



# *Dysphania pumilio* (R. Br.) Mosyakin & Clemants (Amaranthaceae), a new allochthonous species in the flora of Serbia

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**ABSTRACT:** *Dysphania pumilio* (Amaranthaceae) is a new allochthonous species in the flora of Serbia. During the period of 2006-2016, it was recorded at three localities in the valley of the Pčinja River in southeastern Serbia. On the basis of the number of populations and the period of time elapsed since it was recorded for the first time in 2006, we assume that this species is now naturalised in Serbia. *Dysphania pumilio* in Serbia is found in ruderal habitats within settlements, on sand and gravel riverbanks, in well-trodden places along roads, in abandoned cultivated fields, etc., usually within the *Sysimbrion officinalis*, *Hordeion murini* and *Eragrostidion* vegetation alliances. The populations of *D. pumilio* that have been established to date do not show an invasive character in relation to preserved natural habitats in Serbia.

**KEYWORDS:** allochthonous species, Amaranthaceae, *Dysphania pumilio*, Serbia

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## INTRODUCTION

The genus *Dysphania* R. Br., previously included in *Chenopodium* L. (subg. *Ambrosia* A. J. Scott), was originally established to denote about a dozen aromatic plant species characteristic of the Australian mainland (WILSON 1984). However, more recent taxonomic studies have indicated that this genus contains a far greater number of species, some of which are now also present in other parts of the world, where the modern ranges of certain representatives have secondarily increased to a considerable extent (KADEREIT *et al.* 2010; UOTILA 2013).

Up to now, there were five species of the genus *Dysphania* in the flora of Serbia. Often referred to as representatives of the genus *Chenopodium* (SLAVNIĆ 1972; OBRADOVIĆ & PANJKOVIĆ-MATANOVIĆ 1986), they were as follows: *D. ambrosioides* (L.) Mosyakin & Clemants, *D. aristata* (L.) Mosyakin & Clemants,

*D. botrys* (L.) Mosyakin & Clemants, *D. multifida* (L.) Mosyakin & Clemants and *D. schraderiana* (Schult.) Mosyakin & Clemants. During field work in the valley of the Pčinja River (SE Serbia) in 2006, an additional species of *Dysphania* Sect. *Orthospora* (R. Br.) Mosyakin et Clemants in Serbia was recorded, viz., *D. pumilio* (R. Br.) Mosyakin & Clemants.

## MATERIALS AND METHODS

The voucher specimens of *D. pumilio* are deposited in the Herbarium of the Institute of Botany and Botanical Garden "Jevremovac" of the University of Belgrade (BEOU). The determination and morphological description of the species were based on WILSON (1984) and PETROVA *et al.* (2013). The employed nomenclature and classification of taxa are in accordance with *The Plant List* (<http://www.theplantlist.org/>) and UOTILA (2011). Distribution of the species on the territory of

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Serbia was mapped in a UTM (10 × 10 km) grid system (LAMPINEN 2001). The presence of the species in other European countries was ascertained by consulting the relevant floristic literature (GROZEVA 2007; BRANDES 2010; DZHUS 2011; SÎRBU *et al.* 2011; UOTILA 2011; GEDERAAS *et al.* 2012; FREY *et al.* 2015). Its invasiveness status was determined using the terminology according to LAMBTON *et al.* (2008). Data on the abundance of *D. pumilio*, trends of its populations and characteristics of the habitats where it grows in Serbia were obtained in the course of fieldwork performed in 2006 and 2016.

## RESULTS AND DISCUSSION

*Dysphania pumilio* (R. Br.) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59: 382. (2002) (*Ch. pumilio* R. Br., Prodr. Fl. Nov. Holl. 1: 407. (1810)) (Fig. 1a, b, c, d)

*Dysphania pumilio* is an annual, slightly aromatic plant species. The whole plant is densely covered with elongated non-glandular and short glandular trichomes. The stem is branching from the base, 20-50 (80) cm tall. Branches are prostrate, occasionally ascending. Leaves are narrowly to widely elliptical or ovate, rounded at the top, with irregular shallow lobes, rarely bluntly serrate or entire. Leaf laminae are 10-40 mm long, 5-20 mm wide, with short petioles. The basal leaves are ovate-elliptical to lanceolate, with 2-3 (4) lobes on each side; middle leaves are lanceolate with 2-3 lobes, while upper leaves are narrowly lanceolate, mostly with two lobes on each side of the lamina. Flowers are either bisexual or exclusively female, without pedicels, in groups of 4-6 in relatively tiny, compact, spherical inflorescences, placed at leaf axils. The perianth is simple, calyx-like, formed of 5 (4) segments. Segments are narrowly lanceolate, free almost to the base, without a longitudinal rib, with glandular and non-glandular trichomes, especially in their upper part. Segments are permanent, and during fructification they harden and lose colour. The number of stamens is 0-2. The gynoecium is syncarpous, with two free stigmata. The fruit utricle is enclosed in a perianth and has one seed. The pericarp is light yellow, semi-transparent, not fused with other parts of the fruit. The seed is positioned vertically, 0.6-0.8 mm in diameter.

The plant produces a large number of seeds that disperse in an epizoochorous or anemochorous manner, with parts of the perianth participating in dispersal (MORAVCOVÁ *et al.* 2010). Glands in the upper part of the perianth produce a secretion that enables the fruit to better adhere to animal fur and therefore disperse over much greater distances (GROZEVA & CVETANOVA 2013). Due to the presence of a thick seed coat, there is a long period of seed dormancy and therefore high viability. Flowers and fruits are produced from July to October. The chromosome number is  $2n = 16, 18$  (GROZEVA 2007).

**General Distribution:** Native to Australia and

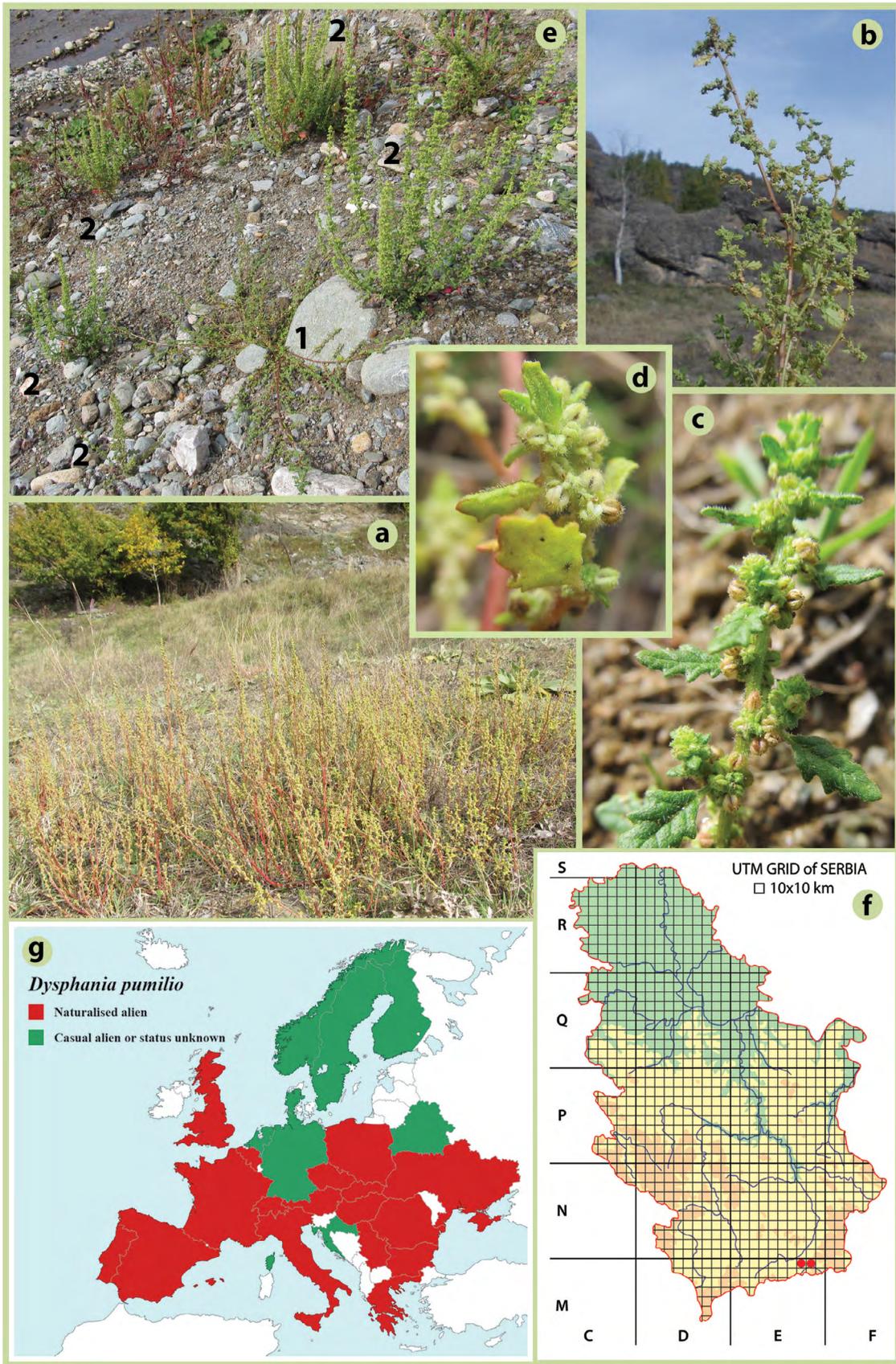
Tasmania, introduced into New Zealand, N and S America, Africa, Asia and Europe (RAHIMINEJAD *et al.* 2004; GROZEVA 2007).

In comparison with other species of the genus *Dysphania* growing in Serbia, *D. pumilio* is morphologically most similar to the species *D. botrys*. It is therefore necessary to stress the main taxonomic details important for separation of these two species. *Dysphania botrys* is strongly aromatic, with an erect stem and profuse, curved, dichotomously branched inflorescences and pinnatifid leaves with 4-6 lobes on each side. *Dysphania pumilio* is generally a shorter plant, weakly aromatic, with proportionally smaller leaves that are sinuate with 3-4 lobes and with tiny spherical inflorescences situated in axils of the leaves (FREY *et al.* 2015). Characteristics of the perianth are considered a supplementary character for identification, since in *D. botrys* the perianth contains five yellowish-green segments that do not harden when ripe, while the perianth in *D. pumilio* contains 4-5 light green segments that harden and turn white as the fruit ripens (GROZEVA & CVETANOVA 2013). The species might also be confused with other *Dysphania* species, in particular with *D. ambrosioides* (UOTILA *et al.* 2001), which differs in having distinctly paniculate inflorescences and entire to dentate leaves.

**Distribution in Serbia, SE Serbia, Pčinja District** (Fig. 1f)

**Novo Selo village [MGRS 34 T EM79]**, in ruderal vegetation on sandy ground (leg. Zlatković, B., Zlatković, K., 17-Sep-2006, 16113 BEOU; sub. *Ch. ambrosioides* L., rev. Zlatković, B., 06-Dec-2016); "The town of Trgovište, Novo Selo village, in ruderal vegetation on sandy ground" (ZLATKOVIĆ *et al.* 2007; sub. *Ch. ambrosioides* L.). When fieldwork was repeated in 2016, the presence of the given species was not confirmed at this locality, in spite of the existence of appropriate habitats.

**Donja Trnica village [MGRS 34T EM89]**, Vražji kamen ("Prošečenik"), in ruderal vegetation on sandy and rocky ground, 590 m (leg. Zlatković, B., Bogosavljević, S., Randelović, M., 15-Oct-2016, 17293 BEOU). The given species occupies an area of several hectares at this locality, attaining particularly high abundance. It is estimated that the population at this site consists of several thousand individuals in the phase of copious flowering and fructification. Maximal abundance was recorded in areas between abandoned cultivated fields under constant movement of domestic animals, as well as on sand-and-gravel river sediments, in vegetation of the alliances *Sysimbrion officinalis* and *Hordeion murini* (Chenopodietea). In such habitats, *D. pumilio* grows together with following plant species: *Amaranthus albus* L., *Anchusa officinalis* L., *Artemisia scoparia* Waldst. & Kit., *Berteroa incana* (L.) DC., *Chenopodium album* L., *Cynodon dactylon* (L.) Pers., *Dysphania botrys*, *Echium*



**Fig. 1.** a – *D. pumilio*, habitat; b – general appearance; c – inflorescence; d – ripe fruits; e – syntopic occurrence of *D. pumilio* (1) and *D. botrys* (2) in Trgovište; f – UTM distribution map of *D. pumilio* occurrence in Serbia; g – presence and status of *D. pumilio* in Europe (according to UOTILA 2011 and DAISIE, modified).

*vulgare* L., *Eragrostis minor* Host, *Erigeron annuus* (L.) Desf., *Eryngium campestre* L., *Euphorbia cyparissias* L., *Linaria genistifolia* (L.) Mill., *Papaver rhoeas* L., *Petrorhagia saxifraga* (L.) Link, *Sanguisorba minor* Scop., *Trifolium campestre* Schreb. and *Verbascum lychnitis* L..

**The town of Trgovište [MGRS 34T EM89]**, in ruderal vegetation, 620 m (leg. Zlatković, B., Bogosavljević, S., Randelović, M., 15-Oct-2016, 17292 BEOU). In the area of Trgovište, the main habitat of *D. pumilio* is represented by vegetation from the alliance *Eragrostidion (Stellarietea mediae)* developed on a strongly trodden substrate. The presence of the given species was also recorded in pioneer-type associations developing on gravel-and-stone deposits and municipal solid waste material along the riverbank in the urban setting. The species *D. botrys* and *D. pumilio* were recorded growing together in this habitat type, *D. botrys* being dominant in terms of abundance (Fig. 1e). In spite of the presence of large areas with favourable habitat types, the population of *D. pumilio* developing inside the town includes only several hundred to a thousand individuals.

Analysis of existing data on the distribution of *D. pumilio* in the European part of its range indicates that this species is present in 25 countries including Serbia (Fig. 1g). In most European countries, the species has the status of a naturalised species (DAISIE 2008; УОТИЛА 2011). In a smaller number of countries, the presence of the species *D. pumilio* seems to be accidental, either reported from a small number of localities or where data on its invasiveness are completely lacking. In view of the fact that the closest known records of *D. pumilio* are from Bulgaria (PETROVA *et al.* 2013), the exchange of grazing animals and their products, facilitated by good traffic connections with other countries of the southern Balkans, may be the way it was introduced into Serbia. Owing to the strong dispersive capacity of this species, we can expect that it will also be found in other, particularly southern regions of Serbia and the Balkan Peninsula where its presence has not yet been detected.

Taking into account the total abundance in each population, the types of habitats where this species grows and the period of time elapsed since the first record in Serbia, we conclude that *D. pumilio* should be considered to have the status of a naturalised, non-invasive plant species in our country. At this moment, the species does not pose any significant threat to autochthonous ecosystems and habitats in areas where it has been recorded.

## CONCLUSION

The first record of *D. pumilio* in Serbia dates from 2006, when it was discovered in the central part of the Pčinja River valley in Southeastern Serbia and erroneously identified as *Ch. ambrosioides*. The currently known

population of *D. pumilio* is estimated to number several thousand individuals, as they have since been additionally recorded at two new localities in the valley. On the territory of Serbia, *D. pumilio* mostly appears on fairly nitrified, well-trodden ground along local roads and in ruderal habitats within settlements, as well as on sand and gravel riverbanks. The highest abundance of the species was recorded in areas under constant grazing and movement of domestic animals. To judge from available published data on the presence of other *Dysphania* species in Serbia and the trend of its spread in Europe, it can be concluded that *D. pumilio* was probably introduced into Serbia in recent decades. Further spreading of *D. pumilio* in the region is expected in the same way as it was introduced into Serbia. The obtained results indicate that *D. pumilio* can be considered a non-invasive, naturalised species on the territory of Serbia. In any event, it is necessary to check for the eventual presence of this species in appropriate habitats in other parts of Serbia in order to precisely determine its range and possibly implement adequate measures for control of its further spread.

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## REFERENCES

- BRANDES D. 2010. *Zur Ruderalflora der Makarska-Riviera (Kroatien)*. The Technical Report Institut für Pflanzenbiologie, Technische Universität Braunschweig. 1-7. DOI: 10.13140/RG.2.1.3615.8167
- DAISIE European Invasive Alien Species Gateway. 2008. *Chenopodium pumilio*. Available from: <http://www.europe-aliens.org/speciesFactsheet.do?speciesId=6595#> [Accessed 23rd January 2017].
- DZHUS MA. 2011. Clammy goosefoot (*Dysphania pumilio* (R. Br.) Mosyakin et Clemants, Amaranthaceae Juss.) – new adventive species in the Belarusian flora. *Vesnik VDU* 5(65): 28-33.
- FREY D, SELLDORF P, PERSICO A, BREUNIG T & SCHOENENBERGER N. 2015. Origine, introduzione e grado di naturalizzazione di nove nuove specie vegetali per la Svizzera. *Bollettino della Società Ticinese di Scienze Naturali* 103: 27-36.
- GEDERAAS L, MOEN TL, SKJELSETH S & LARSEN L-K (eds.). 2012. *Alien species in Norway – with the Norwegian Black List 2012*. The Norwegian Biodiversity Information Centre, Norway.
- GROZEVA N. 2007. *Chenopodium pumilio* (Chenopodiaceae): a new species to the Bulgarian flora. *Phytologia Balcanica* 13(3): 331-334.

- GROZEVA NH & CVETANOVA YG. 2013. Karyological and morphological variations within the genus *Dysphania* (Chenopodiaceae) in Bulgaria. *Acta Botanica Croatica* **72**(1): 49-69.
- KADEREIT G, MAVRODIEV EV, ZACHARIAS EH & SUKHORUKOV AP. 2010. Molecular phylogeny of Atripliceae (Chenopodioideae, Chenopodiaceae): Implications for systematics, biogeography, flower and fruit evolution, and the origin of C<sub>4</sub> photosynthesis. *American Journal of Botany* **97**(10): 1664-1687.
- LAMBON PW, PYŠEK P, BASNOU C, HEJDA M, ARIANOUTSOU M, ESSL F, JAROŠÍK V, PERGL J, WINTER M, ANASTASIU P, ANDRIOPOULOS P, BAZOS I, BRUNDU G, CELESTI-GRAPOW L, CHASSOT P, DELIPETROU P, JOSEFSSON M, KARK S, KLOTZ S, KOKKORIS Y, KÜHN I, MARCHANTE H, PERGLOVÁ I, PINO J, VILÀ M, ZIKOS A, ROY D & HULME PE. 2008. Alien flora of Europe: species diversity, temporal trends, geographical patterns and research needs. *Preslia* **80**: 101-149.
- LAMPINEN R. 2001. *Universal Transverse Mercator (UTM) and Military Grid Reference System (MGRS)*. Downloadable from <http://www.luomus.fi/english/botany/afe/map/-utm.htm>
- MORAVCOVÁ L, PYŠEK P, JAROŠÍK V, HAVLÍČKOVÁ V & ZÁKRAVSKÝ P. 2010. Reproductive characteristics of neophytes in the Czech Republic: traits of invasive and non-invasive species. *Preslia* **82**: 365-390.
- OBRADOVIĆ M & PANJKOVIĆ-MATANOVIĆ V. 1986. Adventivna flora Vojvodine. *Zbornik Matice srpske za prirodne nauke* **70**: 99-114.
- PETROVA A, VLADIMIROV V & GEORGIEV V. 2013. *Invasive alien species of vascular plants in Bulgaria*. Bulgarian Academy of Sciences, Sofia.
- RAHIMINEJAD MR, GHAEMMAGHAMI L & SAHEBI J. 2004. *Chenopodium pumilio* (Chenopodiaceae), new to the flora of Iran. *Willdenowia* **34**(1): 183-186.
- SÎRBU C, OPREA A, ELIÁŠ PJR & FERUS P. 2011. New contribution to the study of alien flora in Romania. *Journal of Plant Development* **18**: 121-134.
- SLAVNIĆ Ž. 1972. *Chenopodium* L. In: JOSIFOVIĆ M (ed.), *Flora SR Srbije III*, pp. 14-29, Srpska akademija nauka i umetnosti, Beograd.
- THE PLANT LIST. 2013. Version 1.1. Published on the Internet; <http://www.theplantlist.org/>
- UOTILA P. 2011. Chenopodiaceae (pro parte majore). - In: *Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity*. Published on the Internet <http://ww2.bgbm.org/EuroPlusMed/> [accessed 08th February 2017].
- UOTILA P. 2013. *Dysphaniasect. Botryoides* (Amaranthaceae s.lat.) in Asia. *Willdenowia* **43**(1): 65-80.
- UOTILA P, RHAUS T & KALHEBER K. 2001. *Chenopodium pumilio* R. Br. In: GREUTER W & RAUS T (eds), *Med-Checklist Notulae*: **20**. *Willdenowia* **31**(2): 320-321.
- WILSON PG. 1984. Chenopodiaceae. In: GEORGE AS (ed.), *Flora of Australia* **4**, pp. 81-317, Australian Government Publishing Service, Canberra.
- ZLATKOVIĆ B, RANĐELOVIĆ V & JUŠKOVIĆ M. 2007. Reports 136-138. In: VLADIMIROV V, DANE F, STEVANOVIĆ V & TAN K. (eds), *New floristic records in the Balkans*: **6**. *Phytologia Balcanica* **13**(3): 452-453.

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**REZIME**

## *Dysphania pumilio* (R. Br.) Mosyakin & Clemants (Amaranthaceae), nova alohtona vrsta u flori Srbije

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*Dysphania pumilio* (Amaranthaceae) je nova, alohtona vrsta u flori Srbije. Njeno prisustvo je, u periodu od 2006. do 2016. godine, zabeleženo na tri lokaliteta u dolini reke Pčinje u jugoistočnoj Srbiji. Nastanjuje ruderalna staništa u naseljima, peskovite i šljunkovite obale reka, ugažena mesta duž puteva, kao i zapuštene obradive površine u sklopu vegetacije sveza *Sysimbrion officinalis*, *Hordeion murini* i *Eragrostidion*. Na osnovu broja registrovanih populacija i pretpostavljenog perioda introdukcije, smatramo da je vrsta naturalizovana u Srbiji, ali da ne ispoljava invazivni karakter u odnosu na očuvana prirodna staništa.

**KLJUČNE REČI:** alohtona vrsta, Amaranthaceae, *Dysphania pumilio*, Srbija

