Utilizing the Weed Suppressive Capacity of Selected Tree Species for Weed Control in Woody Ornamental Nurseries

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Abstract. Woodchip mulches from mature red cedar and magnolia trees were evaluated for their effectiveness in controlling weeds in containerized nursery trees. In laboratory bioassays, water leachates of red cedar and magnolia wood chips were highly inhibitory to germinating lettuce seedlings. In greenhouse tests, red cedar and magnolia wood chip mulches significantly inhibited the germination of red root pigweed and hairy crab grass. The mulches affected red root pigweed seed germination more than that of hairy crab grass. In a field trial, containers with crepe myrtle plants were sown with hairy crab grass and red root pigweed seeds and mulched with red cedar or magnolia wood chips and compared with crepe myrtle plants without mulch and with plants to which an herbicide was applied. Wood chips from both red cedar and magnolia were as effective as the chemical weed control in suppressing weed growth. The wood chip mulches had no inhibitory effect on the growth of crepe myrtle plants.
Objective. The objective of this proposal is to determine if material from these allelopathic woody species can suppress growth of a broadleaf and grass weeds commonly found in containerized woody ornamental nurseries without restricting the growth of the host woody ornamentals.

Methods.

Wood and plant material. Tree limbs from about 10-year old live trees of southern red cedar (*Juniperus cilicicola*) and southern magnolia (*Magnolia grandiflora*) were cut into 1-4-inch segments using a commercial wood chipper and used throughout this study. Seeds of hairy crab grass (*Digitaria sanguinalis*) and red root pigweed (*Amaranthus retroflexus*), obtained from a commercial seed company, were used as the weed seed source.

Effect of mulches on weed seed germination.

Wood chips (5 grams fresh weight) were incubated in 50 ml double distilled water for 24 hours at 37^0C in a temperature-controlled incubator. The liquid was filtered through four layers of cheese cloth and a 0.2 micron filter. Surface sterilized 'Green Ice' lettuce seeds were washed in sterile distilled water and placed on wet filter paper discs within petri plates. Three ml of leacheate from the red cedar and magnolia wood chips were added to the plates. Other plates were treated with water only.

Plastic pots were half-filled with vermiculite. Hairy crab grass or red root pigweed seeds (50 seeds per replicate) were placed between two Whatman #2 paper circles and the filter paper-seed sandwich was placed on vermiculite in pots. This was topped with either magnolia or red cedar wood chip mulches or vermiculite (control) for a thickness of about 4 cm. The pots were placed in a greenhouse in Gainesville, Florida and irrigated daily for one week. The maximum and minimum temperatures during the experimental period were 40 and 30^0C respectively. At the end of one week, the mulches were removed and the weed seed germination was recorded. Each treatment had ten replicates.

Field experiments on weed suppression.

The field experiments were done between April and August 2005 in a field nursery in Gainesville, Fl. Uniform (trimmed to 45 cm height), vegetatively-propagated crepe myrtle (*Lagerstomia indica*) Cv. 'Carolina beauty' plants, obtained from San Felasco Nurseries, Gainesville, Fl were potted in five gallon plastic pots in a commercial potting medium (MetroMix 200). Weed seeds of hairy crab grass and red root pigweed (300 seeds of each species per container) were sown around the crepe myrtle plants. A day after sowing, the containers were mulched with about 4 cm thickness red cedar or magnolia wood chip mulches. For comparison, some containers were treated with one gram of an herbicide (isoxaben/ trifluralin [Snapshot]) and others received no mulch or herbicide treatment. Each treatment had six replicates. The plants were watered to container capacity twice a week or as needed. At the end of 45 days, crepe myrtle plant heights were measured and the weeds in each container were harvested and weighed. Figure 1 shows the layout of the field experiment.

Figure 1. *The layout of the Field Experiment to Evaluate the Effect of Wood Chip Mulches on Weed Suppression in Containers*.

Statistical treatment.

Experiments were set up using a completely randomized design and analyses of data were performed using the SAS statistical package (SAS Institute, 2000). Following analysis of variance, Duncan's multiple range test was used for mean comparisons. Both the greenhouse and field experiments were done twice with similar results. Figures show data from one of the two experiments.

Results and Conclusions

1. Wood chip mulches from both red cedar and Magnolia had water soluble inhibitory substances on germinating lettuce seeds confirmed in lettuce bioassays (Figure 2).

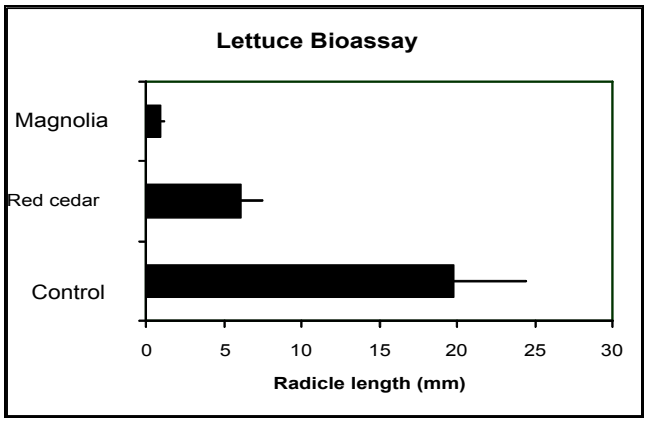

Figure 2. *Effect of Red cedar and Magnolia wood chip leachates on root length of germinating lettuce seeds*.

2. Greenhouse trials showed that the mulches inhibited germination of red root pigweed and hairy crab grass (Figure 3). The dicot weed, red root pignweed, was inhibited more than the monocot weed (Figure 3). This suggests that some of the allelopathic weed suppressing chemicals could be specific.

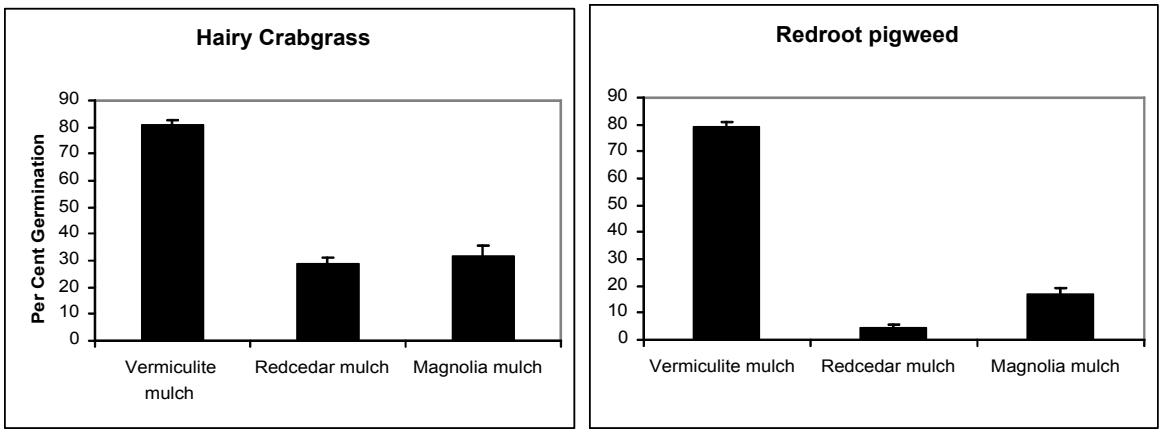

Figure 3. *Effect of Red Cedar and Magnolia Mulch on Germination of Hairy Crabgrass and RedRoot Pigweed in a Greenhouse Experiment.*

3. In the field trial, both the mulches suppressed weed growth as well as the chemical control (Figure 4). The host plant growth was not affected (Figure 5). Weed suppression was not 100% but the conditions under which the field experiments were done were

harsh, characterized by high temperature and heavy rains and some of the water soluble allelochemicals or herbicide could have been leached from the containers.

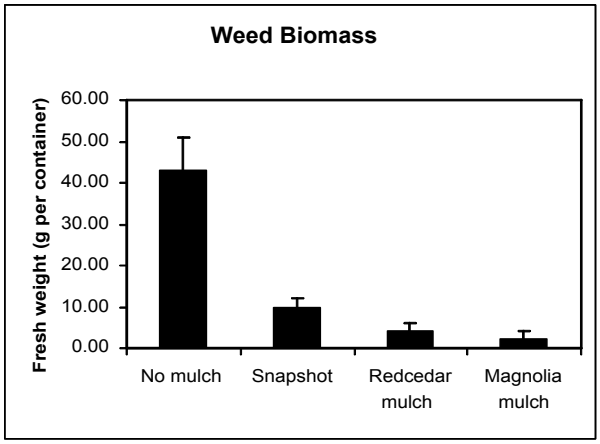

Figure 4. *Effect of Red Cedar and Magnolia Mulches on Weed Suppression in Nursery Containers compared to no mulch and Herbicide (Snapshot) treatmen*t.

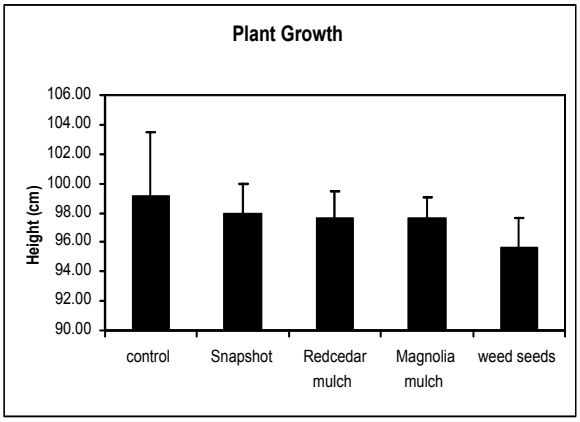

Figure 5. *Effect of Red Cedar and Magnolia mulches and Herbicide (Snapshot) treatments on the growth of Crepe Myrtle plants at the end of the experiment. Note that the mulches did not significantly reduce crepe myrtle plant growth.*

Recommendations. This research has shown that leacheates from wood chips of southern red cedar and southern magnolia are as effective in suppressing weed germination in potted crepe myrtle plants as a commercial herbicide, without inhibiting crepe myrtle growth. This "bioherbicide" could be used in commercial nurseries but growth effects of these mulches on other host plants should be further determined.