The Dioecious Amaranthus spp.: Here to Stay

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"Bid amaranthus all his beauty shed, And daffodils fill their cups with tears, To strew the laureate hearse where Lycid lies." *Paradise Lost, John Milton (1667)

"Immortal amaranth, a flower which once In Paradise, fast by the Tree of Life, Began to bloom, but soon for Man’s offence, To Heav’n remov’d, where first it grew, there grows, And flours aloft shading the Fount of Life." *Paradise Lost, John Milton (1667)

"There are no fields of amaranth on this side of the grave" Imaginary Conversations “Aesop and Rhodope” in works of Walter Savage Landor (1846)

"Weeds never die” Danish proverb

There are nearly 75 species in the genus Amaranthus, part of the Amaranthaceae family, worldwide. In this large genus, there is a distinct group of 10 species that are dioecious (separate male and female plants). In contrast to the monoecious Amaranthus spp. which are represented by species endemic to every continent, the dioecious Amaranthus spp. are all native to North America. The Amaranthus spp. have a long documented history of being fellow travelers with humans. In recent years, three dioecious Amaranthus spp.: Palmer amaranth (Amaranthus palmeri S. Wats.), common waterhemp (Amaranthus rudis Sauer), and tall waterhemp [Amaranthus tuberculatus (Moq) Sauer] have become major weeds to row crops in North America. Palmer amaranth has become a very troublesome weed to cotton (Gossypium hirsutum L.), corn (Zea mays L.) and soybean [Glycine max (L.) Merr.] production in large parts of the southern United States, and the waterhemp complex is now a major weed pest in corn and soybean production in the midwestern United States (Horak and Loughin 2000; King 1966; Mabberly 1997; Robertson 1981; Sauer 1950, 1955, 1972; Wax 1995).

Etymology

The word describing the genus Amaranthus is derived from the Greek word “amaranth,” which means “everlasting” or “never failing flowers.” The everlasting or never failing adjective is descriptive of the Amaranthus species’ showy bracts, which do not whither. Amaranthaceae belongs to the order Centrospermae, a group of families that contains the betalain or anthocyanin pigments and is closely related to the Chenopodiaceae. Monoecious Amaranthus spp. were the first of the family to be characterized, most notably redroot pigweed (Amaranthus retroflexus L.), which was described by Carolus Linnaeus in 1763 in his Species Plantarum. Over three decades later (1789), the genus was placed in Amaranthaceae by Antoine Laurent de Jussieu (1748 to 1836). The dioecious Amaranthus spp. were not described until 1917, over a century later, and were placed in the genera Acnida. In 1955, Jonathan Sauer proposed that the dioecious Acnida species be combined with the monoeocious Amaranth species into one genus, Amaranthus. He provided two reasons for this change in taxonomical classification: (1) because the dioecious Acnida spp. have pistillate flowers with no perianth similar to monoecious Amaranthus spp., and (2) because dioecious Acnida species have the ability to readily cross with monoecious Amaranthus species. Beginning in 1959 the dioecious Acnida were moved into the genus Amaranthus, subgenus Acnida, where they reside today. (Aellen 1959; Britton and Brown 1898; Darlington 1859; Heywood 1993; Hyman and Prankhurst 1995; Robertson 1981; Sauer 1955; Standley 1917). In 1996, Mosyakin and Robertson (1996) proposed that the subgenus Acnida be broken into three sections Acnida, Saueranthus, and Acanthochiton, based on taxonomical differences.

Description

The dioecious habit is the only characteristic that distinguishes the subgenus Acnida, group as a whole from all the monoecious subgenus, Amaranthus. The dioecious Amaranthus spp. all share a combination of characteristics that occur in only a small number of monoecious species, which are a pentamersous staminate flower together with complex terminal inflorescences, often called spikes. The three weedy dioecious species, Palmer amaranth, and the waterhemp complex that contains both common waterhem and tall waterhem, are erect herbs that are typically, though not always, hairless. These species will range in height from 5 cm to 2 m. The stems of these species will vary from green to red to a striate of the two colors. The leaves on Palmer amaranth often have V-shaped variegation and are ovate. The petioles are as long as, or longer than, the leaves, often giving this species a poinsettia-type appearance before flowering. Flowering structures are 30 to 60 cm long, thick and mostly...