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KUDZU ERADICATION TRIALS WITH NEW HERBICIDES.

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ABSTRACT

Two screening studies in Georgia tested new herbicides as potential eradicators of kudzu (Pueraria lobata (Willd.) Ohwi). One study was conducted on a Coastal Plain and the other on a Piedmont site. Tordon 101 was applied as the standard. Those herbicide& which are currently labeled for forest land site preparation and which gave control comparable to Tordon 101 (a-0.05) were Tordon K at 4 qt/A and Arsenal Applicator Concentrate at 6 qt/A. Lower rates of Arsenal, Oust + Roundup rates up to 6 oz + 2 qt/A, and Escort rates up to 8 oz/A did not yield effective control, Spike 80W, a noncrop herbicide, gave control comparable to Tordon 101 when applied at rates of 4 and 6 lb product/A, An experimental herbicide, Lontrel at 2.64 qt/A, gave statistically less control than the Tordon standard. Another experimental formulation, Escort, in combination with Roundup at 1 oz + 1 qt, gave good control and appears promising for controlling kudzu invading pine plantations.

INTRODUCTION

The search continues for more effective kudzu eradication herbicides. At the present time, tests have shown Tordon 101 as the most effective herbicide registered for kudzu eradication on forest lands (3,5,6,7). Two other herbicides, Banvel 720 and Banvel, are currently recommended for streamside treatments and for areas where Tordon's residual property poses a threat to planted seedlings, Repeated tests have shown Banvel herbicides to be about half as effective as Tordon 101 (5,6,7). Several formulations of Spike have demonstrated control comparable to Tordon 101, but Spike is not presently registered for forest land site preparation.

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Discussion of herbicides in this paper does not constitute recommendation of their use or imply that uses discussed here are registered. If herbicides are handled, applied, or disposed of improperly, there is potential for hazards to the applicators, off-site plants, and environment. Herbicides should be handled safely. Follow the directions and heed all precautions on the container label.

Use of trade names is for the reader's information and convenience and does not constitute official endorsement or approval by the U.S. Department of Agriculture to the exclusion of any other suitable product.

Hundreds of acres of kudzu are treated with herbicides that are markedly less effective and more expensive than those already mentioned. Because kudzu patch eradication is an arduous task, it is imperative that the most cost-effective herbicides be used, lest landowners become discouraged by prolonged and unfruitful eradication programs.

To further research into more effective treatments, two screening studies compared Tordon 101 to herbicides that have shown promise for kudzu eradication (1,2,3) (Table 1). The first study tested new herbicides and new combinations of herbicides currently being recommended for kudzu treatments. The second study compared two herbicides that are chemically similar to Tordon 101.

METHODS

Application for both studies was performed with a crawler-tractor sprayer that could maintain a prescribed rate regardless of ground speed (4). A cluster nozzle (Spraying System's Boomjet 5880) applied a spray swath 45 ft wide.

Study 1

Five treatments were compared to the standard of Tordon 101 (Table 1). All treatments were applied at 3 rates.

Herbicides	Rates
Tordon 101	2, 4, and 8 qt/A
Arsenal	2, 4, and 6 qt/A
Escort	2, 4, and 8 oz/A
Escort + Roundup	1/2+1/2, 1+1, and 2 oz+ 2 qt/A
Oust + Roundup	2+1, 4+2, and 6 oz+ 3 qt/A
Spike 80W	2, 4, and 6 lb product/A

In this primary screening study the 4-qt/A rate of Tordon 101 was considered as the standard treatment.

Treatments were replicated 3 times using a completely randomized design and plots that were 45 ft X 100 ft. The study area was a kudzu patch in west central Georgia where the kudzu had grown for more than 15 years. The Coastal Plain soils were sandy loam in texture. This level patch had been burned annually for at least 5 years, which did not decrease the vigor of the kudzu growth but did minimize the buildup of organic matter.

Treatments were applied on June 24, 1985, Rainfall had been abundant-during the previous week and 3/4 in. fell the third day after application. Rainfall is crucial before treatment so that the kudzu is actively growing and after application so.that soil-active herbicides are activated, About 50 gallons of the herbicide-water test mixtures were applied per acre. Cide-Kick II was added as a surfactant-penetrant at 1/4 percent of the total spray volume.

Plots were assessed in early October, 1985, and in July, 1986. Percent cover of green kudzu plants was estimated on 20 ft X 20 ft sample plots that were positioned in the center of treatment plots.

Studv 2

In study 2 a more critical comparison was planned and thus the higher, 8-qt/A rate of Tordon 101 was specified as the standard treatment. Candidate treatments would have to perform at a higher level of effectiveness than in Study 1 to be judged comparable to the Tordon treatment. The two test treatments were Tordon K at 4 qt/A and Lontrel at 2.64 qt/A, which meant that 2-lb acid equivalent of both were applied per acre.

The 3 treatments were replicated 3 times in a completely randomized design. Plots were 45 ft wide and about 200 ft long, extending from a ridge to the lower slope of a kudzu patch in west central Georgia. The Piedmont soils were a stony sandy clay loam. Kudzu had been growing on this land more than 30 years. The older-age of the patch and the stony clayey soils made this kudzu situation difficult to control (3,6).

Application was made on October 17, 1986, 5 days after a 3-inch rain, which was followed in 2 days by a period of frequent rains. October is an effective time to treat kudzu if rainfall is ample (6). Total gallonage was 30 gal/A and was applied with a Boomjet 5880 nozzle that had been modified according to Wehr et al. (9) to make the swath more uniform. A drift retardant was added at 1/4 percent of the total spray volume.

Plot assessments were made on July 1, 1987. Cover was estimated on three 20-by-20-ft sample plots per treatment plot, the sample plots being positioned on the upper, middle, and lower slopes. The three sample plots were averaged for analysis.

The data from study 1 was analyzed using analysis of variance (ANOVA) and one-sided Dunnett's procedure (8), after arcsine square root transformations. The Dunnett's procedure was used for comparing each test treatment to the Tordon 101 standard. The 0.05 level of probability was selected. Because of extremely dissimilar variances in study 2, a nonparametric Kruskell-Wallis test was used.

RESULTS AND DISCUSSION

Study 1

Study 1 treatments yielded significantly different levels of control in the first and second growing seasons as determined by ANOVA. Five rates of the test treatments provided comparable, but less control, to Tordon 101 at 4 qt/A (Table 2) after the second growing season, they were: Spike 80W at 4 lb and 6 lb/A, Escort + Roundup at 1 oz + 1 qt and 2 oz + 2 qt/A, and Arsenal at

6 qt. Because of treatment cost, one-time control of less than 80 or 85 percent is usually unacceptable for the first treatment in an eradication program for open patches.

For kudzu control treatments in pine plantations, Escort + Roundup and Arsenal treatments appear promising (1,3). Although markedly less effective than.Tordon or Spike, southern pines are tolerant to low rates of Escort, Roundup, and Arsenal. However to use the effective rates of Roundup and Arsenal, pines would have to be large enough to sustain some damage or under spraying would have to be used, avoiding foliar contact. The 6 qt/A rate of Arsenal would be exceptionally costly and would probably be much less effective on clay and clay loam soils (3). A prior study has reported better first-year control with Arsenal applied at 2 qt/A than reported here, but still two applications were not adequate to provide eradication (3).

Spike continues to show promise as an herbicide for difficult-to-control patches on noncroplands, but Spike is deadly to pines--even planted up to 2 years after treatment.

Study 2

Tordon K gave control comparable to Tordon 101 (Table 3). The small standard deviation in Table 3 shows that Tordon K gave the most consistent control, even on this difficult-to-control site. Tordon K may be a good option for Tordon 101 in kudzu eradication programs. Lontrel gave acceptable control and may have a future use in such treatments, if it is registered, because loblolly pine has shown tolerance to this herbicide (2,3).

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Table 1. Description of the test herbicides.

Herbicide	Manufacturer	Formulation
Arsenal Applicator Concentrate	American Cyanamid	4 lb a.i. imazapyr per gal
Escort[1]	DuPont	60% a.i. disperable granule of metusulfuron methyl
Lontrel[1]	Dow	3 lb a.e. XRM 3972 per gal
oust	DuPont	75% a.i. disperable granule of sulfometuron methyl
Roundup	Monsanto	4 lb a.i. glyphosate per gal
Spike 80W[2]	Elanco	80% a.i. disperable powder of tebuthiuron
Tordon K	Dow	2 lb a.i. picloram per gal
Tordon 101	Dow	1/2 lb a.e. picloram + 2 lb a.e. 2,4-D amine per gal

[1]Not as yet registered for kudzu treatments on forest lands.
[2]Registered only for kudzu treatments on noncroplands.

Table 2. Herbicides, rate, and percent control during the first and after the second growing season. [1]

Herbicide	Rate	Percent Control 1st Yr		2nd Yr	
Tordon 101	8 qt	99.6		100.0	
Tordon 101	4 qt	99.3	A	94.3	A
Tordon 101	2 qt	98.7		93.3	
Spike 80W	6 lb	84.3	B	91.7	A
Spike 80W	4 lb	97.3	A	86.7	A
Escort + Roundup	1 oz + 1 qt	75.0	B	81.5	A
Arsenal	6 qt	93.0	A	76.3	A
Escort + Roundup	2 oz + 2 qt	90.0	A	66.5	A
Arsenal	4 qt	70.0	B	60.0	B
Oust + Roundup	6 oz + 3 qt	83.3	B	55.0	B
Escort + Roundup	0.5 oz + 0.5 qt	80.0	B	47.5	B
Escort	8 oz	84.3	B	46.7	B
Oust + Roundup	2 oz + 1 qt	40.0	B	40.0	B
Spike 80W	2 lb	45.0	B	40.0	B
Arsenal	2 qt	43.7	B	30.0	B
Oust + Roundup	4 oz + 2 qt	75.0	B	30.0	B
Escort	2 oz	46.7	B	20.0	B
Escort	4 oz	59.0	B	15.0	B

'Means in a column followed by the an "A" are not significantly different (a=0.05) from the standard treatment of Tordon 101 at 4 qt/A as determined by a Dunnett's test.

Table 3. Herbicides, rates, and degree of kudzu control one year after treatment. [1]

Herbicide	Rate		Percent Control		Std Dev.
	qt/A	lb a.e./A	percent		
Tordon 101	8	1 picloram+4 2,4-D	94	A	8.1
Tordon K	4	2 picloram	98	A	1.1
Lontrel	2.6	2 xRM3972	70	B	22.9

'Values in a column followed by an "A" are not significantly different from the standard treatment of Tordon 101 at 8 qt/A as determined by a nonparametric Kruskell-Wallis test.