SOME NEW POSSIBILITIES TO CONTROL KUDZU. J. L. Michael, Southern Forest Experiment Station, Forest Service--USDA, Auburn University, Alabama 36849.

ABSTRACT

Six chemicals were tested at random with 3 replications at 3 rates for foliar activity on kudzu [Pueraria lobata (Willd.) Ohwi]. All chemicals gave some degree of control. DPX-6376, XRM-3972 (Lontrel), and Oust(TM) Weed Killer (formerly known as DPX-5648) gave more than 99% topkill for 3 1/2 months. Preliminary results of greenhouse tests on 1-year-old loblolly pine (Pinus taeda L.) seedlings indicate Lontrel, Oust, and DPX-6376 are safe for foliar application at rates effective on kudzu.

INTRODUCTION

Kudzu, a perennial leguminous vine, was introduced into the United States from Japan in 1876. Since the 1930's when kudzu was widely promoted by the Soil Conservation Service for gully control and temporary pastures, the vine has escaped into hedge-rows and penetrated deeply into forests. Its rapid growth (10 m/year) and its habit of forming dense mats of vegetation enable it to smother pine trees 25 m tall. Kudzu can make forest regeneration almost impossible.

The forest manager's techniques for site preparation are limited to grubbing--manually or mechanically--and to chemical control. Because kudzu reproduces by spread of stolons and rhizomes, effective grubbing must remove the entire root system. Since kudzu's tap root can reach 2 m in length, the grubbing method causes maximum site perturbation and is very expensive.

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CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

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Grubbing's problems prompt interest in chemical control. Successful chemical methods developed over the past 10 years have generally centered on the use of picloram either as a spray, pellet, or impregnated wooden needle which is inserted directly into the root crown. When the first two forms are used, the site is usually either burned or disked during the winter prior to treatment. Applications of sprays and pellets can be made throughout a growing season.

Velpar, Roundup, Krenite, 2,4,5-T, 2,4-DP, 2,4-D, dicamba, and a mixture of TFP and dalapon have also been used as chemical controls. Most of these control measures either cannot be applied to forested lands or are lethal to pines.

This paper reports the test results for 6 chemicals used to control kudzu in the field and the effects of 4 of these 6 chemicals on loblolly pine seedlings in the greenhouse.

MATERIALS AND METHODS

Kudzu Study. Research plots 14.6 x 26.8 meters were established in Tallapoosa County near Dadeville, Alabama, in an old field with 100% kudzu cover. Six chemicals were applied at three rates with three replications in a completely randomized design with three check plots during the period 1-9 July 1981 (Table 1). All chemicals were applied in an aqueous carrier (46 l/ha). Surfactant WK at 0.5% was added to the carrier for EL-187, Oust and DPX-6376. Control plots were also treated with water + surfactant. All applications were from a 4.9 m tractor-mounted boom powered by CO_2.

The degree of control for each treatment was estimated as % reduction in cover. Estimates were conducted 31 July, 23 September, and 22 October 1981. The 22 October data were subjected to analysis of variance and Duncan's Multiple Range Test at the .05 level.

Greenhouse Study. One-year-old loblolly pine and water oak (Quercus nigra L.) seedlings were treated with EL-187, Lontrel, DPX-6376, and Oust to determine foliar and soil activity. In this exploratory survey each rate was applied to three seedlings by foliar spray and by pipet to the soil. Foliar and soil applications were at .28, .56, 1.12, 2.24 and 4.48 kg ai/ha for DPX-6376; .56, 1.12, 2.24, and 4.48 kg ai/ha for Oust; .56, 1.12, and 2.24 kg ai/ha for Lontrel; and 1.12, 2.24 and 4.48 kg ai/ha for EL-187. Tests involved a total of 90 seedlings in each species. Foliar and soil treatments were applied in the greenhouse on 8 and 9 September 1981 respectively and evaluated 6 weeks later. Signs of activity, including necrosis, defoliation, and death, were noted for the soil treated seedlings and for the foliarly treated seedlings.

RESULTS AND DISCUSSION

Results of the field test on kudzu are given in Table 2. In tandem with the greenhouse tests on seedlings, it appears chemical control of kudzu is feasible for infested pine stands.

In the greenhouse screening soil activity phase, EL-187 caused needle burn on pine and defoliation of water oaks at all rates tested. Oust, Lontrel, and DPX-6376 had no effect on pine seedlings but DPX-6376, at .56-4.48 kg ai/ha, showed some soil activity on water oak resulting in leaf necrosis at lower rates and mortality at the highest rate.

In the greenhouse screening foliar activity phase, pine treated with EL-187 at 2.24 kg ai/ha were chlorotic with dead terminal buds and considerable needle burn 6 weeks following treatment. One of three seedlings foliar treated with DPX-6376 at 2.24 and 4.48 kg ai/ha had dead terminal buds and all seedlings treated at these rates had burned needles. All seedlings treated with Oust at 1.12-4.48 kg ai/ha and with Lontrel at .56-2.24 kg ai/ha had very slight needle burn but no terminal bud damage.

These test results, although tentative, indicate at least three new herbicides have potential for controlling kudzu in pine forests without adverse effects on loblolly pine. DPX-6376 gave 100% control of kudzu at 1.12 kg ai/ha for 1 growing season and appears safe on loblolly pine at higher rates. In many of the treated plots, johnsongrass (Sorghum halepense (L.) Persoon), sicklepod (Cassia obtusifolia L.), and other weeds appeared during the period of kudzu control, but these weeds did not appear in the 1.12 kg plots of DPX-6376. The .56 kg ai/ha plots of DPX-6376 also showed very good results with 100% control on 2 of the 3 replicates. More testing is needed at rates of .56 - 1.12 kg ai/ha to determine the optimum rate and time of application for kudzu control with this compound.

Oust and Lontrel are also effective on kudzu at rates which appear safe on pine. Since neither gave 100% control both should be further tested for repeated annual application at rates around 1.12 kg ai/ha.

Southern pines show some tolerance to hexazinone (Velpar) but not at the rates which, in this study, effect a high degree of kudzu control. The Velpar (Liquid) plots treated with 13.44 and 6.72 kg ai/ha gave 98 and 95% control respectively. While it is generally accepted that 100% control of kudzu is necessary, hexazinone is soil active and some residue from these rates may effect additional and improved control next year.

Garlon 4E gave 99% and 92% control of kudzu at 8.96 and 4.48 kg ai/ha respectively. At these rates pines would be killed if present. However, additional studies may indicate that with retreatment Garlon may be acceptable for kudzu control where pine mortality is not a problem.

Results of this study with EL-187 indicate the rates tested were too low. At .56 and 1.12 kg ai/ha there was no control, but at 2.24 kg ai/ha kudzu cover was reduced by 97%. Additional testing should include rates of 2.24 and 4.48 kg ai/ha. Because EL-187 is soil active and residual chemical may remain in the ground, additional control may develop in the coming year.

All of the herbicides tested in this study controlled kudzu to some degree. No attempt was made to determine root kill, therefore, whether any of the treatments will result in long-term control is unknown. But it appears that all of these herbicides should undergo more intensive study in rate and timing aspects to determine maximum potential for kudzu control.

Table 1. Chemicals, manufacturer and rates tested on kudzu in 1981.

Manufacturer	Chemical	Rate (kg active ingredient/hectare)		
DuPont	Velpar Liquid	3.36	6.72	13.44
DuPont	Oust	.28	.56	1.12
DuPont	DPX-6376	.28	.56	1.12
Dow	XRM-3972 (Lontrel)	1.12	2.24	4.48
Dow	Garlon 4E	2.24	4.48	8.96
Elanco	EL-187	.56	1.12	2.24

Table 2. Results of the 1981 field tests of 6 chemicals on kudzu. Treatments, applied 1-9 July 1981 and evaluated 22 October 1981, are listed in the order of effectiveness.

Herbicide	Rate (kg ai/ha)	% Cover Reduction*	
DPX-6376	1.12	100.000	a
Lontrel	4.48	99.999	a
Lontrel	2.24	99.993	a
DPX-6376	.56	99.967	a
Oust	1.12	99.300	a
DPX-6376	.28	98.997	a
Garlon 4E	8.96	98.997	a
Velpar Liquid	13.44	98.300	a
Lontrel	1.12	98.000	a
EL-187	2.24	97.267	a
Velpar Liquid	6.72	94.833	a
Garlon 4E	4.48	91.667	a
Velpar Liquid	3.36	91.667	a
Garlon 4E	2.24	82.000	ab
Oust	.56	67.667	b
Oust	.28	40.000	c
EL-187	.56	0	d
EL-187	1.12	0	d
Control	----	0	d

*Means followed by the same letter are not significantly different at the 0.05 level by Duncan's Multiple Range Test.