Auburn University
Southern Forest Nursery
Management Cooperative

RESEARCH REPORT 14-05

EFFECT OF IMAZAMOX (RAPTOR® AND CLEARCAST®) APPLICATION AT THE TIME OF SOWING ON 4 HARDWOOD SEEDLING SPECIES AT THE CHATSWORTH NURSERY IN GA AND THE EAST TENNESSEE NURSERY

by
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INTRODUCTION

Morning glory (Convolvulaceae Family) includes multiple plant species characterized by an aggressive annual or perennial weed with a climbing or twining form. The family contains at least 50 genera and over 1000 species. While some of the plants in the family provide valuable crops such as the sweet potato, in forest-tree nurseries they are a plant to be reckoned with. This weedy vine will twine all over the nursery bed, covering your seedlings to the point of smothering. Another common name for this plant is "bindweed". The weed is usually introduced either by seed or invasive roots from untreated areas within the nursery. The plants' success as an annoying weed lies in its thick fleshy roots which travel long distances just under the soil surface. Since morning glory is a perennial weed, control lies in removing the entire root system. Hand or machine-weeding can remove large quantities of roots, but any broken pieces are capable of sprouting new growth. Thus, chemical control is required in all areas of the nursery to minimize problems in the cropping areas. Hardwood seedlings are often mentioned as difficult to manage due to morning glory and its habit of "tying up the seedlings" and the lack of herbicides that can be used over/in hardwood seedlings. It is therefore no surprise that according to the 2012 Nursery Practices Survey, morning glory was one of the top three weeds reported by nursery managers as needing attention (Starkey et al; unpublished data). To address the issues of morning glory in hardwood seedling beds, the Nursery Cooperative undertook nursery trials that examined a previously untested herbicide for seedling tolerance at different post-emergent application rates of 12.1% ammonium salt of imazamox. This is the same active ingredient in BASF's Raptor® labeled for agricultural use and BASF's Clearcast®, which is labeled for aquatic use.

METHODOLOGY

The two nurseries used were the East Tennessee State Nursery, Delano, TN and the Native Forest Nursery near Chatsworth, GA. To examine the effects on hardwood seedlings and to determine the degree of control on morning glory, Clearcast® was applied at two rates (4 & 6 oz/a) along with a non-treated control plot (Table 1). The active ingredient (12.1% ammonium salt of imazamox) in both Raptor® and Clearcast® has been reported to control morning glory in forest-tree nursery

production systems. The Nursery Cooperative tested Clearcast® on swamp chestnut oak and plum at the Tennessee State Nursery, Delano, TN and northern red oak and white oak at the Native Forest Nursery at Chatsworth. At the East Tennessee Nursery, the seed were sown on February 13, 2013 and the herbicide treatments were applied on May 14, 2013. At the Chatsworth Nursery the seed were sown on October 31, 2012 and treated on May 15, 2013. The two morning glory species observed were red (*Ipomoea coccinea*) and ivy leaf (*Ipomoea hederacea*) morning glory.

The herbicides were applied by AU Nursery Cooperative personnel using a CO_2 hand sprayer calibrated at 22 gallons per acre on six different hardwood seedling species. Each treatment plot was one seedling bed wide X 5 feet in length that was replicated five times. The experimental area was the seedlings in 175 feet of one nursery bed plus 20 feet of buffer for each trial. The nursery staff made observations and recorded abnormalities in seedling growth within the treated plots and reported that information to the Nursery Cooperative staff in Auburn. Prior to herbicide applications, soil samples were collected from the first six inches of soil in each treatment plot. The samples were pooled and analyzed for organic matter, pH, and soil texture (sand, silt, and clay contents). Morning glory control was evaluated by the percent of weed coverage in each plot for each treatment. At the end of the growing season, all seedlings in each treatment plot were lifted from inside a 9 x 48 inch frame placed in the center of the plot. At the Nursery Cooperative laboratory at Auburn University, seedling density, root collar diameter (RCD), height, and root/shoot dry weights were measured to determine seedling tolerance to the various herbicide treatments.

RESULTS AND DISCUSSION

Soil collected and analyzed at the Soil Testing Laboratory in Auburn University indicated similar soil types for the two nurseries. Soil samples from the Native Plants Nursery in Chatsworth, GA indicated a sandy loam (63:30:7) soil, with soil pH of 5.9 and organic matter content of 2.9%. Samples collected from the East Tennessee Nursery near Cleveland, TN indicated a sandy loam (58:34:7) soil with a soil pH of 5.2 and organic matter content of 2.5%. The efficacy of the herbicides on morning glory control within the plots was difficult to determine due to: 1) the lack of morning glory within some of the plots and, 2) the seedlings hiding/covering up any morning glory within the plots. However, early weed data collected indicates that Clearcast® at both rates used stunted or stopped the growth of morning glory, but did not kill the plant outright. Multiple applications may be necessary to eliminate the runners and flowers that would produce next year's weed seed.

Based on seedling quality and quantity data collected at the end of the growing season, tolerance to the herbicide is dependent upon the tree species. By far the most tolerant species tested was northern red oak as seedling densities, shoot weight, shoot height and RCD were all similar to the control (Table 2, Figure 1). The species next in tolerance was swamp chestnut oak at the East Tennessee Nursery (Table 3, Figure 2). The application of Clearcast® at both rates (4 & 6 oz/a) resulted in significantly shorter seedlings as measured by shoot height. All other seedling parameters were similar. White oak treated at Chatsworth resulted in less shoot weight, shorter seedlings and smaller RCD's when compared to the non-treated control plots (Table 2, Figure 3). The least tolerant species tested was plum, as all seedling parameters were negatively affected by the application of Clearcast® (Table 3, Figure 4). Thus, plum is not a good candidate for post-

emergence control of morning glory using Clearcast®. In previous herbicide trials to control morning glory (Enebak et al, 2013) using Dismiss®, Pendulum Aquacap® and BroadStar®, plum was the least tolerant as well with common persimmon, hazelnut, swamp chestnut oak, water oak and willow oak are tolerant to the post-emergent application of these same herbicides.

MANAGEMENT IMPLICATIONS

1) Based on seedling quality and quantity data collected at the end of the growing season, northern red oak is the most tolerant species tested for post-emergence applications of Clearcast® at both the 4 and 6 oz/ac. Seedling quality was not affected by the herbicide and was similar to the non-treated control plots.

2) Seedling quality and quantity data collected from swamp chestnut oak and white oak indicated that Clearcast® reduced seedling shoot height over non-treated controls in both the swamp chestnut oak and white oak. Seedling shoot weight and RCD was reduced on the white oak, ranking it the least tolerant of the three oak species tested.

3) As in previous herbicide trials, post emergence applications of Clearcast® on plum was detrimental to the production of plum seedlings at both rates, with the 6 oz/ac the most severe in the reduction in plantable seedlings.

4) The use of Clearcast® stunted morning glory plants, but did not kill them with one application in these trials. It is possible that multiple applications of Clearcast® over the growing season would eliminate the runners and subsequent flower and seed production.

LITERATURE CITED

Enebak, S.A., Whitaker, B., Brooks, B. and Jackson, P. 2013. Controlling Morning Glory (Ipomoea sp.) in hardwoods using pre and post-emergence herbicides at the East Tennessee and Native Forest Nurseries. RESEARCH REPORT 13-01, Southern Forest Nursery Management Cooperative, Auburn University. 9 pp.

Table 1. Treatments applied post-emergent to Northern Red, Swamp Chestnut, White Oak and Plum at the Chatsworth and East Tennessee Nurseries -2013.

Treatment *(No.)*	**Post-emergent Herbicide** *(Trade Name)*	**Product** *(oz/ac)*	**Non-ionic Surfactant** *(%)*
Check	*Control*	-	-
Clearcast 4	Clearcast®	4	0.25% V/V (1 qt/100 gal)
Clearcast 6	Clearcast®	6	0.25% V/V (1 qt/100 gal)

Table 2. Effect of Clearcast treatments on White Oak and Northern Red Oak seedling characteristics at Chatsworth, GA 2013.

	White Oak				**Northern Red Oak**			
Trt	**Density (ft^2)**	**ShtWgt (g)**	**ShtHgt (cm)**	**RCD (mm)**	**Density (ft^2)**	**ShtWgt (g)**	**ShtHgt (cm)**	**RCD (mm)**
Control	14.1 a	5.7 a	28.5 a	5.26 a	9.3 a	7.1 a	31.5 a	6.6 a
Clearcast 4	15.1 a	4.7 b	24.0 b	4.80 b	8.2 a	8.4 a	33.5 a	6.5 a
Clearcast 6	14.2 a	4.4 b	22.5 b	4.78 b	8.7 a	7.7 a	31.5 a	6.4 a

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre, respectively. Letters within a column denote significant differences among treatments using Duncan's Multiple Range test @ alpha=0.05 level.

Table 3. Effect of Clearcast treatments on Swamp Chestnut Oak and Plum seedling characteristics at East Tennessee Nursery, 2013.

	Swamp Chestnut Oak				**Plum**			
Trt	**Density (ft^2)**	**ShtWgt (g)**	**ShtHgt (cm)**	**RCD (mm)**	**Density (ft^2)**	**ShtWgt (g)**	**ShtHgt (cm)**	**RCD (mm)**
Control	10.7 a	11.0 a	57.0 a	5.90 a	16.6 a	15.5 a	64.2 a	5.33 a
Clearcast 4	10.0 a	11.5 a	49.5 b	6.57 a	9.4 b	6.0 b	39.7 b	3.63 b
Clearcast 6	10.7 a	12.2 a	50.3 b	6.24 a	5.6 b	9.1 b	44.9 b	4.10 ab

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre, respectively. Letters within a column denote significant differences among treatments using Duncan's Multiple Range test @ alpha=0.05 level.

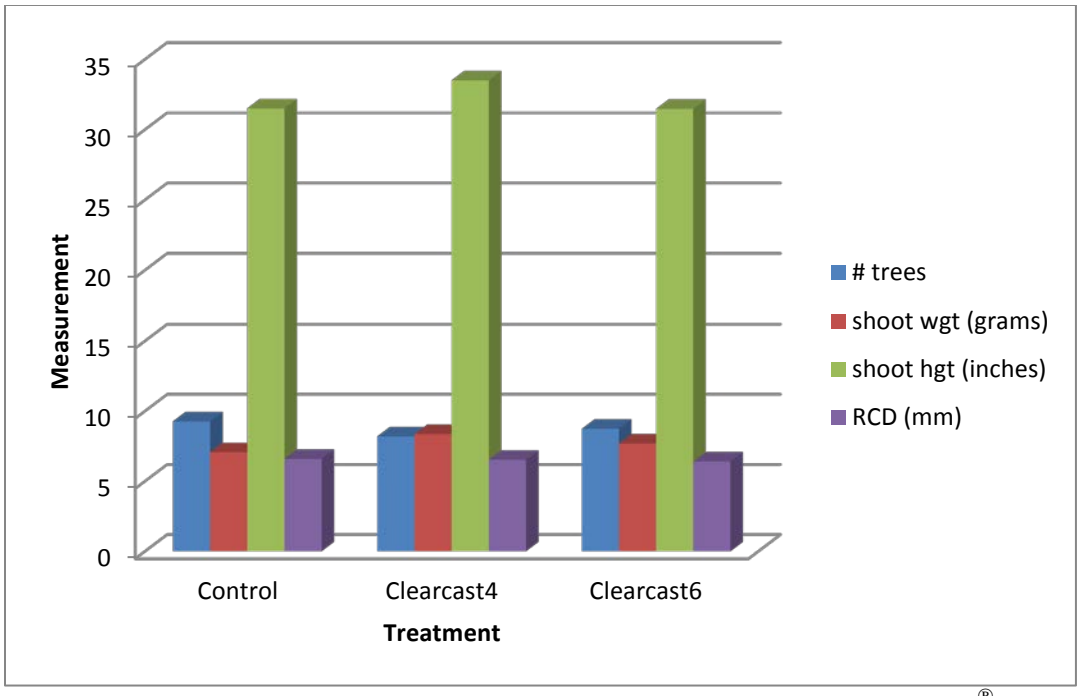

Figure 1. Northern Red Oak Seedling Characteristics treated with Clearcast® at the Native Forest Nursery in Chatsworth, GA 2013.

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre. If letters are present, they denote significant differences from Control within a seedling character using Duncan's Multiple Range test @ alpha=0.05 level.

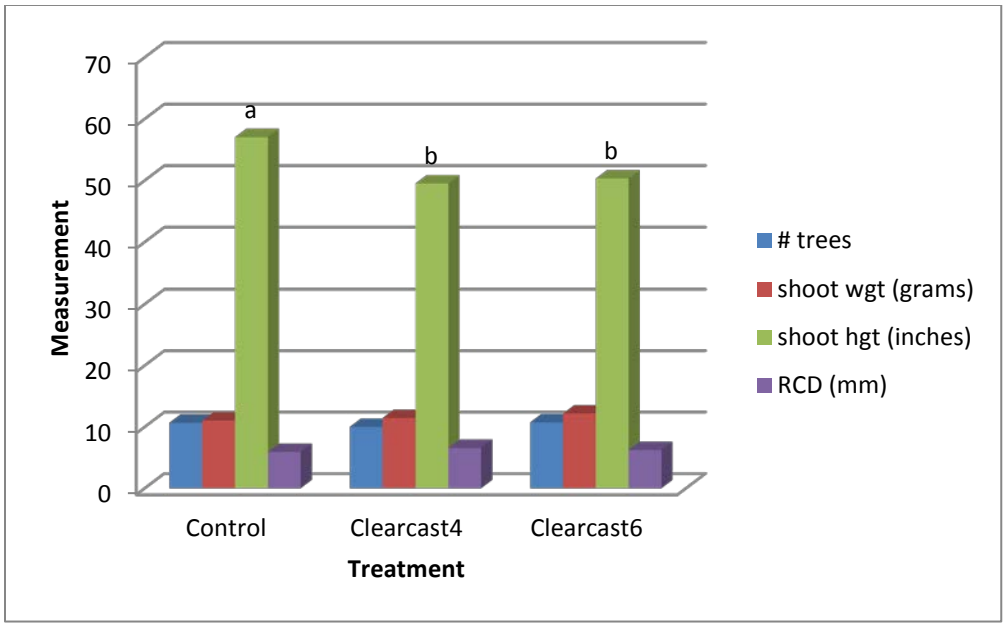

Figure 2. Swamp Chestnut Oak Seedling Characteristics treated with Clearcast® at the East Tennessee Nursery in Delano, TN 2013.

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre. If letters are present, they denote significant differences from Control within a seedling character using Duncan's Multiple Range test @ alpha=0.05 level.

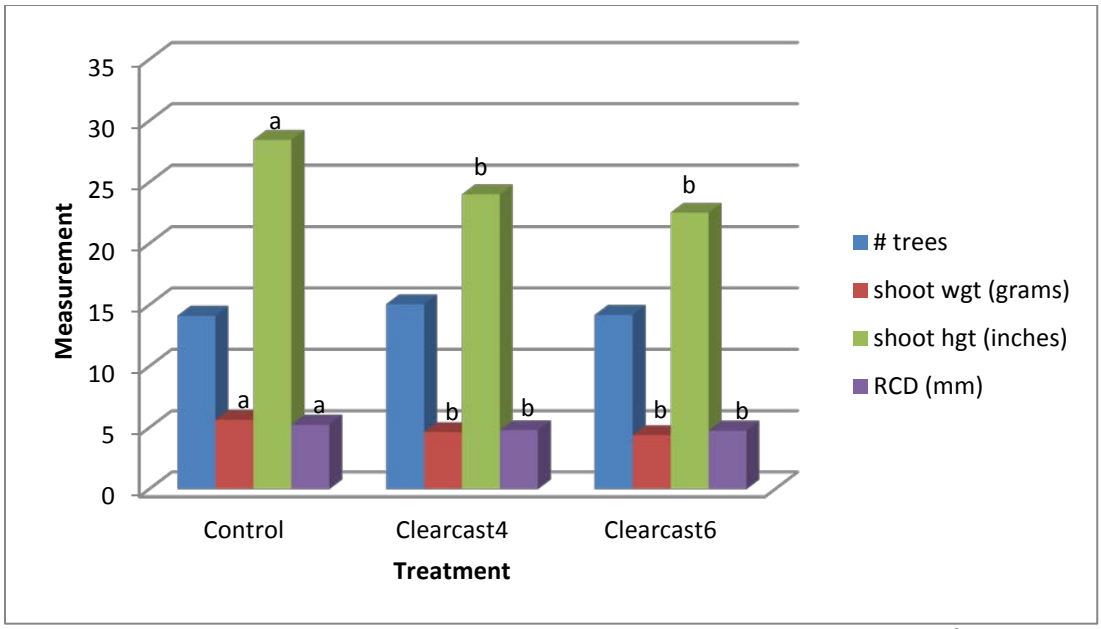

Figure 3. White Oak Seedling Characteristics Treated with Clearcast® at the Native Forest Nursery in Chatsworth, GA 2013.

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre. If letters are present, they denote significant differences from Control within a seedling character using Duncan's Multiple Range test @ alpha=0.05 level.

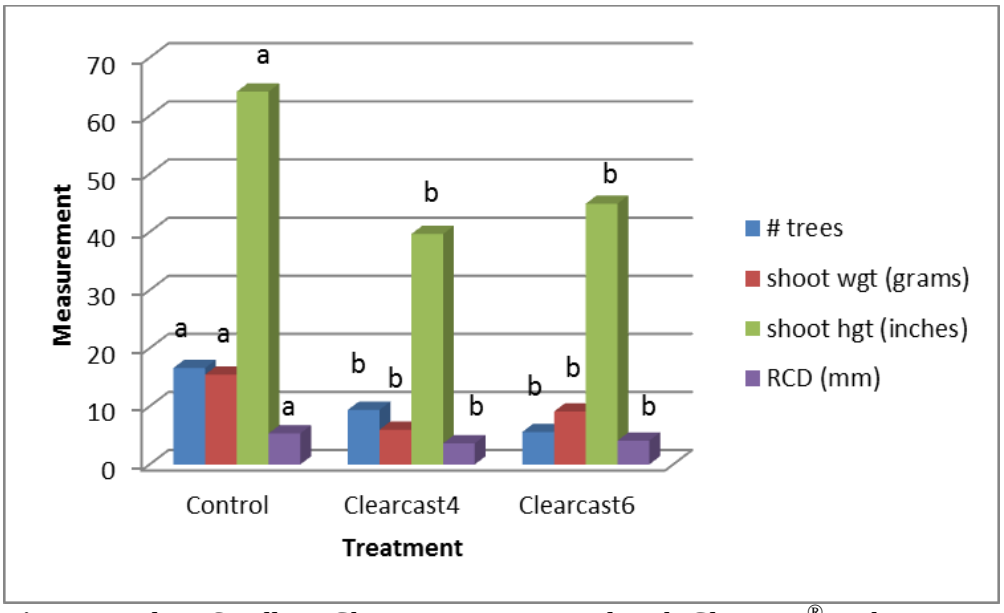

Figure 4. Plum Seedling Characteristics treated with Clearcast® at the East Tennessee Nursery in Delano, TN 2013.

Control = no treatment, Clearcast 4 and Clearcast 6 = 4 and 6 oz of (12.1% ammonium salt of imazamox) per acre. If letters are present, they denote significant differences from Control within a seedling character using Duncan's Multiple Range test @ alpha=0.05 level.