Vascular Weed Control in Container Production Using Select Non-chemical Top-dress Treatments©

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Vascular weeds are a major problem in nursery container production, leading to expensive hand weeding and the application of chemical herbicides for their removal. Weeds compete with the crop being produced for water, nutrients, and light, resulting in stunted crops, increased inputs for production and potential loss in profits. Six non-chemical top-dress treatments were tested for their suppressive and preventative qualities against four different weed species common to container nursery production. Twenty seeds each of *Cardamine hirsuta, Epilobium ciliatum, Sagina procumbens*, and *Senecio vulgaris* were sown in Classic 200-containers filled with a conventional potting mix, fertilized with a time-release fertilizer, and top-dress treatments were applied either before or after weed seeds were sown. These treatments consist of buckwheat hulls, cocoa shells, coir fiber discs, geotextile discs, pine bark mulch, rice hulls, or controls which lack any top-dress treatment. The experiment was conducted in a greenhouse where a diurnal temperature flux was utilized and supplemental HID lighting was used to promote a long-day environment. The objective of this study was to replicate common weed pressures typical in a production nursery and determine which top-dress treatments were most successful in preventing and/or suppressing the establishment of these weed seedlings. Effectiveness of treatments was assessed by determining the survival of weed seedlings at 30 days following sowing. Results indicate that buckwheat hulls and rice hulls have the greatest effect in controlling weed growth in containers for the weed species *C. hirsuta*, *E. ciliatum*, and *S. procumbens*.

INTRODUCTION

A common definition of a weed often found in literature is any plant growing where it is not wanted. However, a weed is more involved than this; a weed can also be seen as any vegetation that competes with the crop being produced for available resources such as nutrition, water, light, and air. The presence of weeds in a container also reduces the marketability of that plant (Neal, 1999). Growers want to maximize the return on their crop, and any weeds competing in the containers will reduce the quality of the plant and therefore reduce their bottom line (Berchielli-Robertson et al., 1990; Fretz, 1972).

While the issue of weed control in container production is very important, the bulk of the current literature is focused on the use of herbicides for weed control. In these current trials we are interested in non-chemical controls and their efficacy in weed suppression and prevention. Recently some researchers have experimented with geo-textile discs (Appelton and French, 2000), PennMulch and Wulpack (Wooten and Neal, 2000), as well as herbicide-treated bark nuggets (Mathers, 2003) but a comparative study of organic methods is lacking from the literature.

Weed seed can be introduced into the production area either through contaminated potting media or introduced by wind, water, and nearby mature plants (Berchielli-Robertson et al., 1990). Based on these methods by which weed seeds could be introduced into the nursery production cycle, we investigated both the suppressive effects of various top-dress treatments if the potting media had been contaminated with weed seed prior to the application of treatments as well as the preventative effects of the treatments as if the weed seed had been introduced by wind or other means once treatments had been applied.

We began this research project by surveying local, regional, and national nurseries, asking for a list of the most problematic weeds they encounter in their container production systems. Their feedback corresponded with information noted in previous research (Case, et al., 2005; Cross and Skroch, 1992).

MATERIALS AND METHODS

- Two concurrent trials (preventative and suppressive) run in a greenhouse, replicating outdoor summer conditions.
- Seven mulch treatments tested across 4 weed species common to nursery container production.
- Classic 200 pots filled with Fafard 2® commercial mix.
- A ½-inch layer of mulch applied per pot.
- Twenty seeds of each species sown per pot.
- Five replications for each treatment/species combination.
- Preventative trial: seeds sown after treatments were applied.
- Suppressive trial: seeds sown prior to treatment application.
- Osmocote Plus® (Scotts-Siera Horticultural Products, 2006) time-released fertilizer applied at suggested rate of 6 g per pot for nursery plants.
- All pots watered daily.
- At 30 days after sowing, both trials were evaluated for efficacy in controlling seed germination and subsequent emergence.
- Analysis of varience (ANOVA) was conducted and means were compared using a Dunnett's t-Test (SAS Institute, 2006).

RESULTS

All treatments in both trials showed a significant difference from the control in all four species studied.

Cardamine hirsute. Buckwheat hulls and rice hulls both had the least number of plants per pot across both trials.

Epilobium ciliatum. Buckwheat hulls, cocoa shells, and rice hulls all had the least number of plants per pot across both trials.

Sagina procumbens. Buckwheat hulls, geodiscs, and rice hulls all had less than one plant per pot across both trials.

Senecio vulgaris. Cocoa shells in the suppression trial were the only mulch to have less than one plant per pot. All other treatments had more than one plant per pot in both trials.

DISCUSSION

Results indicate that rice hulls and buckwheat hulls appear to have the greatest effect in controlling weed growth in containers for the weed species *C. hirsuta*, *E. ciliatum,* and *S. procumbens*. Cocoa shells proved to control weed growth in most species, however they quickly grew a thick layer of fungus and consequently was a great breeding ground for fungus gnats. The larval stage of the fungus gnat feeds on young plant roots and is therefore discouraged from any container production area.

In a nursery production environment, the presence of just one solitary weed could impart unwanted weed pressure. Weeds mature quickly, can produce many seeds in a generation and can spread these seeds throughout the container area. For this reason, top-dress treatments that show complete preventative and suppressive control are desired.

Depth of top-dress treatments could have a direct effect on weed seed germination and subsequent growth. In this study, we used a consistent depth for our top-dress treatments, however, a comparative study of varying depths of organic mulches, mainly buckwheat or rice hulls, should be conducted.

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