Southern Forest Nursery Management Cooperative™

RESEARCH REPORT 25-01

SECOND-YEAR TRIALS OF ARKON™ (PYRIMISULFAN) FOR ANNUAL SEDGE AND NUTSEDGE CONTROL IN BAREROOT PINE SEEDLING BEDS

by
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INTRODUCTION

The Southern Forest Nursery Management Cooperative (SFNMC) installed its first trials of a turf management herbicide containing pyrimisulfan (Vexis®) in 2021. This granular herbicide targets nutsedge and annual sedge for control. Three years of successful testing of Vexis® in over-the-top, post-emergent applications in seven bareroot pine seedling nurseries led to its labeling by the EPA in 2024 for use in loblolly and slash pine bareroot nurseries in Alabama, Arkansas, Georgia, North Carolina, and South Carolina.

As the Vexis® trials were successful, its manufacturer, PBI-Gordon, expressed interest in testing its liquid formulation of pyrimisulfan, Arkon™, prior to pursuing any additional labels for Vexis® in other states. The company introduced Arkon™ in late 2022 for use on turf, sod production areas, and non-cropland sites for control of annual sedge, nutsedge, rushes, kylinga, and various broadleaf weeds. Bareroot conifer nurseries are not listed on its label as an acceptable site or crop for use. Arkon™ is a Group 2 post-emergent selective herbicide in liquid formulation. It contains 1.24% pyrimisulfan as its active ingredient. In comparison, Vexis®, the granular pyrimisulfan product tested by the SFNMC contains 0.025% pyrimisulfan. Technical information provided by the manufacturer states that Arkon™ applications 'reduce both tuber number and viability of purple and yellow nutsedge'. It is sold in 1-gallon and 2.5-gallon jugs, 30-gallon drums, and 275-gallon totes.

SFNMC member nurseries with annual sedge and nutsedge problems voiced their need to obtain liquid formulation labeling of pyrimisulfan due to its more precise measurements of application amounts, ease of application, and more thorough weed coverage in applications when compared to granular product applications. The first year of Arkon™ trials by the SFNMC were conducted in 2023 in three member nurseries. These trials included testing three rates of the product (1/2X, 1X, and 2X the label rate for turf use) in a single application timing (at 7 weeks post-sowing). Results from these trials were positive in both sedge control and seedling tolerance and were submitted with raw data collected from each installation to the manufacturer. Upon receipt of the first-year results, Akron's manufacturer requested that the SFNMC install a second year of studies in additional nurseries to test in varying soil types, and in different rate and timing regimes.

The purpose of this second-year of Arkon™ testing was to evaluate loblolly and slash pine seedling tolerance and to provide data to member nurseries and PBI-Gordon for possible inclusion in future 24(c) labeling.

METHODOLOGY

Arkon™ trials were installed in June and July of 2024 in Rayonier's Elberta, Alabama Nursery, Weyerhaeuser's Pearl

River Nursery in Hazlehurst, Mississippi and ArborGen's Shellman, Georgia Nursery (Table 1). At the recommendation of PBI-Gordon, only two rates of Arkon™ were tested, 1X (1.7 fl. oz./1000sq. ft.) and 2X (3.4 fl. oz./1000 sq. ft), the label rates previously tested in 2023. However, two different timing regimes were included, with half of the plots treated at 7-weeks post-sowing, and half of the plots treated twice, at 7- and 12-weeks post sowing (Table 2 and Figure 1).

In loblolly and slash pine beds, plots 10 feet in length were measured and flagged for identification prior to herbicide application. SFNMC staff applied the herbicide with a CO2 hand sprayer calibrated to broadcast a spray volume of 25 gallons of water per acre. Five replications were installed in each species, for a total of 250 feet per seedling bed used (except for the slash pine trial at the Pearl River Nursery with four replications). After spray applications were made, each nursery waited at least two hours before irrigating, per the Arkon™ label recommendation.

To provide information to PBI-Gordon, photos were taken and estimates of nutsedge and annual sedge weed coverage of each plot were made in June and July at each nursery. Coverages were ranked by the percentage of the plot that contained the weeds in four categories, 0 to 20%, 20 to 50%, 50 to 80%, and 80 to 100%. Unusually tall weeds and weeds of other species were also noted.

At the end of the growing season, seedling samples were collected from each plot in each installation. All seedlings within a 9-inch by 4-foot counting frame placed in each plot were lifted by hand, with outside rows' seedlings marked and separated from inside rows' seedlings. These were taken to the SFNMC laboratory in Auburn, Alabama for measurements.

From each plot's samples, the total number of seedlings were counted to measure bed density. From the inside rows' seedlings of each plot, a random selection of 25 seedlings was measured for shoot height, root collar diameter, shoot dry weight, and root dry weight. Data was analyzed using R Statistical Software (v4.1.2; R Core Team 2021) to identify significant differences between the means of each measured characteristic with Tukey's Honest Significant Difference (HSD) post hoc test. A significance level at alpha = 0.05 was used.

RESULTS

Loblolly pine: At the Rayonier Nursery, there were no **negative** effects of herbicide on any seedling characteristic when compared to non-treated control seedlings (Table 3). There were significantly higher bed density counts (by 9+ additional seedlings per square foot), root collar diameters, and shoot dry weights on treated seedlings when compared to non-treated control seedlings. During the growing season, these treated seedlings did not compete with nutsedge and annual sedge in their plots so they were able to grow much larger and were not choked out by weeds.

Analysis from the ArborGen Nursery (Table 4) showed no **negative** effects of Arkon™ treatments except for a slight (0.7 cm) difference in shoot heights between non-treated control seedlings and those treated with two times the label rate at 7 weeks post-sowing. Root dry weights of treated seedlings at the highest rate in a double application were significantly higher than all other seedlings.

At the Weyerhaeuser Nursery, there were no **negative** effects of herbicide on any seedling characteristic when compared to non-treated control seedlings. There were small significant differences in seedling heights, with taller seedlings noted in three of the treatments when compared to non-treated seedlings. Root collar diameters were also significantly larger (by up to 0.49 mm) in three treated plots. The root weight ratio of seedlings collected from the plots receiving the most Arkon™ application (two times the label rate at 7- and 12-weeks post-sowing) was significantly higher than the non-treated control seedlings (Table 5).

Slash pine: No statistically significant **negative** effects of Arkon™ (pyrimisulfan) were quantified in slash seedling samples from the Rayonier Nursery (Table 6) or the Weyerhaeuser Nursery (Table 8). Like the loblolly pine results from the Rayonier Nursery, larger root collar diameters, shoot dry weights, and root dry weights were noted in treated plots when compared to non-treated seedlings. Trial slash seedlings from the Weyerhaeuser Nursery also showed increased root collar diameters, root weights, and root weight ratios in several treated plots, compared to non-treated control seedlings.

Analysis at the ArborGen Nursery (Table 7) showed no statistically significant **negative** effects of Arkon™ on any characteristic except for seedling height, with treated seedlings being shorter than non-treated control seedlings. A similar result was seen in the 2023 Arkon™ trial at this nursery. In both instances, seedlings were intentionally not top-clipped during the growing season and the height difference between non-treated control seedlings and treated

seedlings was easily visible at the end of the growing season. In the 2023 trial, the largest height difference was 1.5 centimeters between control seedlings and seedlings treated at two times the label rate with one application. In this trial, the largest height difference was 4.7 centimeters between non-treated control seedlings and those treated at two times the label rate with two applications. These seedlings were grown at a lower density than in the 2023 trial, so these seedlings would be considerably taller than those planted in more typical lower densities. Because the omission of top-clipping is not standard practice in SFNMC nurseries, this height difference will most likely not be measurable in top-clipped slash pine in Arkon™- treated seedling beds. Increased root dry weights and root weight ratios were noted in seedlings from treated plots when compared to non-treated control plot seedlings.

Nutsedge: Annual sedge and nutsedge populations in the trial beds varied widely by nursery. Estimates of populations were made in June and July at the time of Arkon™ applications. Differences between those estimates showed the effect of pyrimisulfan on these weeds over that 5-week period between applications.

At ArborGen's Shellman Nursery and Weyerhaeuser's Pearl River Nursery, very little (less than 10% of the plot covered) nutsedge or annual sedge was observed in the trial plots in June or July.

The Rayonier Nursery trial plots were intentionally installed in beds with high sedge populations, with annual sedge (*Cyperus compressus*) being the predominant weed. Treated loblolly plots showed the greatest effect of Arkon™ treatments, as sedge populations were reduced from an average of 50-80% coverage in June to 0-20% coverage by 5 weeks after the first treatment. The non-treated control plots in the loblolly trial bed increased in weed coverage, from approximately 40% coverage in June to 80-100% coverage five weeks later. In the slash bed, treated plots did not show as large a decrease in sedge coverage, although the control plots did show an increase in annual sedge populations, with an increase from 20-50% coverage to 80-100% coverage five weeks later.

MANAGEMENT IMPLICATIONS

Results from this second year of Arkon™ trials in bareroot in loblolly and slash pine seedlings provides further evidence of the herbicide's effectiveness in controlling two of the most problematic weeds in southern forest-tree nurseries, nutsedge and annual sedge. Not only are seedling crops negatively affected by sedge infestations, the cost of removal by hand-weeding has increased, as have the problems of obtaining adequate and timely labor to do this field work.

Data and results from these trials will be used to pursue labelling of Arkon™ for annual sedge and nutsedge control in bareroot loblolly and slash pine nurseries. Additional testing is required, with rates and timings altered to better accommodate nurseries' needs to control these sedge weeds early in the growing season. If additional information on sedge control is needed, estimates of annual sedge and/or nutsedge populations should be made later in the growing season when weeds are still actively growing (September or October) to evaluate the effect of the second applications on weed populations.

As with any new product on the market, SFNMC member nurseries wishing to conduct in-house trials of Arkon™ should follow the guidelines for testing contained in "How To Test Herbicides In Forest Tree Nurseries", USFS General Technical Report PNW-127, accessible at https://research.fs.usda.gov/treesearch/7521. In this publication, the following information is provided:

"Under the Federal Insecticide, Fungicide and Rodenticide Act, administered by the U.S. Environmental Protection Agency, it is legal to use any pesticide (herbicides are pesticides) in one of two ways. First, pesticides may be used according to their label directions and precautions. This means that use-pattern, site, and target pest appear on the label, with directions and precautions which pertain to a particular situation. Or, the pesticide label is written in such a manner that a prudent person can interpret it to include hislher proposed use-pattern.

Secondly, pesticides may be used under experimental permits issued by State pesticide regulatory agencies or the U.S. Environmental Protection Agency. In these instances, a pesticide is obtained from and used under the general direction of a representative of the chemical manufacturer, who is usually the person to whom the experimental permit is issued. Details and assistance can be obtained from USDA Forest Service pesticide specialists, State pesticide regulatory personnel, or technical representatives of the chemical manufacturer. The objective of testing is to find safe herbicides which control weeds economically while not adversely affecting the seedlings produced.

If restricted-use herbicides are used, the applicator or supervisor must be certified. Certification usually requires training plus passing a written test. Information on the certification of applicators is available from the USDA Forest Service or

Cooperative Extension Service."

Because Arkon™ is not presently labelled for use in conifer nurseries, the first method of use is not currently allowed. The second method described in which Experimental Use permits are required, also does not apply to SFNMC nurseries based on the Federal Code of Regulations, Title 40, Chapter I, Subchapter E, Part 172, Subpart A, Section 172.3. This section describes exemptions to Experimental Use permits. Because SFNMC nurseries install small experimental plots when testing pesticides, these areas and activities fall under the 'cumulative total of no more than 10 acres of land per pest' and are exempt from the need for Experimental Use permits. Additionally, Arkon™ is not a restricted use pesticide, so applicator certification is not required.

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Table 1. The three nurseries and their corresponding soil types.

Nursery	Soil type
Rayonier Nursery, Elberta, AL	Wadley loamy fine sand, 0-5% slopes (0-6 inches loamy fine sand, 6-73 inches fine sand, 73-83 inches sandy loam)
Weyerhaeuser Pearl River Nursery, Hazlehurst, MS	Latonia loamy sand, 0-5% slopes (0-8 inches loamy sand, 8-45 inches sandy loam, 45-80 inches loamy sand)
ArborGen Nursery, Shellman, GA	Lucy loamy sand, 0-5% slopes (0-24 inches loamy sand, 24-35 inches sandy loam, 35-70 inches sandy clay loam)

Table 2. Treatment information.

Treatment #	Description	Arkon™ Rate/Timing
1	control	no treatment
2	1X rate at 7 weeks	1.7 fl. oz/1000 sq ft at 7 weeks post-sow
3	1X rate at 7 + 12 weeks	1.7 fl. oz/1000 sq ft at 7 weeks and 12 weeks post-sow
4	2X rate at 7 weeks	3.4 fl. oz/1000 sq ft at 7 weeks post-sow
5	2X rate at 7 + 12 weeks	3.4 fl. oz/1000 sq ft at 7 weeks and 12 weeks post-sow

Table 3. Bareroot loblolly pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 11 and July 18, 2024, at Rayonier Nursery, Elberta, AL.

Treatment Timing	Rate (ounces/ 1000 ft^2)	Density (seedlings/ ft^2) [1,2]	Shoot height (cm) [2]	Root collar diameter (mm) [1,2]	Shoot dry weight (g) [1,2]	Root dry weight (g)	Root weight ratio (%)[3]
Control	0.0	5.7 ± 1.15 b	21.5 ± 0.44 ab	3.95 ± 0.05 c	1.40 ± 0.10 b	0.85 ± 0.06	37.7 ± 0.99
1X label rate 7 weeks	1.7	9.5 ± 0.61 b	20.8 ± 0.32 ab	**4.34 ± 0.06** b	1.73 ± 0.07 ab	0.97 ± 0.10	35.6 ± 1.92
1X label rate 7 + 12 weeks	1.7 + 1.7	**14.9 ± 1.41** a	21.7 ± 0.31 a	**4.76 ± 0.06** a	**2.12 ± 0.17** a	1.07 ± 0.08	33.8 ± 0.57
2X label rate 7 weeks	3.4	**14.5 ± 0.65** a	20.5 ± 0.26 b	**4.70 ± 0.05** a	**2.11 ± 0.12** a	1.09 ± 0.05	34.2 ± 1.18
2X label rate 7 + 12 weeks	3.4 + 3.4	**14.9 ± 0.80** a	19.9 ± 0.32 b	**4.68 ± 0.06** a	**2.07 ± 0.13** a	1.11 ± 0.05	35.0 ± 0.97
p-value		*<0.001*	*<0.001*	*<0.001*	*0.0013*	*0.082*	*0.20*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control (p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p>0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

Table 4. Bareroot loblolly pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 4 and July 8, 2024, at ArborGen Nursery, Shellman, GA.

Treatment Timing	Rate (ounces/ 1000 ft²)	Density (seedlings/ ft²)	Shoot height (cm) [1,2]	Root collar diameter (mm)	Shoot dry weight (g)	Root dry weight (g) [1,2]	Root weight ratio (%)[3]
Control	0.0	30.6 ± 1.11	27.9 ± 0.14 a	4.88 ± 0.04	2.58 ± 0.10	0.65 ± 0.03 b	20.1 ± 0.58
1X label rate 7 weeks	1.7	31.8 ± 1.10	27.3 ± 0.20 ab	4.72 ± 0.05	2.31 ± 0.06	0.64 ± 0.02 b	21.8 ± 0.45
1X label rate 7 + 12 weeks	1.7 + 1.7	29.3 ± 2.09	27.9 ± 0.16 a	4.99 ± 0.18	2.50 ± 0.06	0.68 ± 0.01 ab	21.4 ± 0.29
2X label rate 7 weeks	3.4	29.6 ± 1.33	**27.2 ± 0.17** b	4.75 ± 0.05	2.51 ± 0.11	0.69 ± 0.02 ab	21.6 ± 0.60
2X label rate 7 + 12 weeks	3.4 + 3.4	27.9 ± 0.55	27.6 ± 0.18 ab	4.94 ± 0.05	2.65 ± 0.06	**0.76 ± 0.03** a	22.3 ± 0.65
p-value		*0.338*	*0.004*	*0.152*	*0.070*	*0.020*	*0.096*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control(p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p>0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

Table 5. Bareroot loblolly pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 14 and July 19, 2024, at Weyerhaeuser Pearl River Nursery, Hazlehurst, MS.

Treatment Timing	Rate (ounces/ 1000 ft²)	Density (seedlings/ ft²)	Shoot height (cm) [1, 2]	Root collar diameter (mm)[1, 2]	Shoot dry weight (g)	Root dry weight (g) [1,2]	Root weight ratio (%)[1, 2, 3]
Control	0.0	24.5 ± 0.40	29.4 ± 0.22 b	4.71 ± 0.05 c	2.75 ± 0.31	0.50 ± 0.03 c	15.8 ± 0.96 b
1X label rate 7 weeks	1.7	22.4 ± 1.81	29.9 ± 0.18 ab	**4.98 ± 0.05** b	3.09 ± 0.12	0.61 ± 0.02 bc	16.5 ± 0.37 ab
1X label rate 7 + 12 weeks	1.7 + 1.7	23.1 ± 0.48	**30.3 ± 0.20** a	**5.05 ± 0.05** ab	3.23 ± 0.18	**0.67 ± 0.05** ab	17.2 ± 0.69 ab
2X label rate 7 weeks	3.4	22.2 ± 0.93	**30.5 ± 0.19** a	4.88 ± 0.05 bc	3.04 ± 0.10	0.61 ± 0.03 bc	16.7 ± 0.46 ab
2X label rate 7 + 12 weeks	3.4 + 3.4	22.7 ± 0.89	**30.5 ± 0.22** a	**5.20 ± 0.05** a	3.36 ± 0.12	**0.76 ± 0.03** a	**18.5 ± 0.15** a
p-value		*0.528*	*<0.001*	*<0.001*	*0.219*	*<0.001*	*0.054*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control (p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p>0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

Table 6. Bareroot slash pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 11 and July 18, 2024, at Rayonier Nursery, Elberta, AL.

Treatment Timing	Rate (ounces/ 1000 ft²)	Density (seedlings/ ft²)	Shoot height (cm)	Root collar diameter (mm) [1,2]	Shoot dry weight (g) [1,2]	Root dry weight (g) [1,2]	Root weight ratio (%)[3]
Control	0.0	19.7 ± 1.00	21.4 ± 0.28	4.37 ± 0.05 b	1.96 ± 0.16 b	0.91 ± 0.06 b	31.7 ± 0.57
1X label rate 7 weeks	1.7	21.2 ± 0.57	22.6 ± 1.04	**5.40 ± 0.06** a	**3.28 ± 0.12** a	**1.49 ± 0.07** a	31.2 ± 0.60
1X label rate 7 + 12 weeks	1.7 + 1.7	22.4 ± 0.71	22.7 ± 0.28	**5.58 ± 0.20** a	**3.25 ± 0.17** a	**1.47 ± 0.06** a	31.2 ± 0.65
2X label rate 7 weeks	3.4	20.5 ± 0.64	21.9 ± 0.32	**5.40 ± 0.06** a	**3.28± 0.24** a	**1.42 ± 0.10** a	30.2 ± 0.75
2X label rate 7 + 12 weeks	3.4 + 3.4	20.8 ± 0.98	21.4 ± 0.25	**5.50 ± 0.08** a	**3.39 ± 0.15** a	**1.62 ± 0.08** a	32.3 ± 0.52
p-value		*0.221*	*0.223*	*<0.001*	*<0.001*	*<0.001*	*0.239*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control (p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p>0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

Table 7. Bareroot slash pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 4 and July 8, 2024, at ArborGen Nursery, Shellman, GA.

Treatment Timing	Rate (ounces/ 1000 ft²)	Density (seedlings/ ft²)	Shoot height (cm) [1,2]	Root collar diameter (mm)	Shoot dry weight (g)	Root dry weight (g) [1,2]	Root weight ratio (%)[1, 2, 3]
Control	0.0	7.7 ± 0.64	33.7 ± 0.50 a	8.79 ± 0.16	9.13 ± 0.48	1.79 ± 0.08 c	16.5 ± 0.73 b
1X label rate 7 weeks	1.7	7.5 ± 0.46	**30.9 ± 0.60 b**	8.84 ± 0.16	9.15 ± 0.53	**2.34 ± 0.10 ab**	**20.4 ± 0.49** a
1X label rate 7 + 12 weeks	1.7 + 1.7	7.7 ± 0.74	**29.5 ± 0.58 b**	8.16 ± 0.14	7.94 ± 0.29	2.01 ± 0.06 bc	**20.3 ± 0.89** a
2X label rate 7 weeks	3.4	8.4 ± 0.99	**31.1 ± 0.55 b**	9.09 ± 0.46	9.09 ± 0.65	2.16 ± 0.10 abc	19.3 ± 0.36 ab
2X label rate 7 + 12 weeks	3.4 + 3.4	6.7 ± 0.79	**29.0 ± 0.65 b**	8.91 ± 0.16	9.20 ± 0.90	**2.59 ± 0.22** a	**22.1 ± 1.05** a
p-value		*0.615*	*<0.001*	*0.163*	*0.542*	*<0.001*	*<0.001*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control (p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p>0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

Table 8. Bareroot slash pine seedling characteristics treated with pyrimisulfan (Arkon™) at 7- and 12-weeks post-sowing on June 14 and July 19, 2024, at Weyerhaeuser Pearl River Nursery, Hazlehurst, MS.

Treatment Timing	Rate (ounces/ 1000 ft^2)	Density (seedlings/ ft^2)	Shoot height (cm) [2]	Root collar diameter (mm) [1,2]	Shoot dry weight (g)	Root dry weight (g) [1,2]	Root weight ratio (%) [1, 2, 3]
Control	0.0	23.8 ± 1.69	28.5 ± 0.34 ab	5.18 ± 0.08 b	3.56 ± 0.25	0.76 ± 0.02 b	17.6 ± 0.71 b
1X label rate 7 weeks	1.7	23.0 ± 1.02	29.3 ± 0.40 a	5.42 ± 0.09 ab	3.60 ± 0.16	0.86 ± 0.02 ab	19.3 ± 0.28 ab
1X label rate 7 + 12 weeks	1.7 + 1.7	21.8 ± 0.98	27.8 ± 0.40 ab	**5.59 ± 0.08** a	3.72 ± 0.17	0.90 ± 0.05 ab	19.6 ± 0.24 ab
2X label rate 7 weeks	3.4	21.8 ± 1.52	28.0 ± 0.040 ab	**5.67 ± 0.10** a	3.94 ± 0.27	0.93 ± 0.07 ab	19.1 ± 0.09 ab
2X label rate 7 + 12 weeks	3.4 + 3.4	22.1 ± 0.98	27.3 ± 0.40 b	**5.56 ± 0.08** a	3.64 ± 0.14	**0.96 ± 0.01** a	**20.8 ± 0.76** a
p-value		*0.796*	*0.014*	*<0.001*	*0.711*	*0.034*	*0.009*

[1] Bold within a seedling characteristic indicates significant difference between that rate and control (p>0.05).

[2] Different letters within a seedling characteristic indicate significant differences in rates (p0.05).

[3] Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.