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Research Note

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Combinations of Foliar- and Soil-Applied Herbicides For Controlling Hardwood Brush

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SUMMARY

Triclopyr and 2,4,5-T esters at 1.0 lb a/A; and hexazinone, picloram, and tebuthiuron pellets at 3.0 lb a/A were applied either separately or in liquid and pellet herbicide combinations to 1/60-acre plots for mixed hardwood brush control. Only two treatments — triclopyr ester with picloram pellets and 2,4,5-T ester with picloram pellets — gave acceptable topkill of mixed brush through two growing seasons.

Additional keywords: 2,4,5-T ester, triclopyr ester, picloram, tebuthiuron, hexazinone.

INTRODUCTION

Reducing herbicide application rates would lower capital investment costs and reduce environmental risks in forest management. But it is difficult to control the numerous hardwood species with low dosages of a single herbicide. Herbicide combinations are one means of increasing the spectrum of weeds controlled without increasing the dosages used.

Earlier unpublished research[1] has shown topkills of 97 percent to hardwood brush by 2,4,5-T ester applied at 1 lb a[2]/A in late April followed by picloram at 4 lb a/A a month later. Tebuthiuron applied at 4 lb a/A on May 10 followed by triclopyr amine at 1.5 lb a/A on June 24 caused topkills of 75 percent. This study continued this work and tested several new combinations of herbicides for their effectiveness at low application rates.

METHODS AND MATERIALS

Previous work with hexazinone, picloram, and tebuthiuron pellets indicates that they should give 80 percent or better control of mixed hardwood brush in central Louisiana at a 6 lb a/A rate, while 2,4,5-T at 2 lb a/A is generally accepted as an effective rate. Lesser rates have been unsatisfactory. In this study, the pellet herbicides (hexazinone, picloram, and tebuthiuron)[3] were broadcast at a 3.0 lb a/A rate, and the liquid herbicides (2,4,5-T and triclopyr) were sprayed at a 1.0 lb a/A rate.

The herbicides were tested singly and in liquid-pellet combinations. Each treatment was randomly assigned to three 1/60-acre plots that were laid out in a completely randomized design. The study area was located on an upland sandy loam in central Louisiana in a stand of mixed hardwood brush composed primarily of flowering dogwood (*Cornus florida* L.), huckleberry (*Gaylussacia* spp.), red maple (*Acer rubrum* L.), sweetgum (*Liquidambar styraciflua* L.), and blackgum (*Nyssa sylvatica* Marsh.). Forty hardwood stems per plot were randomly selected and tagged from among the 21 species present.

The pellet herbicides were broadcast by hand on April 12, 1977, and the liquid herbicides were applied with a back pack mist blower on May 3, 1977. Water was used as the carrier, with a spray volume of 20 gallons per acre.

Treatment effects were determined in late summer by estimating percent topkill for each stem at the end of the first and second growing seasons. Values for the 40 plants sampled were then averaged to obtain a

[1] McLemore, B. F. 1977. Unpublished data. U.S. Dep. Agric. For. Serv., Southern Forest Experiment Station, Pineville, La.

[2] a — acid equivalent (2,4,5-T, triclopyr, picloram), active ingredient (hexazione, tebuthiuron).

[3] Hexazinone (3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4 (1H;3H)dione) as Velpar DPX-3674-10P.
Picloram (potassium salt of 4-amino-3,5,6-trichloropicolinic acid) as Tordon 10K.
Tebuthiuron (1-(5-tert-butyl-1,3,4-thiadiazol-2-yl)-1-3-dimethylurea) as EL-103.
2,4,5-T ester (propylene glycol butyl ether ester of 2,4,5-trichlorophenoxyacetic acid) as ESTERON 245.
Triclopyr ester (ethylene glycol butyl ether ester of 3,5,6-trichloro-2-pyridyloxyacetic acid) as DOWCO 233 (M-4021).

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percent topkill per plot. Percents were converted to arcsin proportion for statistical analysis (ANOV .05). Duncan's Multiple Range Tests were used to evaluate differences among treatment means.

RESULTS AND DISCUSSION

As mentioned earlier, average topkill of hardwood brush should be 80 percent or better. The triclopyr-picloram combination was the only treatment to meet this standard with a mean value statistically different from unacceptable results (table 1). Also, the triclopyr-picloram combination allowed no foliar recovery from the first to the second growing season. Foliar recovery of the 2,4,5-T-picloram combination was only 3 percent, which is acceptable. Visual evaluation during inspection confirmed that the triclopyr-picloram and the 2,4,5-T-picloram combinations both gave acceptable brush control through two growing seasons. All other treatments were unacceptable.

Table 2 reports the control by species for the two

Table 1.—*Average topkill of hardwood brush after one and two growing seasons*

Treatment	Rate of application	Topkill per growing season 1st	2nd	
	Lb a/A	-----*Percent*-----		
Triclopyr ester + picloram	1.0 + 3.0	98	98[1]	a
2,4,5-T ester + picloram	1.0 + 3.0	92	89	ab
Triclopyr ester + tebuthiuron	1.0 + 3.0	90	84	bc
Triclopyr ester + hexazinone	1.0 + 3.0	85	75	bcd
2,4,5-T ester + hexazinone	1.0 + 3.0	85	75	bcd
Triclopyr ester	1.0	80	70	cde
2,4,5-T ester	1.0	74	67	cde
2,4,5-T ester + tebuthiuron	1.0 + 3.0	79	67	cde
Picloram	3.0	66	60	de
Tebuthiuron	3.0	56	50	de
Hexazinone	3.0	51	46	e

[1]Percent topkills followed by the same letter are not significantly different at the 0.05 level.

Table 2.—*Topkill of hardwood species after two growing seasons*

Species	Topkill						
	Hexazinone pellets	Tebuthiuron pellets	Picloram pellets	Triclopyr ester	2,4,5-T ester	2,4,5-T +picloram	Triclopyr + picloram
	----------*Percent*----------						
Primary species:							
Cornus florida L.	73(16)[1]	72(18)	83(25)	70(7)	76(17)	100(6)	99(28)
Gaylussacia spp.	2(36)	4(36)	58(20)	49(16)	33(20)	80(24)	95(27)
Acer rubrum L.	42(18)	62(15)	41(35)	63(29)	54(33)	75(24)	98(16)
Liquidambar styraciflua L.	84(23)	65(12)	86(7)	93(30)	100(17)	96(30)	100(8)
Nyssa sylvatica Marsh.	81(7)	47(14)	100(6)	100(5)	100(5)	100(9)	100(12)
Beech family:							
Quercus stellata Wang.	— [2]	100(3)	—	55(2)	—	87(5)	—
Q. alba L.	68(3)	100(3)	—	100(2)	79(4)	100(1)	100(2)
Q. marilandica Muenchh.	40(1)	—	—	—	100(1)	—	—
Q. nigra L.	—	100(1)	100(1)	—	100(1)	100(1)	100(1)
Q. falcata Marsh. var. *falcata*	—	100(2)	12(2)	62(2)	15(1)	40(1)	100(5)
Carya spp.	5(6)	20(1)	15(1)	53(8)	79(4)	—	100(1)
Fagus grandifolia Ehrh	100(1)	—	10(1)	68(4)	55(3)	70(2)	100(6)
Minor species:							
Prunus serotina Ehrh	50(2)	78(8)	100(2)	62(10)	79(4)	100(5)	100(1)
Crataegus spp.	100(2)	100(3)	31(13)	62(2)	100(1)	100(3)	100(3)
Viburnum dentatum L.	100(1)	100(4)	72(6)	100(1)	82(5)	100(6)	100(1)
Ilex opaca Ait.	—	—	—	—	—	100(1)	—
Rhus copallina L.	100(3)	—	100(1)	—	—	—	100(5)
Lonicera japonica Thumb.	—	—	—	100(1)	—	100(1)	100(3)
Sassafras albidum (Nutt.) Nees	25(1)	—	—	—	100(3)	100(1)	100(1)
Callicarpa americana L.	—	—	—	—	35(1)	—	—
Diospyros virginiana L.	—	—	—	40(1)	—	—	—
Average	47(120)[3]	50(120)	60(120)	71(120)	68(120)	88(120)	98(120)

[1]Number of stems treated.
[2]No data.
[3]Differences in percent between table 1 and 2 due to rounding error.

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acceptable treatment combinations and for each single herbicide treatment. Hexazinone and tebuthiuron are included because our rate is similar to the full rate recommended by the manufacturers.

Hexazinone, picloram, triclopyr, and 2,4,5-T effectively controlled blackgum and sweetgum, and picloram also controlled flowering dogwood. Tebuthiuron did poorly with all the primary species. The 2,4,5-T-picloram combination successfully controlled all the primary species except red maple, while the triclopyr-picloram combination was successful with every species.

Not enough oak stems were treated to make valid conclusions, but both tebuthiuron and the triclopyr-picloram combination were consistently effective in controlling the few oaks present. The other treatments had varying results.

The two treatment combinations successfully controlled the minor mixed hardwoods, while results with the single herbicide treatments were erratic.

In conclusion, each herbicide applied alone controlled certain species, but none gave the overall brush control obtained with the two combinations.

This study confirmed positive results from earlier studies with low dosages of 2,4,5-T, triclopyr, and picloram. Site preparation using picloram pellets at 2 lb a/A followed by 2,4,5-T spray at 1 lb a/A should cost $70 per acre. If triclopyr were used, the cost would be higher; but it should be noted that triclopyr ester is not labeled for herbicide use at present.

This publication reports research involving pesticides. It does not contain recommendations for their use nor does it imply that the uses discussed have been registered. All uses of pesticides must be registered by appropriate State and Federal agencies before they can be recommended.

Caution: Pesticides can be injurous 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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