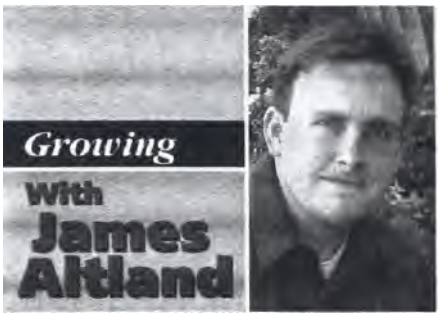
Little weed, big trouble

Clean liners are the best way to prevent a slow and steady pearlwort invasion



Pearlwort *(Sagina procumhens)* is one of the most troublesome weeds in Oregon nursery production. Although diminutive, it produces an abundance of seeds and is difficult to remove from containers. This article will describe the biology, spread and control of pearlwort in nursery production.

Growth and appearance

Despite a similar name, pearlwort is not related to liverwort (Marchantiapoly-morpha). Pearlwort is a perennial plant (Marchantiapoly-morpa).
in the family Caryophyllaceae, closely related to chickweed *(Stellaria media).* Pearlwort is a seed-bearing vascular plant; liverwort is a primitive, spore-bearing plant that lacks a vascular system. Both species grow in similar environments and are often found growing together in the same containers. However, their biology and required management practices are much different.

Pearlwort is a perennial weed introduced from Europe. The plant resembles moss because of its needlelike, linear-shaped leaves and matlike growth habit. It naturally occurs in cool, moist climates typical of coastal regions, so it becomes particularly troublesome on moist, frequently irrigated container nursery crops.

Pearlwort has slender taproots. Cotyledons are small and needle-shaped. Leaves are arranged oppositely along the stern, with each pair merging together and wrapping around the stem. Sterns are slightly swollen where each pair of leaves occurs and may appear whorled. Each leaf is up to 1.5 centimeters long and bright green. Stems are procumbent, meaning they grow along the ground without rooting. Flowers are solitary, small and hypogynous. There are four green sepals and four smaller white petals. The white petals are difficult to see with the naked eye. The sepals form a cup shape that aids in seed dispersal. As water droplets from rainfall or irrigation land in the cup-shaped structure, mature seed are splashed from the mother plant.

Flowering and seed production

The blooming period for pearlwort occurs from mid- to late spring and

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lasts about one month for a colony of plants. In natural landscapes, most vegetative growth occurs during the spring while the weather is moist and cool. Frequent irrigation in container nurseries provides a suitable environment for growth throughout the growing season. Flowers can develop fertile seed without insect pollinators. Seeds are about 0.3 millimeters wide, light tan to dark or reddish brown in color and have superficial ridges. Pearlwort produces an average of 4,600 to a maximum of 26,300 seeds per plant (Salisbury, 1976). The longevity of pearlwort seed viability in soils or container substrates is unknown, but it is at least seven years (Akinola et al., 1998).

Seeds are dispersed by splashing. We have no data on dispersal distance for *S. procumbens* (our weed of interest); however, closely related *S. decumbens* and *S. maxima* disperse their seeds up to 16 inches and 30 inches, respectively, by splashing from rain drops. When splashed, multiple seeds are contained within a single splashed water droplet. The trajectory of the splashed droplet dictates the trajectory and distance of seed dispersal. It's not

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Pearlwort cotyledons are minute, with linear leaves.


With its prostrate growth habit along the container surface, *Sagina procumbens* appears mosslike.


Pearlwort flowers have four larger green sepals and four smaller white petals.


When growing on gravel, pearlwort easily disperses seeds up to 30 inches away and into containers.

certain how high from the soil surface seed can be splashed, but it's safe to assume that seed could be splashed from plants growing on the gravel floor up and into containerized nursery stock.

Movement in nurseries

Based on my observations at nurseries and conversations with nursery producers, I believe the primary pathway for pearlwort movement into a nursery is through propagation liners. Pearlwort can infest liners, even if liners appear clean and weed-free. Once introduced into the nursery, pearlwort spreads out from the liner and disperses seed onto the gravel. Pearlwort growing on the gravel easily disperses seed hack into subsequent crops. Pearlwort is a perennial plant, so the cycle is repetitive.

Pearlwort control

The first step in controlling pearlwort is to prevent it from entering the nursery site. If you purchase liners from another operation, examine them closely for signs of pearlwort infestation. Demand liners that are free of pearlwort and other weeds.

If you propagate your own liners, then the challenge to use pearlwort-free liners is on you. Options for pearlwort control in propagation are limited. Eradicate pearlwort with herbicides containing glyphosate (Roundup and many other products) when propagation houses are empty. Diquat (Reward), glufosinate (Finale) and pelargonic acid (Scythe) are other options for postemergent weed control in greenhouses; however, glyphosate is preferred for killing the perennial roots of pearlwort. Unfortunately, pearlwort seeds are long-lived, making scouting and subsequent control measures necessary. Pearlwort does not grow quickly, so semi-frequent scouting to remove germinated plants is suggested.

Once liners are potted into larger containers and placed outdoors, you have more herbicidal control options. Under ideal circumstances, propagation liners and the gravel over which the potted containers are placed should be clean and weed-free.

Weeds growing on the gravel or weed fabric in the container yard are unacceptable. Over the course of a production season, it is understandable that some weeds will ultimately occur, even with a good management plan. From seed, pearlwort is easy to control. Pearlwort seeds are very small (about 0.3 millimeters wide) so they must germinate on the substrate surface. Use of a coarse substrate or a topical mulch application will provide effective control. Past research has shown that increasing bark particle size reduces germination and subsequent growth of pearlwort (see hark photo on Page 29). Pearlwort seed size is so small that it must germinate in a site immediately suitable for growth. It has little reserved carbohydrates to germinate and "explore" the soil for moisture and nutrients. The relatively dry surface caused by mulches or coarse substrate will prevent this weed from establishing.

Many pre-emergent herbicides are effective in preventing pearlwort germination. We conducted an experiment to evaluate common granular herbicides for controlling pearlwort from seed. Containers amended with fertilizers were potted, over-seeded with pearlwort and then treated with herbicides and rates listed in Table 1. Products containing oxadiazon offer poor control. Ronstar, Regal 0-0 and Pre Pair contain oxadiazon and provided moderate to poor control of pearlwort (Table 1). Products containing dinitroaniline herbicides (oryzalin, pendimethalin, prodiamine and trifluralin) seem to be most effective. RegalKade is 0.5 percent prodiamine and provided perfect control in this trial. RegalStar contains oxadiazon but also contains 0.3 percent prodiamine, so control was still good. Pendulum is 2 percent pendimethalin and provided outstanding control. Snapshot contains trifluralin and provided excellent pearlwort control in this and other trials I have conducted.

A more common scenario occurs when pearlwort-infested liners are potted into larger containers. Even when thoroughly hand-weeded prior to potting, sufficient roots remain in the container to regenerate the plant.

We recently conducted research to evaluate what granular herbicide

products provide the most effective control of pearlwort re-emerging from roots (following a thorough hand-weeding). This research was conducted similarly and concomitantly with research described on creeping wood sorrel in a previous article (July 2006, available at the *Digger* link at www.oan.org). Containers with vigorous populations of pearlwort were hand-weeded so that no shoots were visible on the substrate surface; only the crown of the plant remained. I would surmise that this weeding effort was typical of most nursery operations. Herbicides listed in Table 2 were applied at their maximum labeled rate, and pearlwort regrowth was monitored.

The results show that Snapshot, Rout, Pendulum and RegalKade provided the most effective control. These products all contain dinitroaniline herbicides. Another group of herbicides called PPO inhibitors (oxadiazon, oxyfluorfen, flumioxazin) were less effective. PPO-inhibiting herbicides will burn foliage and green stems of many crops upon contact. It is surprising that these compounds did not provide more effective control, considering their potential to cause serious injury to plant parts they contact.

Table 1.
Pre-emergent pearlwort (*Sagina procumbens*) control with granular pre-emergent herbicides.

Herbicide [z]	Rate (lb/acre)	Pearlwort dry weight (mg)
BroadStar	150	0
Kansel	100	53
OH2	100	43
Pendulum	200	0
Pre Pair	150	20
Regal O-O	100	198
Regal Star	200	0
RegalKade	200	0
Ronstar	200	62
Rout	100	0
Snapshot	200	0
Control		185

[z] Recently filled, weed-free containers were treated with the herbicides and then pearlwort seeds to determine what product best prevents seedling emergence. Control pots were hand-weeded similar to other treatments, but no herbicide was applied.

Table 2.
Regeneration of pearlwort after hand-weeding and application of the following herbicides and rates.

Herbicide	Rate (lb/acre)	Coverage (%) [z]	Pearlwort dry weight (mg)
Snapshot	200	0	0
Rout	100	12	18
Ronstar	200	40	304
Pendulum	200	3	13
RegalStar	200	20	500
RegalKade	200	9	10
BroadStar	150	33	458
Control [y]		43	240

[z] Coverage was rated as the percent of the substrate surface covered by pearlwort.

[y] Control pots were hand-weeded similar to other treatments, but no herbicide was applied.

Conclusions

Pearlwort is not an aggressive plant. My research has shown that it germinates slowly and then grows even more slowly. However, lack of control options in propagation houses allows even this dawdling weed to grow rampant. Sanitation in the container yard and strict use of weed-free liners are the most effective way to control this species. If infested liners are used, it is extremely difficult to remove pearlwort from potted container crops. Thorough hand-weeding, followed by applications of either Snapshot, Pendulum, Rout or RegalKade, should provide effective control in the aftermath of a pearlwort infestation.

Increasing bark particle size, from left to right, resulted in decreased pearlwort germination.

The troublesome weed growing out from the center is a common sight among infested containers, indicating the infestation started with the potted liner.

Disclaimer: This article is for educational purposes only. Mention of a specific product should not be interpreted as an endorsement, nor should failure to mention a product be considered a criticism. Always read the product label prior to using any herbicide.

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