"Weeds Just Want to Have Fun!!!"

or

Why Are These 10 Common Container Weeds So Common?: Part 2

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The 10 most common container weeds are listed in Table 1. The four top strategies these weeds use to be included among the 10 most common, will be presented. These four strategies indicate, "Weeds just want to have fun!" Weeds like to travel, they like the water, they like to wear disguises and they like to just hang-out. Weeds in your containers and container yards, have done all their planning, have their "ducks in a row," and are now just "chilling." The acronym for the four strategies for fun is **DSWW**: 1) "***D****ifficult to Control"* - which comprises issues regarding proper herbicide selection, hand weeding and pseudo-dormancies; 2) "**S**heer Numbers" - consisting of extensive seed production abilities and effective dispersal mechanisms; 3) "***W****eed Seed Continuum*" - involves the six lifecycles of weeds and which lifecycle(s) container weeds predominate, the corresponding timing of herbicide applications and the consideration of herbicide dose response within weed species; and, 4) "***W****e Like It Here*" - the heat and/or nutrient and water rich environment of the containers, is just the place where weeds want to live and raise a family! The top 10 weeds will be listed according to which **D, S, W** or **W** strategies best illustrates their rise to predominance in nursery containers. In this article we will discuss the last first 5 in Table 1, in part 2 of this article we will discuss weeds number 6-10.

Table 1. Common nursery container weeds listed by family and life cycle. The strategies of DSWW that have the species uses *most* predominantly are indicated. Note: "D" indicates "difficult to control", "S" indicates "sheer numbers", the first W or "W_1" indicates some strategy the species is using in the continuum of "weed seed emergence", and the second W or "W_2" indicates the species is utilizing a strategy of "we like it here" or exploitation of the container environment.

Common name	Scientific name	Division or family	Life cycle	Strategy
1. a) Hairy bittercress	*Cardamine hirsuta*	Brassicaceae	Winter annual	D,S,W_1,W_2
b) Pennsylvania bittercress	*Cardamine pennsylvanica*	Brassicaceae	Winter annual/ biennial	D,S,W_1,W_2
2. Prostrate spurge	*Chamaescyce maculata* or *Eurphorbia maculata*	Eurphorbiaceae	Summer annual	S,W_1, W_2
3. Horseweed or marestail	*Conyza canadensis*	Asteraceae	Summer and	S,W_1

			winter annual	
4. Northern willowherb	*Epilobium ciliatum*	Onagraceae	Perennial	S,W_2
5. Liverwort	*Marchantia polymorpha*	Hepatophyta	Perennial	D,S,W_2
6. Creeping red woodsorrel	*Oxalis corniculata*	Oxalidaceae	Perennial (spreads by stolons)	D,S,W_2
7. Annual bluegrass	*Poa annua*	Poaceae	Winter annual	D,S,W_1,W_2
8. Birdseye pearlwort	*Sagina procumbens*	Caryophyllaceae	Perennial	S,W_1, W_2
9. Common groundsel	*Senecio vulgaris*	Asteraceae	Winter annual	S,W_1
10. Common chickweed	*Stellaria media*	Caryophyllaceae	Summer or winter annual	S,W_1,W_2

Arguably, all the weeds listed in Table 1 could be called “difficult to control.” However, I have reserved the “D” or “difficult to control” strategy to those weeds that have a particular issue with physical or chemical controls, improper herbicide selection or resistance issues. Therefore only the two bittercress, the liverwort, perennial oxalis and annual bluegrass have a “D” strategy (Table 1). Every weed in Table 1 is extremely effective at either sexual or asexual propagation. Often the “sheer numbers” strategy is a requirement of any successful weed population. “Sheer numbers” has two adaptive advantages. The first is a matter of reproductive survival, with so many propagules generated you virtually guarantee some will live to reproduce another generation. The second advantage is a matter of adaption, by reproducing in large numbers, the probability of finding that one rare individual with some selective trait for herbicide resistance, drought tolerance, handling compacted soil, or some other desired ability is significantly increased.

The ten common container weeds selected for this article (Table 1) span the gamut of life cycles. Filling different niches on the nursery production calendar in order to maximize the range of the “weed seed emergence continuum.” Container weeds emerge from early spring with the summer annuals such as chickweed, through mid-summer with the prostrate spurge, into fall with the winter annuals such as annual bluegrass and bittercress, and the perennials “somewhat ever present” depending on your region of the country with liverwort in winter or creeping oxalis in summer. The “we like it here” strategy with container weeds usually involves the appeal of the well watered and nutrient rich environment that the container provides. Some weed species such as common chickweed and pearlwort have even taken this strategy a step further to include the intersections of the container drain holes and the ground fabrics. Here these species enjoy the water-nutrient, media-laden solution that pours out the bottom

of the container after each irrigation or rain event. The “we like it here” strategy for other species, however, is all about the heat. Spotted spurge is a good example of this thriving where temperatures are “smoking hot,” it finds its niche in the container yard, in crevices of polyhouses and of course the black plastic container itself.

6. Creeping Wood-sorrel (Oxalis corniculata)

Fig. 1. Creeping wood-sorrel *(Oxalis corniculata)* is a low-growing perennial that has long spreading stems that root out at the nodes. Creeping woodsorrel is a prime example of the “difficult to control” strategy that causes it to be one of the worst weeds to manage in nurseries. (Taken by H. Mathers).

Oxalis corniculata L. is a low-growing perennial weed which spreads rapidly by seed and has purplish-green long trailing stems (Fig. 1). In a survey of 32 Alabama nurseries in 1987 by Gilliam et al. (1990), oxalis *(Oxalis corniculata* and/or *O.stricta)* and prostrate spurge *(Euphorbia maculata),* were two of the most difficult weeds to control. *Oxalis stricta* is similar to *Oxalis corniculata* in that both are perennials; however, *Oxalis corniculata* has longer trailing stems that root where they touch the ground (Fig. 1). Normally, *Oxalis* thrives in the cool season and behaves like a winter annual; however Cross and Skroch (1992) reported that oxalis can be a major problem year round under certain nursery production systems. *Oxalis* which is in the woodsorrel family (Oxalidaceae) (Table 1) has explosive seed pods similar to the mustards adding to its “sheer numbers” strategy. The leaves are compound and consist of three valentine-heart-shaped leaflets attached usually erect petioles by their pointed ends (Fig. 1). This similarity to a clover leaf is why *Oxalis* can be confused with Black medic (*Medicago*

lupulina L.) and white-clover (*Trifolium repens* L.) which are members of the legume family. *Oxalis corniculata* will root out at each node and establish a new plant (Fig.1). If even a piece of stem with a node is left behind in hand-weeding, a new plant can establish. The flowers are bright yellow with five uniform shaped petals and 10-15 stamen. Another name for *Oxalis* is *Sour*-clover because of its characteristic sour taste which is another way to distinguish it from white-clover.

For postemergent control of oxalis, Finale is effective and registered but must be used very carefully. Simpson et al. (2004) showed that diuron provided excellent *oxalis* control and that crop tolerance was good with dormant nursery crops. However injury occurred if crops were actively growing. Other researchers evaluating diuron as a preemergence herbicide have shown that nursery crop tolerance is improved with overhead irrigation soon after diuron application (1 hr.) (Ahrens et al., 2003; Barolli et al., 2003; Richardson et al., 2004).

For preemergence control, Dr. James Altland (Oregon) found up to 60 DAT control with Snapshot (isoxaben + treflan) and Ronstar (oxadiazon). BroadStar (flumioxazin, Valent U.S.A. Corp., Walnut Creek, CA) also provided commercially acceptable control at 60 DAT (Altland, Oregon); however, the control with Snapshot and Ronstar was better. In 2005 study, at Ohio State University (OSU), we compared Showcase™ (Dow AgroSciences, Indianapolis, IN) an over-the-top 3-way granular-formulation [(trifluralin (2%) + isoxaben (0.25%) + oxyfluorfen (0.25%)] at 200 lb/ac (5 lb ai/ac, to Dimension (dithiopyr, Dow AgroSciences) at 1.25 lb/ac (0.5 lb ai/ac), Gallery (isoxaben, Dow AgroSciences) at 1.33 lb/ac (1.0 lb ai/ac), Snapshot isoxaben + trifluralin, Dow AgroSciences) at 200 lb/ac (5 lb ai/ac), BroadStar (flumioxazin, Valent U.S.A. Corp., Walnut Creek, CA) at 150 lb/ac (3.75 lb ai/ac) and an untreated control to the Showcase™ On May 9, 2005, #1 pots were filled with soilless container mix consisting of 60% aged pine bark, 20% rice hulls, 10% sand, 5% technigrow, 5% stone aggregate and then treatments were applied. Efficacy pots were immediately seeded common groundsel (*Senecio vulgaris*), and creeping wood sorrel (*Oxalis corniculata*). All liquid sprays (Dimension and Gallery) were applied with a CO_2 backpack sprayer equipped with Teejet 8002 evs flat fan nozzles in a spray volume of 25 gal/ac (233.42 l/ha). Four species were evaluated for phytotoxicity: yew (*Taxus* 'Everlow'), azalea (*Azalea* 'Karen'), compact holly (*Ilex glabra* 'Compacta'), and liriope (*Liriope spicata* 'Silver Dragon'). Dates of evaluation were: 15, 60, and 90 DAT (days after treatment). The efficacy trial indicated, Snapshot and BroadStar provided superior control of Oxalis and Groundsel at 15 DAT (Mathers and Case, 2005). Dimension gave poor control through all dates. Snapshot and BroadStar continued to provide commercially acceptable control across all species at 60 DAT (Mathers and Case, 2005). Showcase was commercially acceptable for oxalis at 60 DAT but not for groundsel. Starting at 15 DAT groundsel was escaping in the Showcase treatments. 60 DAT seemed to be the maximum residual for all five herbicides tested (Mathers and Case, 2005). BroadStar gave the highest efficacy scores but creeping woodsorrel was establishing at 60 DAT and pots were infested by 90 DAT (Mathers and Case, 2005). Liriope was somewhat phytotoxic to BroadStar and Showcase, although Showcase was less phytotoxic than BroadStar (Mathers and Case). Phytotoxicity was evident at 15 DAT and carried

through to 90 DAT, although it was lessening with both treatments. There was some phytotoxicity with the other three species at 15 DAT, but it did not persist past 15 DAT, indicating there is little long-term phytotoxicity with any of these herbicides to *Taxus, Azalea* or *Ilex* (Mathers and Case, 2005). In recent studies we have also found Marengo G (indaziflam) (OHP) provides excellent control of oxalis (Mathers and Case, unpublished).

7. Annual Bluegrass *(Poa Annua)*

Fig. 2. Annual bluegrass (*Poa annua*) is commonly found in nursery containers and landscape beds. It utilizes the "weed seed continuum" strategy most effectively, capitalizing on the cool temperatures of fall and spring to inflict severe damage by nutrient and moisture competition with its dense mat-forming habit. (Taken by H. Mathers).

In the Grass family (Poaceae) there are also numerous difficult weeds to control in ornamentals. The most common grassy weed is annual bluegrass (*Poa annua*). *Poa annua* has distinguishing light green leaves that are also distinctively boat-shaped at the tip (Fig. 2) and is a true winter annual, germinating in September to October. Each flower head produces thousands of seeds and it has a clumping habit (Fig. 2). Annual bluegrass is scattered nearly throughout the United States. The flower heads are white and die off in warm weather.

Of the selective postemergence grass herbicides, Envoy (Clethodim) is the only one providing commercially acceptable control for bluegrass. Envoy is also effective on Bermudagrass and tall fescue. Most of preemergence herbicides are effective and preemergence is the preferred method of control. In a trial conducted in 2002 and 2003 comparing Snapshot and BroadStar control for annual bluegrass, the BroadStar was

very good in 2002 and statistically similar to Snapshot. However, in 2003, the BroadStar control was very poor while the Snapshot remained excellent. Besides Snapshot other excellent preemergence herbicides are Prodiamine, Pendimethalin (although some resistant populations exist), Dithiopyr, Oxadiazon, Oryzalin.

8. Birdseye pearlwort (*Sagina procumbens*)

Fig. 3 (A, B and C). (A). Pearlwort (*Sagina procumbens*) is a member of the pink family with characteristic five, deeply dissected petals. (B). Pearlwort can be an indicator of overwatering and utilizes the strategy of "we like it here" by optimizing on the moist conditions of containers and container yard. (C) Pearlwort also uses the "sheer numbers" strategy, spreading easily by seed and rooting out at nodes, and every little piece left behind from weeding or in pot crevices or cracks.(Taken by H. Mathers).

Birdseye pearlwort is also known as arctic pearlwort and procumbent pearlwort. It is in the family (Caryophyllaceae) or the pink family, the same as the Chickweeds, Corn spurries, Stitchworts, Cockles (cow, purple or white), Bouncingbet and Bladder campion. Pearlwort forms a dense mass of very narrow, hairless, pointed-tip leaves (Fig. 3A and C). The leaves are also opposite to one another along the stem, but appear to be arranged in whorls (Fig. 3C). It can flower from April to September and produces small inconspicuous white flowers. As with any pink family member the flower petals are in five and deeply divided with five sepals, one behind each petal, that are longer than the petals (Fig. 3A). Birdseye pearlwort is a native perennial broadleaf plant that resembles moss and usually requires a disturbance to establish. It prefers wet, gravelly or sandy soils and is at home in the moist environment of containers and container yards (Fig. 3B). Thus, pearlwort is often an indication that irrigation is too frequent or excessive or the sites is improperly drained. Prostrate to ascending stems are up to about 7 inches (18 cm) in length (Fig. 3C). Stems root at nodes and form a dense mat (Fig. 3 A and B). Fruits consist of small capsules on fruit stalks that typically curve downward (Fig. 3C). Seeds can be spread by water splash, mowing, and on the

soles of shoes. Although the reproductive potential from seed is extremely high, the greater threat to spread in nurseries has been from the procumbent growth habit and re-rooting at internodes. Each little piece left behind in a crevice or crack of a re-used container creates a new plant. Every little piece needs to be removed in a hand weeding event and preemergence herbicides applied before any growth has occurred.

Some of the best preemergence products have been Rout (oxyfluorfen + oryzalin), and Snapshot is studies by Altland in Oregon. In studies by Judge, Neal and Wooten (2005) in North Carolina, Snapshot far out performed BroadStar or OH2 (oxyfluorfen + pendimethalin) (to a lesser extent). In studies in Connecticut, Mervosh and Ahrens (2008), BroadStar and Rout where the best performing herbicides at 16 Weeks after treatment (WAT). There are postemergence herbicides that work on Pearlwort but because of its perennial, mat-forming habit many require repeat application; in nursery stock preemergence control, proper watering and sanitation are essential to control.

9. Common Groundsel (*Senecio vulgaris*)

Fig. 4. Groundsel has two phenotypes making it the best example of the "weed seed continuum" strategy. (Taken by H. Mathers).

Groundsel is in the aster family and as such has very effective wind dispersal of its seed. Groundsel is also a winter annual reproducing only by seed. Young plants are distinguished by their irregular lobed and toothed leaves that produce no milky juice (Fig. 4). Older plants are easily recognized by their small conical-cylindrical, yellow, flower heads with black tipped involucral bracts around the base of each head (Fig. 4). Although, a winter annual, groundsel perhaps is the best illustrator of the "weed seed continuum" strategy. Dr. Doug Doohan and his graduate student Rodrigo Figueroa at OSU, 2003, found that common groundsel plants alter their reproduction and seed dispersal strategy depending on growing conditions. Plants growing in autumn conditions favored dispersal in time. Fall plants produced relatively more dormant seeds that could survive unfavorable conditions for germination. Plants growing in summer conditions favored dispersal in space. Summer plants produced relatively fewer seeds that were non-dormant providing them greater potential for dispersal to sites where conditions were right for rapid regeneration. Even though the groundsel

seeds had an obligate requirement for light to terminate dormancy so that germination could proceed (Hilton 1983), the dormancy level of the seeds and their consequent percent germination was modified by temperature. Temperature altered seed germination directly, providing a broad optimum temperature at which germination could occur and decreasing germination when temperatures were extreme. Temperature also affected the germination response of seeds indirectly by altering the physiology of seeds produced on plants exposed to varying growth conditions. Under warm condition 25ºC day/ 15º C night and 8 hr. days and 16 hr. nights, plants were tall in stature, produced more flowers, the seed ripened quickly and was non-dormant. However, under cool condition 15ºC day/ 5º C night and the same day-lengths as with warm conditions, plants were short in stature, produced few flowers, the seed ripened slowly and was dormant (Figueroa and Doohan, 2005). The two best herbicides for preemergence control of groundsel in Altland's Oregon studies were Rout and BroadStar. As indicated above in the woodsorrel section, our OSU study with Groundsel indicated BroadStar and Snapshot were superior products and that Dimension and Showcase were in effective at control groundsel to 60 DAT (Mathers and Case, 2005).

10. Common Chickweed *(Stellaria media)*

Fig. 5. A and B. (A). Chickweed likes the moist, high nutrient conditions of the ground fabric mats and drain holes that nursery container yards provided. (B). As a member of the pink family as with pearlwort above the flowers have five petals that are deeply dissected.

As indicated for pearlwort, chickweeds and stitchworts (*Stellaria sp.* and *Cerastium sp.*), are members of the pink family. Most preemergence herbicides work on members of the Pink family, including Simazine, Diuron, Casoron, Surflan, and Kerb. Many pink family members, however, are resistant to Ronstar. The best preemergence control, however, for common chickweed is with SureGuard (flumioxazin). If SureGuard is used before chickweed plants are 2" high then postemergence control will also be successful. Glyphosate and Paraquat provide good postemergence control; however, 2,4-D (which should never be used around ornamentals unless all other options for control are exhausted), provide good to poor control depending on the specific species. Common chickweed is often found growing out of the drain holes of containers growing

on geotextile mats that cover the container yard or the floor of a polyhouse (Fig.5A). High nutrient content, standing water and small amounts of media that flow with the excess irrigation out of the containers' drain holes create an ideal environment for chickweed and illustrate this weeds "we like it here strategy."

Common chickweed has white, small flowers that form at the tips of branches and in angles between pairs of branches. It is distinguishing from other chickweeds by ovate-pointed leaves (Fig. 5B). It is a winter annual that can flower throughout the season. It is a prolific seed producer. It is confused sometimes for mouse-eared chickweed which is often a perennial and has densely hairy stems and leaves. The leaves of mouse-eared chickweed are also sessile as with common chickweed stems are present (Fig. 5B).

Conclusions

In the second part of this article we have continued to see how weeds are utilizing the "**D**ifficult to Control", "**S**heer Numbers" "***W****eed Seed Continuum*" and/or a "***W****e like It Here*" strategies for happy, prosperous lives in the nursery and nursery yard! Ralph Waldo Emerson said, "When Nature has work to be done, she creates a genius to do it." He also said, "What is a weed? A plant whose virtues have not been discovered." If we combine both of these Emerson quotes we come to the take-home for this two-part series: *Weeds are geniuses at what they do and their virtues are for survival* (Hannah Mathers). "Weeds are plants that have mastered every survival skill except growing in rows!" (Doug Larson).