

Newly Recorded Species of *Amaranthus* (*Amaranthaceae*) from China—*Amaranthus powellii* and *Amaranthus blitum* (Postprint)

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Abstract

Over 20 species of the genus *Amaranthus* have been recorded in China, primarily as exotic weeds. *Amaranthus* species exhibit similar morphology and are frequently misidentified. The authors discovered two new exotic species from submitted misidentified specimens, which were respectively named Baoshi amaranth and Bushi amaranth based on the etymology of their Latin specific epithets. Baoshi amaranth and Bushi amaranth are morphologically similar, originating from the southwestern United States and Europe respectively; they are monoecious, with 3-5 tepals on female flowers, the tepals being unequal in length and equal to or shorter than the utricles, and the utricles being dehiscent or indehiscent. The two species can be distinguished by the number and morphology of tepals, whether the utricles dehisce, and bract size. This paper also provides Chinese morphological descriptions and color photographs of the two species, and reports on their distribution, habitat, and harmfulness.

Full Text

Preamble

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Two Newly Recorded Species of *Amaranthus* from China: *Amaranthus powellii* and *Amaranthus bouchonii*

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Abstract

More than 20 species of *Amaranthus* have been recorded in China, most of which are alien weeds. Species within the genus are morphologically similar and frequently misidentified. From submitted specimens that had been misidentified, the authors discovered two new alien species. Based on the Latin meanings of their specific epithets, they are named *Amaranthus powellii* (鲍氏苋) and *Amaranthus bouchonii* (布氏苋). These two species are morphologically similar, originating from the southwestern United States and Europe, respectively. Both are monoecious, with pistillate flowers possessing 3–5 tepals that are unequal in length, equal to or shorter than the utricle, which may be dehiscent or indehiscent. The two species can be distinguished by the number and shape of tepals, whether the utricle dehisces, and the size of bracts. This paper provides Chinese morphological descriptions, color illustrations, and reports on their distribution, habitat, and harmful status.

Keywords: *Amaranthus*, alien weeds, new records, *Amaranthus powellii* S. Watson, *Amaranthus bouchonii* Thell.

Introduction

The genus *Amaranthus* (Amaranthaceae) comprises annual or biennial herbs that are monoecious or dioecious. Approximately 65 species occur worldwide, of which 12 are agricultural and environmental weeds to varying degrees, such as the notorious weed *A. retroflexus* L., along with a few cultivated species like *A. hypochondriacus* L. and *A. caudatus* L., and the endangered species *A. pumilus* Raf. (Mosyakin & Robertson, 2003; Bayón, 2015). More than 20 species have been recorded in China, with only one being native and the remainder alien (Xu, 2010). Alien species such as *A. retroflexus* and *A. lividus* were introduced over a century ago and have become common harmful weeds in farmland and natural environments. In recent years, the newly discovered dioecious invasive weed *A. palmeri* from North America poses an even greater risk and has been included in the list of quarantine pests and the Ministry of Environmental Protection's list of alien invasive plants. This paper documents *Amaranthus powellii* S. Watson and *A. bouchonii* Thell., two species discovered in China for the first time. Belonging to subgenus *Amaranthus*, they originate from North America and Europe, respectively, and are closely related to *A. retroflexus* (Xu et al., 2017). In particular, *A. powellii*, a common *Amaranthus* weed in soybean and corn fields in the United States, warrants continued attention due to its potential ecological risks.

The taxonomy of *A. powellii* and *A. bouchonii* has been controversial. Based on stem anatomical structure and other characteristics, Costea et al. (2001) considered *A. bouchonii* to be a subspecies of *A. powellii*. However, Thellung (1926), Aellen (1959, 1964), and Wilkin (1992) argued that their different origins represent distinct geographical populations. Based on collection information from China, as well as differences in inflorescence, tepal, utricle, and seed morphol-

ogy (Wilkin, 1992; Costea et al., 2001), chromosome number, symmetry, and cDNA content (Greizerstein & Poggio, 1992; Greizerstein et al., 1997), this paper adopts the classification views of Thellung (1926), Aellen (1959, 1964), and Wilkin (1992), recognizing *A. bouchonii* as an independently originated species.

1. *Amaranthus powellii* S. Watson

Amaranthus powellii S. Watson in Proc. Amer. Acad. Arts. 10: 347. 1875. Type: Described from a plant cultivated at Harvard University “from seeds brought from Arizona by Col Powell” Powell s.n. (Holotype, US 16163!; isotype, MO!)

Morphological Description: Annual herb, 50 cm tall. Stem erect, glabrous or pubescent in the inflorescence region. Petiole 1.5–3 cm; leaf blade elliptic to rhombic, 4–7 cm long, 1.5–4 cm wide, base cuneate to broadly cuneate, margin entire, apex truncate to obtuse or emarginate, with a small fine spine 0.5–1 mm long. Terminal inflorescence erect, spicate, unbranched, about 15 cm long; lateral inflorescences short and spicate. Bracts rigid, 4.5–7 mm long, 2–3 times as long as the tepals, apex with a spiny mucro. Staminate flowers with 3–5 tepals, stamens 3–5; pistillate flowers with 4–5 tepals, linear-lanceolate to elliptic, 1.5–3 mm long, markedly unequal, inner tepals with inconspicuous midvein, outer tepals with prominent green midvein extending into a rigid aristate tip. Utricle elliptic to obovate, circumscissile, pericarp wrinkled along upper part of dehiscence line, 2–2.2 mm long; style branches robust, spreading from base, apex attenuate. Seed obovate, biconvex-lenticular, black to dark brown, 1.1–1.2 mm long, 0.9–1.1 mm wide, relatively regular in shape.

Specimen Examined: Liaoning: Dalian City, roadside weed, altitude 10 m, 19 August 2009, Li Zhenyu et al., 11798.

Distribution and Habitat: Native to the southwestern United States along the Mexican border and the mountainous regions of western South America (Mosyakin & Robertson, 2003; Sauer, 1967). Common in farmland, along railways, roadsides, wastelands, riverbanks, lake shores, and streams at altitudes of 0–2500 m, and a pioneer species in canyons and deserts (Sauer, 1967). In the early 18th century, it spread to eastern North America, becoming a widespread pernicious weed within half a century (Sauer, 1967). Before the 18th century, it was introduced to Germany and subsequently spread as an invasive weed in central and northern Europe, where it was once misidentified as *A. hybridus* L. (Sauer, 1967). Thereafter, it became a new invasive plant in southern India and South Africa (Sauer, 1967). In addition to these regions, *A. powellii* is now widely distributed in other temperate countries worldwide: Ethiopia, Uganda, Tanzania, Pakistan, Australia, New Zealand, Canada, Peru, Bolivia, and Chile.

2. *Amaranthus bouchonii* Thell.

Amaranthus bouchonii Thell. in Mondet Pl. Rev. Mens. ser. 3, 45 (160): 4. 1926; *Amaranthus powellii* subsp. *bouchonii* (Thell.) Costea & Carretero in

Sida 19(4): 964. 2001. Type: France, Bordeaux, Boutant, trash dumps by harbor, 25 Sept. 1925, A. Bouchon, s.n. (US!).

Morphological Description: Annual herb, 30–50 cm tall. Stem erect, glabrous or pubescent in the inflorescence region. Petiole 1.5–3 cm; leaf blade elliptic to rhombic, 1.5–7.5 cm long, 0.5–3 cm wide, base cuneate to broadly cuneate, margin entire, apex truncate to obtuse or emarginate, with a small fine spine about 0.2 mm long. Inflorescence nearly erect, 4–16 cm, branched at base. Bracts short and thin, 2.8–5 mm long, with green midvein, rigid and straight. Staminate flowers with 3–5 tepals, stamens 3–5; pistillate flowers with 3–5 tepals, 0.5–2.2 mm long, markedly unequal, sometimes tending toward reduction, linear-lanceolate to oblong, with inconspicuous midvein (visible only on the longest tepal). Utricle elliptic to obovate, indehiscent, 1.2–2.2 mm long, pericarp smooth, sometimes with dark longitudinal stripes; style branches robust, spreading from base, apex attenuate. Seed elliptic to round or obovate, biconvex-lenticular, black, dark brown to reddish brown, 0.9–1.1 mm long, 0.8–1 mm wide.

Specimens Examined: Beijing: Longtan Lake, Chongwen District, altitude 43 m, 13 June 1989, Li Zengxin, 4385; Huangtugang, Fengtai District, altitude 47 m, 2 July 1989, Li Zengxin, 4443; Yuquanying, Fengtai District, roadside grassland, altitude 44 m, 5 October 1990, Li Zengxin, 5240; Wanfeng Road, Fengtai District, roadside grassland, altitude 60 m, 24 July 2004, Li Zengxin, 7171; Muxidi, Haidian District, roadside grassland, altitude 55 m, 16 October 2005, Li Zengxin, 7465; Muxidi, Haidian District, roadside grassland, altitude 55 m, 15 October 2006, Li Zengxin, 7698; Beijing Institute of Landscape Architecture, Siyuan Bridge, Chaoyang District, altitude 44 m, 22 September 2005, Li Zengxin, 7406; Lianhuachi Park, Fengtai District, altitude 53 m, 2 September 2006, Li Zengxin, 7664 (2 sheets).

Distribution and Habitat: First discovered and documented by Thellung (1926) from a trash dump at the mouth of the Gironde River in southwestern France. Also distributed in the Netherlands, Belgium, Germany, Turkey, Switzerland, Italy, and the United States. Common in roadside grasslands and wastelands.

Distinguishing Characters: The distinguishing characters between the two species recorded in this paper are as follows: bracts, tepals, utricles, and seeds of *A. powellii* are generally longer than those of *A. bouchonii*; the utricle of *A. powellii* is dehiscent with wrinkled upper pericarp, whereas that of *A. bouchonii* is indehiscent, smooth, and sometimes with dark longitudinal stripes; *A. powellii* typically has 4–5 tepals, while *A. bouchonii* has 3–5 tepals with greater variation in number, sometimes with the shortest tepal showing a tendency toward reduction. Similar species that should be carefully distinguished in future *Amaranthus* identification work include *A. retroflexus* and *A. hybridus*.

Note: A1. Herbarium specimen of *A. powellii*; A2. Tepals, bracts, and utricles of *A. powellii*; A3. Seeds of *A. powellii*; B1. Herbarium specimen of *A.*

bouchonii; B2. Tepals and utricles of *A. bouchonii*; B3. Seeds of *A. bouchonii*.
Plate I. *Amaranthus powellii* S. Watson and *A. bouchonii* Thell.

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