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## **Invasive status and occurrence of *Amaranthus polygonoides* (*Amaranthaceae*) in Italy, with notes on its taxonomy and morphology**

### **Abstract**

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The occurrence and the invasive status in Italy of *Amaranthus polygonoides* L. are discussed. Morphological characters, taxonomical notes and distribution map are also given.

*Key words*: Alien Flora, Italian regions, Amaranth.

### **Introduction**

*Amaranthus* L. (*Amaranthaceae*) is a genus of about 70 species of monoecious and dioecious usually annuals of worldwide distribution, about 40 of which are native to America, while the remaining ones are native to the other continents (Costea & al. 2001a). 19 species are included in the Italian flora (Conti & al. 2005, 2007; Iamónico 2008a, 2008b). *A. blitum* L. subsp. *blitum* and *A. graecizans* L. are native to Europe, while the remaining ones are considered alien species (most of them are native to the Americas and only two are native to Asia).

Amarants have a high ecologic plasticity that allows them to spread widely and to take possession easily of synanthropic areas characterized by medium to low environmental quality. Consequently, they often have economical and, secondly, ecological impacts (infestation of fields and loss of urban biodiversity) (Iamónico 2008c, 2008d).

Exact identification, careful monitoring, present distribution, ecological studies and evaluation of invasive *status* are necessary informations to precede and to oppose the damage caused by biological invasion (Roy 2008) and to choose the most suitable actions to adopt.

In this paper the presence of *Amaranthus polygonoides* L. in Italy is discussed. Distribution, evaluation of its invasive *status*, notes on its morphology and taxonomy are also given.

## Materials and methods

The study was carried out by:

- extensive analysis of literature;
- investigation and examination of the specimens kept in the following Herbaria: APP, AQUI, BI, BOLO, BOZ, CAME (*Herb. Ballelli*), CAT, FI, IS, LEC, MRSN, MSNM, NAP, RO, ROV, PAD, PAL, PERU (*Herb. Cicioni*), PESA, PI, TO, TSB, URT. The following personal Herbaria were also checked: Herb. Alessandrini (Bologna), Herb. Argenti (Belluno), Herb. Bazzichelli (Roma), Herb. Iberite (Latina), Herb. Lattanzi (Roma), Herb. Pavesi (Roma), Herb. Soldano (Vercelli), Herb. Tisi (Torino).
- filed surveys.

## Occurrence in Italy

The first record of *A. polygonoides* in Italy is by Tenore (1831) «*in maritimis Adriatici: Pescara*». Subsequently, Sanguinetti (1864) reports this species for Porto d'Ascoli and San Benedetto towns (Marche region). Fiori & Paoletti (1900-1902) indicate it as «*inselvat. nelle sabbie mar. del Piceno a Porto d'Ascoli, S. Benedetto, ecc. (Sanguinetti), a Pescara? (Ten.) e nell'Orto bot. Di Mantova (Ex Spec. Hb. Pat.)*». Saccardo (1909) also quotes the records by Tenore (1831), Sanguinetti (1864) and Fiori & Paoletti (1900-1902). Béguinot & Mazza (1916) refer to Fiori & Paoletti (1900-1902) for this species. Fiori (1923) reports the same localities «*avvent. nell'Orto bot. di Mantova e lungo il lit. del Piceno a Porto d'Ascoli*» and doubtfully at «*S. Benedetto e Pescara*» (the author certainly refers for «*S. Benedetto*» to San Benedetto del Tronto, a little town of Marche). Zangheri (1976) reports *A. polygonoides* as an ephemeral species, without locality. Pignatti (1982) records *A. polygonoides* for Marche (Porto d'Ascoli and San Benedetto del Tronto towns), while its presence in Abruzzo (Pescara) is doubtful. Conti & al. (2005) confirm this species for Marche and they also recorded it for Lazio and Molise regions. In the subsequent update of the Checklist of the Italian Vascular Flora (Conti & al. 2007) one new record is reported and the species is considered as “no longer recorded” for Abruzzo, based on Tenore (1831) and Cesati (1873).

As regard Abruzzo, a consideration is to be made. The records by Cesati (1873) and Tenore (1831) refer to a herbarium sheet kept in NAP. Four specimens and four labels are found in this sheet. All specimens are correctly identified as *A. polygonoides* (Rev. D. Iamonico, 04 Feb 2009). The labels report ambiguous informations and they are not pinned, so they are not easily referable to the different specimens. A first label reports “*Scleropus amarantoides*” and “*Bonn.*” that is probably the collector; no locality is indicated. The second label reports the name “*A. polygonoides*”, the locality “*Pescara*” (this locality was subsequently crossed out) and the word “*cultivato*”. In the third label is only wrote “*Ascoli*”, while in the fourth label are reported “*A. polygonoides*”, “*Ascoli*” (this locality was subsequently crossed out) and “*Giulia*”. According to Cesati (1873) the latter refers «*fuori dubbio...a Giulia Nuova*», today the small town Giulianova (Province of Teramo). So the records in Pescara city by Fiori (1923) and Pignatti (1982) have to be

deleted and, therefore, only the oldest record for Abruzzo region refers to Giulianova town (the exact collection date is never indicated, but it certainly is previous the year 1831).

As regard Molise region, *A. polygonoides* was not reported by Lucchese (1995). The author (*in verbis*) claims he never collected this species, neither have I found it during my floristic surveys. The record in Checklist of the Italian flora (Conti & al. 2005) is probably uncorrect. Therefore, *A. polygonoides* can be excluded from regional flora of Molise.

Regarding Lombardia region, two specimens of *A. polygonoides* are kept in FI and PAD. One of these is collected “*nelle sabbie e negli incolti mantovano*” (Leg. Barbieri, Mar 1877, FI), the other in “*Orto botanico di Mantova spontaneo*” (*sine collectore, sine die*, PAD); the exsiccatum kept in PAD is certainly collected in XIX century (R. Marcucci, *in verbis*). The plants are correctly identified (Rev. D. Iamónico, 24 Jun 2009) and they represent a no longer records for Mantova Province. So *A. polygonoides* can be considered as casual alien species in the Region. The records by Fiori & Paoletti (1900-1902) («*inselvat. ... nell’Orto bot. di Mantova (Ex Spec. Hb. Pat.)*») and by Fiori (1923) («*avvent. nell’Orto bot. di Mantova...*») certainly refer to the specimen kept in PAD.

Only one specimen (kept in FI) is collected in Veneto region in “*Orto bot. di Padova*” (Leg. Adr. Fiori, Aug 1896), but in the label is clearly indicated “*coltivato*” [cultivated].

Celesti-Grapow & al. (2009) reported *A. polygonoides* as a casual alien species for Puglia region. However, no specimens and no quotation on literature are found. P. Medagli (*in verbis*) confirms this. So, the species can be excluded from regional flora.

As regard Trentino-Alto Adige region, *A. polygonoides* was indicated as species “not recorded since 1950” by Celesti-Grapow & al. (2009), based on Biasioni (1924, 1929). No specimen was found.

Finally, four specimens are kept in FI. The localities of collection are never indicated, but in the labels are always reported: “*Giardino dei Semplici*” (Herbarium Ricasolium, 1820), “*Hort. Bot. Bonon.*” (Herbarium Ricasolium, 1829, Leg. P. Bubani, Dal Dr. Bubani, Firenze 1834), “*H. Bot. mus. Flor.*” (Herbarium I. et R. Musaei Florentini, 27 Jun 1857, *sine collectore*, sub *Amblogyna polygonoides*) and “*H. Pisano*” (Herbarium Horti Pisani, 1839 etc., *sine collectore*, Da G. Savi in Giugno 1843, sub *Scleropus amaranthoides* Schlecht). I suppose that these plants were cultivated. Chiara Nepi (*in verbis*) confirms my supposition.

Recently, *A. polygonoides* was considered as “recorded in the past by mistake” for Lazio and was excluded from the regional flora (Iamónico 2008b). The investigation of *Herbarium* specimens also confirmed that *A. polygonoides* is to be considered as “no longer recorded” for Marche and Campania (Celesti-Grapow & al. 2009; Iamónico 2009).

The distribution map of *A. polygonoides* in Italy is reported in Fig. 1. Cultivated specimens are not indicated.

### Taxonomical notes

*Amaranthus polygonoides* was first described by Linneo (1759) from “*Jamaica*”. *A. polygonoides* Roxb. (Roxburgh 1832) and *A. polygonoides* Zoll. (Zollinger 1845) are illegitimate. The epithet “*polygonoides*” was used in several nomenclature combinations at subspecies or variety ranks, but always referring to *A. blitum* L. subsp. *emarginatus* (Moq. ex Uline et Bray) Carretero, Muñoz Garmendia & Pedrol (see Costea & al. 2001b).

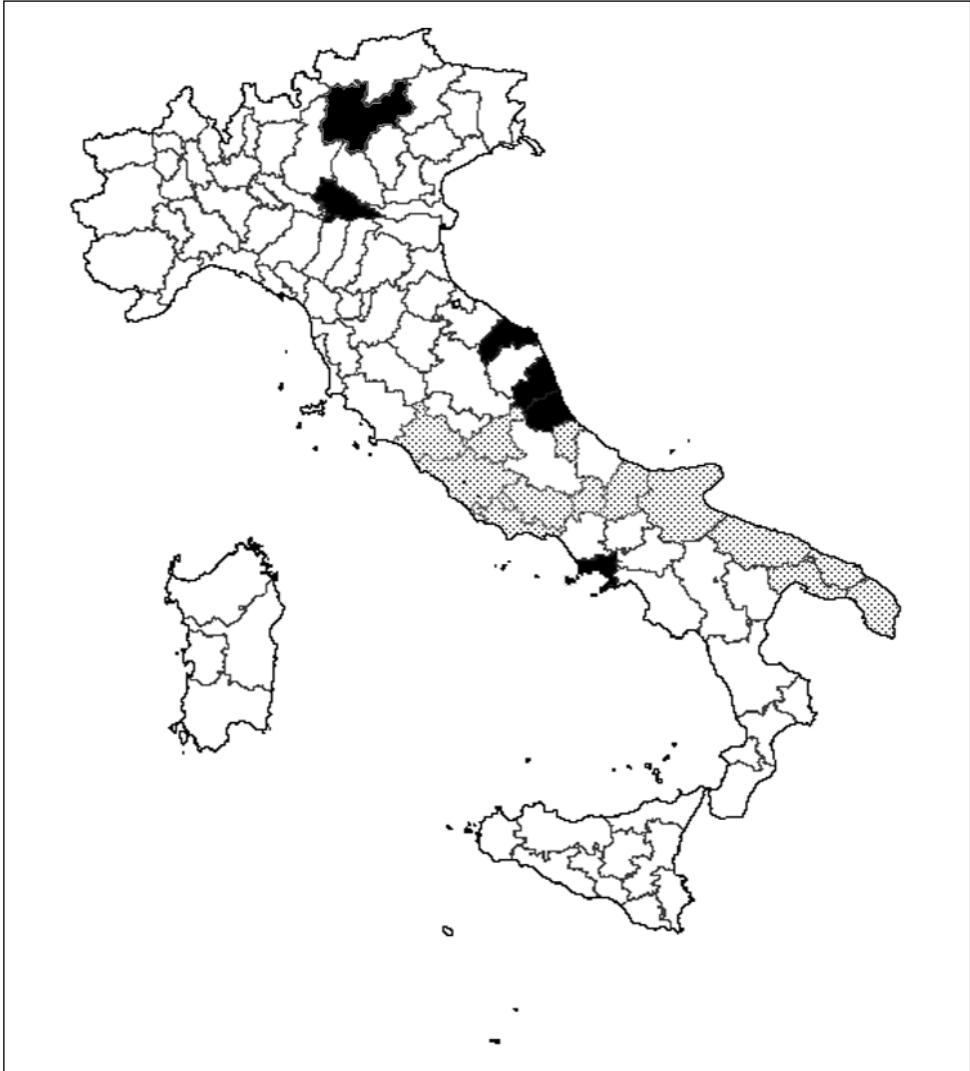


Fig. 1. Distribution map of *A. polygonoides* in Italy: old records (■); wrong records (▨).

The genera *Amblogyna* Raf. and *Scleropus* Schrad. were respectively described by Rafinesque (1836) and Schrader (1835) and they are considered synonyms of *Amaranthus* L.; so the names *Amblogyna polygonoides* Raf. [ $\equiv$  *Amblogyna polygonoides* Danzell & A. Gibson., nom. Illeg. (Danzell & Gibson 1861)] and *Scleropus amaranthoides* Schrad. are synonyms of *Amaranthus polygonoides*.

*A. polygonoides* is included in the subgen. *Albresia* (Kunth) Gren. & Godr. (*sensu* Mosyakin & Robertson 1996), provisionally included in the sect. *Pyxidium* Moquin because of unsolved taxonomical problems.

***Amaranthus polygonoides* L.** Pl. Jamaic. Pug.: 27 (1759)

Prostrate or ascending annual to 0.3-0.4 m, with glabrous stem. Leaves ovate (0.3-1 × 0.6-2 cm), with base cuneate and obtuse (sometimes emarginate) apex; margins usually undulate; petiole equaling the blade. Flowers in axillary clusters. Bracts of pistillate flower ovate to lanceolate, about 1 mm long, shorter than the tepals. Tepals 5, equal, connate in proximal  $\frac{1}{3}$  and patent above, 2-3 mm long, obovate to spatulate, with apex rounded or retuse, mucronate. Fruit indehiscent, 2-2.5 mm, ellipsoidal, about equaling tepals. Seeds 0.8-1 mm in diameter, lenticular, red-brown to black, shiny.

Chromosome number:  $2n = 34$  (Song & al. 2002).

*A. polygonoides* is native to Argentina and has been reported for several states in North America (Mosyakin & Robertson 2003). Bojian & al. (2003) and Brenan (1981) did not report this species respectively for China and southern Africa. Aellen (1964) and Akeroyd (1993) quoted *A. polygonoides* as a synonym of *A. lividus* L. for Europe and reported ruderal areas as habitats. Based on the specimens examined, *A. polygonoides* could be found in disturbed areas (especially railway or roadsides) in Italy. Flowering is in later summer.

**Conclusion**

Based on literature, herbarium and field surveys no recent records of *A. polygonoides* exist for Italy. So, according to Pyšek & al. (2004) this neophyte can be considered as casual alien occurring temporarily in synanthropic environment. The oldest Italian specimen is kept in FI (Giardino dei semplici, 1820, *sine collectore*), but it probably refers to a cultivated plant, while the oldest Italian specimen refers to a spontaneous plant is kept in NAP and was collected by G. Gussone before 1817.

**Specimina visa**

Toscana, Giardino dei Semplici, 1820, *sine collectore* (FI); *Hort. Bot. Bonon*, 1829, leg. P. Bubani, Dal Dr. Bubani. Firenze 1834 (FI, *Herbarium Ricasoliano*); Marche, Porto d'Ascoli, 07-1839, leg. P. Sanguinetti, det. G. Lusina (RO); Toscana, H° Pisano, 1839 ect., *sine collectore*, Da G. Savi in Giugno 1843 (FI); Toscana, H. Bot. Mus. Flor., 27-06-1857, *sine collectore* (FI); Lombardia, nelle sabbie e negli incolti nel mantovano, Mar 1877, leg. Barbieri (FI); Veneto, Orto Botanico di Padova, coltivato, 08-1896, *Adr. Fiori* (FI); Marche, Senigallia, sui binari della stazione ferroviaria, 30-06-1946, A. Bettini (FI); *ibidem* (FI); *ibidem* (FI); Marche, da semi di piante di Senigallia sul mio terrazzo in vaso, 22-07-1949, leg. A. Bettini (FI); Marche, Ascoli, *sine die*, *sine collectore*, det. G. Lusina (RO); Campania, Golfo di Napoli, *sine die* (ante 1817), G. Gussone (NAP, *Herb. Gussone*); Abruzzo, Giulia, *sine die* (ante 1831), M. Tenore (NAP, *Herb. Tenore*); Lombardia, nasce nell'Orto botanico di Mantova spontaneo, *sine die* (ante 1817), *sine collectore* (PAD).

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