SFNMC Contact Meeting

Shellman, Georgia

July 29, 2025

2024 Arkon™ Bareroot Pine Trial Results

2025 Arkon™ Bareroot Pine Trial Updates

Nina Dowling Payne

2024 Arkon™ Bareroot Pine Trial Results

Purpose
Methods
Results
Conclusions

Purpose of trial

- To test Arkon™ for its suitability for use in weed control in bareroot pine seedlings

- Arkon™:
  - Liquid
  - 1.24% pyrimisulfan
  - Post-emergent
  - Annual sedge, purple and yellow nutsedge, rush, broadleaf weeds
  - Labeled for turf, sod production, non-cropland sites, *not conifer nurseries*

- SFNMC Arkon™ history:
  - Second SFNMC trial in bareroot pine
  - Three years of testing Vexis® (0.025% pyrimisulfan) in bareroot pine (2021-2023)

Results of 2024 Arkon™ Bareroot Pine Trials

Methods

- Trials in ArborGen Shellman, GA Nursery, Rayonier Elberta, AL Nursery, and Weyerhaeuser Pearl River, MS Nursery
- Trials in loblolly and slash pine
- 3 rates: 0, 1X, and 2X label rate
- 10-foot plots used for each rate; 5 replications per species
- In June and July, made applications on each species at
  7 weeks post-sowing (single spray) and
  7 and 12 weeks post-sowing (double spray)
- In June and July, quantified sedge plot coverage by estimating 0-20%, 20-50%, 50-80%, or 80-100% coverage
- In October, November, and February, collected seedling samples in each plot for processing
- Results in Research Report 25-01

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
Nina Payne and Annakay Newell

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

Loblolly pine at Rayonier Elberta, AL Nursery

Treatment	Density (seedlings/sq. ft.)[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	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	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	**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	**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	**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.

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Loblolly pine at ArborGen Shellman, GA Nursery

Treatment	Density (seedlings/sq. ft.)	Shoot height (cm) [1,2]	Root collar diameter (mm)	Shoot dry weight (g)	Root dry weight (g) [1,2]	Root Weight Ratio (%)[3]
Control	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	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	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	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	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*	*0.07*	*0.02*	*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.

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Loblolly pine at Weyerhaeuser Pearl River, MS Nursery

Treatment	Density (seedlings/sq. ft.)	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	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	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	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	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	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.

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Slash pine at Rayonier Elberta, AL Nursery

Treatment	Density (seedlings/sq. ft.)	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	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	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	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	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	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.

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Slash pine at ArborGen Shellman, GA Nursery

Treatment	Density (seedlings/sq. ft.)	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	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	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	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	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	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.

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Slash pine at Weyerhaeuser Pearl River, MS Nursery

Treatment	Density (seedlings/sq. ft.)	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	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	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	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	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	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 (p>0.05).
[3]Root Weight Ratio is calculated by (root dry weight/total dry weight) X 100.

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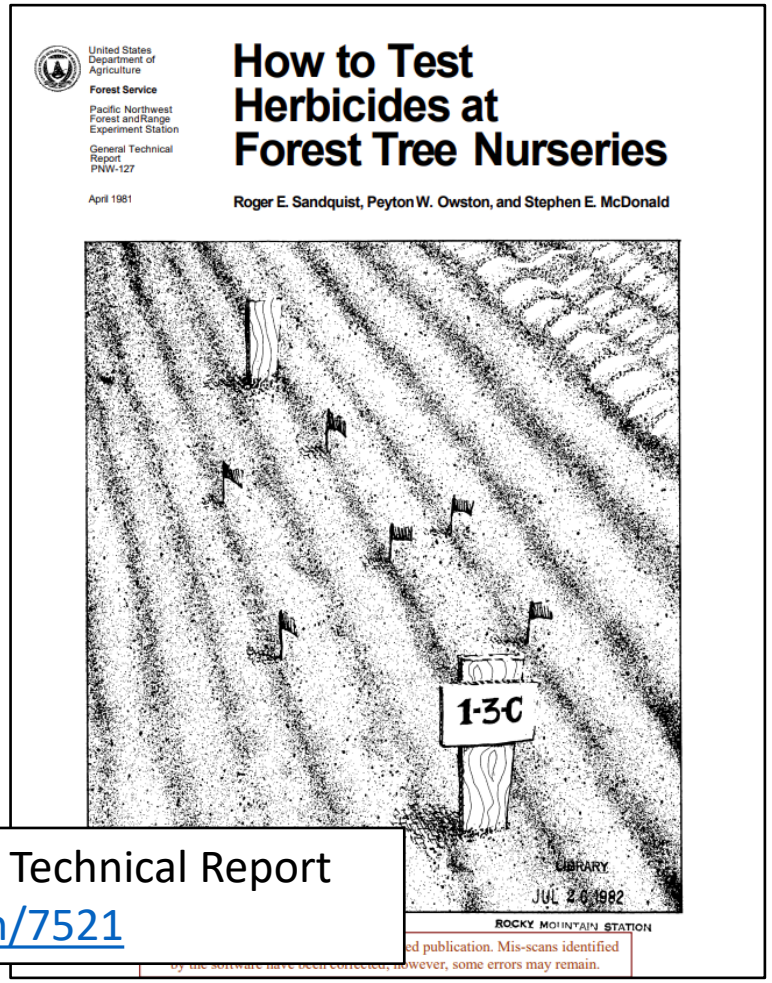
Conclusions

- Second year of testing of Arkon™ in bareroot loblolly and slash pine showed good seedling tolerance with good annual sedge and nutsedge control
- Additional Arkon™ testing in bareroot loblolly and slash pine (at least 1 more year) will need to be completed before initiation of 24(c) application process
- If you are buying Vexis® or Arkon™, their manufacturer requests the names and locations of your pesticide dealers to aid in their evaluation of labeling Arkon™ - send these to Nina Payne
- It is legal for SFNMC nurseries to test this product without an experimental permit under

Federal Code of Regulations, Title 40, Chapter 1, Subchapter E, Part 172, Subpart A, Section 172.3


United States Department of Agriculture
Forest Service
Pacific Northwest Forest and Range Experiment Station
General Technical Report PNW-127
April 1981

How to Test Herbicides at Forest Tree Nurseries

Roger E. Sandquist, Peyton W. Owston, and Stephen E. McDonald

1-30

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JUL 20 1982
ROCKY MOUNTAIN STATION

ed publication. Mis-scans identified
by the software have been corrected; however, some errors may remain.

"How To Test Herbicides In Forest Tree Nurseries", USFS General Technical Report PNW- 127, accessible at https://research.fs.usda.gov/treesearch/7521

Rayonier Elberta, AL Nursery 7-18-24
5 weeks after 1 Arkon™ application

at white flags
no Arkon™ treatment

at yellow flag
1X rate sprayed at 7 weeks

Nutlets found in samples 3-31-25
from Rayonier 1X rate at 7 weeks plot


Rayonier Elberta, AL Nursery 7-18-24
5 weeks after 1 Arkon™ application
at white flag
no Arkon™ treatment
at red flag
2X rate sprayed at 7 weeks
at yellow flag
1X rate sprayed at 7 weeks
end of study area
no treatment

PYRIMISULFAN GROUP 2 HERBICIDE

ARKON HERBICIDE LIQUID

Not for sale, distribution or use in Nassau or Suffolk Counties in New York State.

ACTIVE INGREDIENT:
Pyrimisulfan 1.24%
OTHER INGREDIENTS: 98.76%
TOTAL 100.00%

THIS PRODUCT CONTAINS:
0.103 lb. Pyrimisulfan per gallon or 1.24%

KEEP OUT OF REACH OF CHILDREN
CAUTION

STOP! **READ THE ENTIRE LABEL FIRST. OBSERVE ALL PRECAUTIONS AND FOLLOW DIRECTIONS CAREFULLY.**

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals
CAUTION: Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Remove and wash contaminated clothing before reuse. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet.

First Aid	
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.
If in eyes:	• Hold eye open and rinse slowly and gently with water for 15 - 20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact 1-877-800-5556 for emergency medical treatment information.	

Personal Protective Equipment (PPE)
All mixers, loaders, and applicators and other handlers must wear:
- Chemical resistant gloves made of barrier laminate, butyl rubber (≥ 14 mils), nitrile rubber (≥ 14 mils), neoprene rubber (≥ 14 mils), polyvinyl chloride (PVC) (≥ 14 mils), or viton (≥ 14 mils),
- Long-sleeved shirt and long pants, and
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls
When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations
Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Removing clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Environmental Hazards
Do not apply to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwater or rinsate.

Groundwater Advisory: This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Surface Water Advisory: This product has a potential for reaching surface water via runoff after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features such as ponds, streams, and springs will reduce the potential loading of pyrimisulfan from runoff water. Runoff of this product will be reduced by avoiding applications when heavy rainfall or irrigation is expected to occur within 48 hours.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements
Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170.

This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:
- coveralls,
- chemical-resistant gloves made of any water-proof material,
- shoes plus socks

Non-Agricultural Use Requirements
The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow people (or pets) to enter the treated area until spray has dried.

1. Product Description
Arkon Herbicide Liquid is a selective herbicide for post-emergent control of listed broadleaf weeds, sedges, kyllinga, and rush species commonly found in turfgrasses. It can be used on established warm-season turfgrasses (including improved varieties of St. Augustinegrass such as Bitterblue and Floratam) and cool-season turfgrasses. Fall applications provide improved control of winter weeds such as henbit, false dandelion, ground ivy (creeping charlie), and chickweed.

2. Resistance Management
For resistance management, this product contains Group 2 herbicide. Any weed population may contain or develop plants naturally resistant to this product and other Group 2 herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same area. Appropriate resistance management strategies should be followed.

2025 Arkon™ Early Application Bareroot Pine Trials Update

Purpose

Methods

Purpose

- To test Arkon™ for its suitability in bareroot pine seedlings when applied *earlier in the growing season than previously tested* to control earlier emerging nutsedge and annual sedge

- To provide additional data to the Arkon™ manufacturer for possible labeling in bareroot conifer seedling nurseries (third year of SFNMC testing of Arkon™)

Methods

- Trials in ArborGen Shellman, GA, Georgia Forestry Commission Flint River Nursery, GA, and PRT-IFCO Pine Hill Nursery, AL in loblolly and slash pine
- 2 rates: 0 and 1X label rate
- 3 application timings: at 4 weeks post-sowing
  at 5 weeks post-sowing
  at 6 weeks post-sowing (earliest timing in previous trials was at 7 weeks)
- 10-foot plots used for each rate; 5 replications per species
- Seedling samples will be collected from each plot and processed for seedling quality in late 2025/early 2026 with research report to follow

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