

Biology and Management of *Pilea microphylla* (Artillery weed) in Ornamental Crop Production¹

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Species Description

Class: Dicotyledonous plant

Family: Urticaceae

Other Common Names: rockweed, gunpowder plant, artillery weed

Life Span: annual or short lived-perennial

Habitat: Artillery weed occurs primarily in moist, disturbed areas but can tolerate dry conditions once established. In landscapes, artillery weed is typically found growing in rock mulch beds, in cracks in driveways and hardscapes, and in planting beds. In nurseries, it can be problematic in containers, container drain holes, ground cloth (Figure 1), walkways, aisles, and in greenhouses. It prefers a partially shaded environment but can grow in full sun.

Distribution: Artillery weed is thought to be native to South America, but some authors claim it is native to parts of North America (USDA 2016). It is found throughout Florida, but is most problematic in the central and southern parts of the state. It has also become widely naturalized in subtropical and tropical areas in many parts of the world.



Figure 1. Artillery weed growth through nursery ground cloth.

Credits: Annette Chandler, UF/IFAS

Growth Habit: It is a low growing succulent herb that can spread 1 to 2 feet in width and grows 0.5 to 1.5 feet in height.

Seedling: Cotyledons are green with opposite, obcordate (they start at a point and then widen until they form a notch at the apex) leaves with smooth margins (Figure 2). First true leaves are green. Stems are whitish in color.

Shoots: Stems are fragile, green, nearly translucent, succulent, and spreading (Figure 3). Plants have opposite to subopposite, simple, obovate leaves with short petioles and with most but not all leaves having three primary veins

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originating from the leaf base. Leaves are evergreen and are 3.64–1.13 mm wide and 8.25–1.14 mm long.

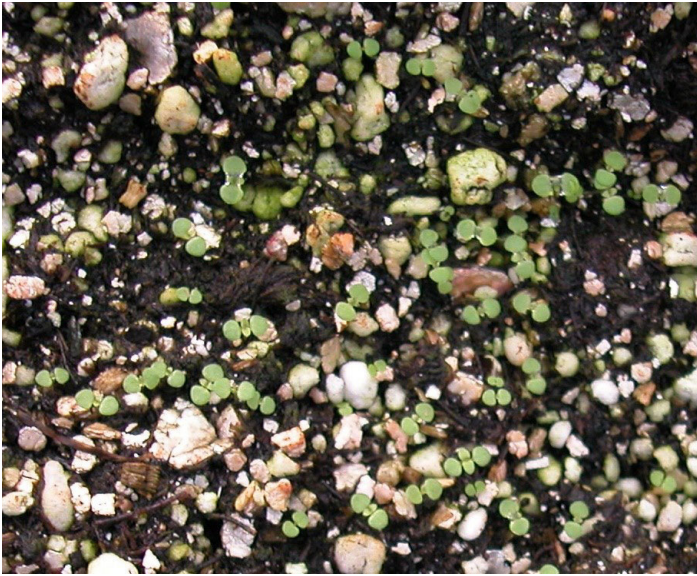


Figure 2. Artillery weed seedlings.
Credits: Annette Chandler, UF/IFAS



Figure 3. Artillery weed stems.
Credits: Annette Chandler, UF/IFAS

Roots: Fibrous roots or rarely a short taproot.

Inflorescence: dense cyme (a group of flowers where the growing points end in a flower), branched clusters from leaf axils

Flowers: small, whitish to greenish, unisexual; sepals 4 mm in male flowers, 3 mm in female; no petals; 4 stamens; year round flowering occurs (Figure 4).

Fruits: achene, light brown, length less than 0.5 mm, smooth (Gilman 1999).



Figure 4. Artillery weed in flower.
Credits: Annette Chandler, UF/IFAS

Similar Species: *Pilea pumila* (Canadian clearweed) is a similar species to *Pilea microphylla*. The distinguishing character of *Pilea pumila* is that it has broad, ovate to elliptic leaves, that grow to 4 in. long and 2.5 in. wide, and leaf margins are toothed (serrated). Artillery weed has small smooth edged leaves, usually less than 8.25 mm long and 3.64 mm wide.

Plant Biology: Year-round flowering occurs, and the pollen grains are ejected forcefully (hence the common name artillery weed). Artillery weed grows primarily in shaded areas and can tolerate extended flooding, alkalinity, clay, sand, and acidic loam (Gilman 1999). This plant shows moderate drought tolerance and poor tolerance in soils with high salinity (Gilman 1999).

Management

Cultural and Physical Control

Cultural control involves proper sanitation practices, such as using weed-free growing media and clean pots. Inspect plant material for artillery weed seedlings when bringing in new plant material into the nursery or landscape. In landscapes, remove artillery weed seedlings from potted plants before transplanting to prevent future infestations.

Hand weeding effectively controls artillery weed in small areas. Because small seedlings are not easily removed by hand and artillery weed can regrow from roots or stem fragments, hand weeding must be thorough. Large and densely infested areas may be too labor intensive for such thorough hand weeding. Applying organic mulch (pines-traw, pinebark, etc.) at a depth of at least 2 inches has been shown to provide control in research trials.

Chemical Control

PREEMERGENCE CONTROL

Most of the common preemergence herbicides provide excellent control of artillery weed. Oxyfluorfen has been shown to provide good control (Freitas et al. 2004, Freitas et al. 2007a, Freitas et al. 2007b). Research trials at UF/IFAS have shown the following preemergents to provide excellent control: oxadiazon (Ronstar® G), dimethanamid-p (Tower®), indaziflam (Marengo® or Specticle®), pendimethalin + dimethanamid-p (FreeHand®), oxyfluorfen + pendimethalin (OH2®), oxyfluorfen + prodiamine (Biathlon®), prodiamine (Barricade®), pendimethalin (Pendulum®), s-metolachlor (Pennant Magnum®), isoxaben (Gallery®), and prodiamine + isoxaben (Gemini™). Table 1 lists preemergence herbicides labeled for use in ornamental plant production and landscapes and that can be used for the control of artillery weed.

POSTEMERGENCE CONTROL

Due to prolific seed production, it is important to tank-mix a preemergence herbicide in with a postemergence herbicide when attempting to control artillery weed. Herbicides, including oxadiazon (Ronstar® FLO) (Conover and Stamps 1994), flumioxazin (SureGuard®), and glufosinate (Finale®), have provided excellent postemergence control in research trials. Oxadiazon and flumioxazin are both primarily used as preemergence herbicides but do provide some early postemergence control. In greenhouse trials, these two herbicides have provided greater than 95% control of mature artillery weed. Contact herbicides, including pelargonic acid (Scythe®) and diquat (Reward®), can provide temporary control but re-treatment is typically needed. Glyphosate (RoundUp® and many others), sulfosulfuron (Certainty®), and sulfentrazone (Dismiss®) typically only provide suppression or poor control. If artillery weed is growing in containers, directed applications can be made using a contact action herbicide such as pelargonic acid or diquat but care must be taken to ensure ornamental foliage is not contacted. If the ornamental growth habit does not allow for directed applications to be made, granular formulations of oxadiazon (Ronstar® G) and liquid formulations of dimethanamid-p (Tower®) can provide some suppression and are labeled for over-the-top use in many crops. A list of postemergence herbicides, including their labeled sites, are included in Table 2.

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Table 1. Preemergence herbicides labeled for use in ornamental plant production and landscapes and their efficacy for control of artillery weed.

Common Name (active ingredient)	Example trade name and formulation	Labeled Use Rate (Product/Acre)	WSSA Herbicide Group ¹	Efficacy ²	Container production	Field production	Greenhouse or fully-enclosed structures	Landscape
dithiopyr	Dimension® 2EW	1 to 2 pts.	3	G	YES	YES	NO	YES
pendimethalin	Pendulum® 2G	100 to 200 lbs.	3	G	YES	YES	NO	YES
	Pendulum® 3.3EC	2.4 to 4.8 qt.			YES	YES	NO	YES
proflamifam	RegalKade 0.5G	132 to 300 lbs.	3	G	YES	YES	NO	YES
	Barricade® 4FL	21 to 48 fl. oz.			YES	YES	NO	YES
flumioxazin	Broadstar™ 0.25G	150 lbs.	14	G	YES	YES	NO	YES
	SureGuard® 51WDG	8 to 12 oz.			YES ³	YES ³	NO	YES ⁴
oxadiazon	Ronstar® 2G		14	G	YES	YES	NO	YES
dimethenamid-p	Tower® 6EC	21 to 32 fl. oz.	15	G	YES	YES	NO	YES
s-metolachlor	Pennant	1.3 to 2.6 pts.	15	S-G	YES	YES	NO	YES
	Magnum® 7.6 EC				YES	YES	NO	YES
isoxaben	Gallery® 75DF	0.66 to 1.33 lbs.	21	G	YES	YES	NO	YES
	Gallery® 4.16SC	16 to 31 fl. oz.			YES	YES	NO	YES
indaziflam	Marengo® 0.622 SC	7.5 to 15.5 fl.oz.	29	G	NO ⁵	YES	YES ⁶	NO ⁷
	Marengo® 0.0224G	100 to 200 lbs.			YES	YES	NO	NO ⁷
pendimethalin+dimethenamid-p	FreeHand® 1.75G	100 to 200 lbs.	3 + 15	G	YES	YES	NO	YES

¹Herbicide groups are based according to primary sites of action and can be used to select herbicides that have differing sites of action (Weed Technology 17:605-619 [2003]).

²P = poor control; S = suppression, G = good control.

³Can only be used in selected conifer and deciduous tree species. Check manufacturer's label for a complete list of species and recommended application methods.

⁴Can be applied as a directed application around established woody landscape ornamentals.

⁵Marengo® 0.622 SC can be used in pot-in-pot container ornamentals as a directed application only.

⁶Labeled for use on greenhouse floors prior to plant production. Plants can be placed back inside greenhouse 24 hrs after application.

⁷Indiziflam is also available by the trade name Specticle which can be applied to turf and landscape sites.

Table 2. Postemergence herbicides labeled for use in and around ornamentals for control of artillery weed¹.

Active Ingredient	Example trade name	Labeled Use Rates (product/Acre)	WSSA Herbicide Group	Container production ²	Field production	Greenhouse or fully-enclosed structures	Landscape	Notes:
Diquat	Reward®	1 to 2 qt.	22	YES	YES	YES	YES	Thorough coverage and repeated applications may be needed.
Flumioxazin	SureGuard®	8 to 12 oz.	14	YES ³	YES ³	NO	YES ³	Higher rate provides better postemergence control. Primarily used as a preemergence herbicide.
Glufosinate	Finale®	2 to 6 qt.	10	YES	YES	YES	YES	Thorough coverage is needed.
Oxadiazon	Ronstar® FLO	80 to 122 fl. oz.	14	YES ⁴	YES ⁴	NO	YES	Thorough coverage is needed. Primarily used as a preemergence herbicide.

¹Postemergence control is highly dependant upon the growth stage at the time of application. Many factors can impact herbicide performance. Repeat applications and use of preemergence herbicides may be needed for complete control.

²Herbicide groups are based according to primary sites of action and can be used to select herbicides that have differing sites of action (Mallory-Smith and Retzinger 2003).

³Labeled for use as a directed application or over-the-top only to certain trees and conifers. Consult product label for details.

⁴Labeled for use as a directed application or over-the-top only to certain conifers and a small list of other crops. Consult product label for details.