction of the weeds has been continuing. This taxon has a limited distribution, as alien species, in the world (Figure 1) and the current record is a surprise.

It will be carried out of greenhouse with the pot soil and will be able to spread easily in NE Anatolia due to appropriate environmental conditions.

Among the accompanying weeds (native and non-native (\*)) in the greenhouse, we observed the following species: *Acalypha australis* L.\*, *Ailanthus altissima* (Mill.) Swingle\* (small seedlings), *Bidens frondosa* L.\*, *Chenopodium album* L., *Cardamine lazica* Boiss. & Balansa, *Commelina communis* L.\*, *Digitaria sanguinalis* (L.) Scop., *Echinochloa crus-galli* (L.) P.Beauv., *Euphorbia peplus* L., *Galinsoga parviflora* Cav.\*, *Lysimachia arvensis* (L.) U. Manns & Anderb., *Microstegium vimineum* (Trin.) A. Camus\*, *Myosotis arvensis* (L.) Hill, *Oxalis corniculata* L.\*, *Parietaria judaica* L., *Persicaria thunbergii* (Siebold & Zucc.) H.Gross\*, *Phyllanthus tenellus* Roxb.\*, *Phytolacca americana* L.\*, *Polypodium vulgare* L., *Solanum nigrum* L., *Sonchus asper* (L.) Hill, *Stellaria media* (L.) Vill., *Tradescantia fluminensis* Vell.\*, *Urtica dioica* L.

*A. brachystachya* is reported in this article for the first time in the alien flora of Türkiye. It has been identified in the NE Anatolia as a weed and is estimated to be carried to this place via the pot soil. Although the time of introduction of the species is not clear, depending on our ongoing studies on alien species in the region, it is possible to say that it may be carried to studied place in a short time before. The authors suppose that this alien taxon was accidentally introduced in Türkiye by imported uncertified seeds and/or infected potted ornamental plant soil.

Studies shed light that greenhouses are one of the important places through which the alien species introduced to vascular flora of Türkiye (Terzioğlu, 2024). Different cultural practices, such as irrigation, planting, fertilizing, saving equipment clean and tillage are employed for creating appropriate condition for the greenhouse plants. Properly used such kind of practices help in controlling greenhouse weeds. Cultural methods, alone cannot control greenhouse weeds, but help in reducing their population, and prevent to dispersing diaspores out of greenhouses. This species should be monitor especially in gardens where the ornamental plants carried from the greenhouses.

## Ethics Committee Approval

N/A

## Peer-review

Externally peer-reviewed.

## Author Contributions

Conceptualization: S.T. and F.K.; Investigation: S.T.; Material and Methodology: S.T. and F.K.; Visualization: S.T. and F.K.; Writing-Original Draft: S.T.; Writing-review & Editing: S.T. and F.K. All authors have read and agreed to the published version of the manuscript.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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