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EFFECT OF PELLET SIZE ON DEFOLIATION AND ESTIMATED KILL OF SMALL STEMS TREATED WITH HEXAZINONE

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ABSTRACT

Hexazinone [3-cyclohexyl-6-(dimethylamino)-1-methyl-1,2,5-triazine-2,4,(1H,2H)-dione] was tested in the 2, 1, and 0.5 cc size pellet (10% ai) against very small stems [average height, 1.97m; average ground line diameter (GLD), 2 cm] of water oak, Quercus nigra L., at 1.12 and 2.24 kg/ha on a sandy loam soil. First year defoliation of water oak by the 0.5 cc pellet at 2.24 kg/ha was significantly better than the 2 cc pellet at the same rate (88% and 59% respectively). Defoliation by the 0.5 cc pellet at 1.12 kg/ha (63%) was as good as defoliation from the 2 cc pellet at 2.24 kg/ha. On the basis of previous experiments, absolute kill of water oak in this study was calculated. The 0.5 cc pellet at 2.24 kg/ha will result in kill of 56% of the small stems in this study and the 2 cc pellet at this same rate will kill 32% of the stems. Reduction of the pellet size from 2 cc to 0.5 cc can result in product which is more effective and make its use feasible on some sites where it is not currently recommended.

INTRODUCTION

Hexazinone has been tested, registered and used throughout the South in the 2 cc pellet formulation (10% active ingredient) for both site preparation and pine release. While it is very effective on most of the woody competitors found in southern pine forests, a major drawback in its use in forestry is its ineffectiveness against small stems, i.e., those less than 1.2 cm diameter at breast height. The current 24 (c) label in Alabama recognizes this shortcoming and does not recommend hexazinone use against stems smaller than 5 cm. If a way could he found to make this chemical more effective on small stems while keeping it in the soild formulation, it would he very beneficial to forestry users.

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, they can harm humans, domestic animals, desirable plants, and pollinating insects, fish or other wildlife, and may contaminate water supplies. Use herbicides only when needed and handle them with care. Follow the directions and heed all precautions on the container label.

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

Tests conducted in 1978-1980 and previously reported (Michael, 1980) showed a trend toward increased oak kill when the pellet size was reduced from the commercial size of 2 cc to 1 cc. While the differences were not statistically significant, the 1 cc pellet gave higher average kills than the 2 cc at nearly all rates tested in spring and summer.

This paper reports the results of a study designed to compare the effectiveness of 0.5, 1, and 2 cc pellets against very small stems.

MATERIALS AND METHODS

The study area is located near Auburn, Alabama, in the remnants of a loblolly pine (Pinus taeda L.) stand that was destroyed by a hurricane in 1975. The site has a few pines still standing but it is currently dominated by many small stems (21,072/ha with an average GLD of 1.5 cm) most of which are water oak, (53.5%) with some sweetgum, Liquidambar styraciflua L., (9.9%); sassafras, Sassafras albidum (Nuttall) Nees, (7.9%); and Vaccinium sp. (12.3%) interspersed. The soil is coarse to medium with 5-25 cm of sandy loam over a sandy clay loam subsoil.

Hexazinone pellets containing 10% active ingredient in the 0.5 cc, 1 cc, and the 2 cc size were appled to 0.4 ha plots at two rates with four replications in a completely randomized design on May 25-June 10, 1980, for a total of 28 plots (including untreated controls) (table 1). The 1 and 2 cc pellets were supplied by E. I. duPont de Nemours & Co. The 0.5 cc pellets were made by sawing the 1 cc pellet in half. The grid spacings used to obtain the desired rates are in table 1. Exact grid spacings were obtained by dragging meter tapes through the plots at specifed intervals and placing the pellets on the ground at specified intervals. The treated plots received enough rainfall (6 cm) to activate the herbicide (as judged by the disappearance of the pellets) by July 8. There was no rainfall during the application period.

Measurement plots of 0.01 ha were centered in each treatment plot. Because plots were contiguous, a 10 m border lay between measurement plots. Nithin measurement plots, 25 small water oak stems [average height, 1.97 m; GLD, 2 cm] were randomly tagged with numbered metallic labels.

Treatment effectiveness was evaluated in October 1980. Defoliation was estimated to the nearest 10% and recorded for each tagged specimen. The data on percent defoliation were then subjected to analysis of variance and Duncan's Multiple Range Test at the .05 level.

RESULTS AND DISCUSSION

The three sizes of hexazinone pellets were tested at two rates. The lower rate, 1.12 kg ai/ha, is that recommended for site preparation in Alabama for easily controlled species on sandy loam soil. The higher rate, 2.24 kg ai/ha, is that recommended for site preparation in Alabama for difficult to control species on sandy clay loam soils. While water oak is an easy to control species, stems smaller than 5 cm DBH are difficult to control with

the 2 cc pellet. The defoliation results from this study are in table 2. For both rates the 0.5 cc pellet performed better than the commercially available 2 cc pellet and the difference was significant at the .05 level for the higher rate. The 0.5 cc pellet treatments resulted *in* as good defoliation as the 2 cc pellet at 1/2 the rate. Another important feature which was not quantified but was readily apparent during inspection of the plots is that many vines, principally Lonicera japonica Thunberg, Rubus sp. and Vitis sp., which were present on all plots initially were controlled to a very high degree on the 0.5 cc plots. There was essentially no control of these species on the 2 cc plots.

While defoliation is the parameter often measured in herbicide tests, the percent of stems killed is the determining factor in evaluating the success of a herbicide treatment for site preparation. The final kill is usually related to the degree of defoliation. The percentage of the small oak stems killed in this test can be estimated from the number that were completely defoliated by the end of the first growing season. Hexazinone treated plants typically defoliate and at least partially refoliate l-2 times during the first growing season following treatment. Stems that die usually do so during the second growing season. In previous unreported studies, the number of water oaks dead at the end of the second growing season was 95% of the number that completely defoliated during the first growing season following treatment (fig. 1). Using 95% it is possible to calculate the percent kill resulting from the treatments in this test (table 3).

The predicted kill from all treatments is about the same except for the 2.24 kg ai/ha rate of the 0.5 cc pellet projected to result in the kill of 56% of all small water oak stems in this study.

Reducing the size of the hexazinone pellet to 1/4 of the currently marketed size (2 cc) would result in a product about 75% more effective at the higher rate. This enhancement of effectiveness is presumbably due to the large number of pellets available for distribution and the resulting higher probability of contact with root systems of small hardwoods. Reducing the pellet size to 0.5 cc would increase the usefulness of hexazinone pellets in forestry in two ways. First, it would give potential control of some vines, notably Lonicera sp. which are often a problem during regeneration. Second, it would make the hexazinone pellet useful against small stems and thereby expand the number of sites where its use could be recommended.

LITERATURE CITED

Michael, J. L. 1980. Formulation, rate, and season of application effects of hexazinone (Velpar) gridball on oak topkill. Proc. South. Weed Sci. Soc. 33:110-113.

Table 1. Average pellet weight, size and grid dimensions for rates of hexazinone applied to sandy loam soil in the comparison of 0.5, 1, and 2 cc pellets on small stems of water oak in 1980

Pellet Size (cc)	Pellet Weight (grams)	Rate (kg ai/ha)	Grid Dimensions (m)
0.5	0.89	1.12	0.9 x 0.9
		2.24	0.6 x 0.6
1.0	1.91	1.12	1.3 x 1.3
		2.24	0.9 x 0.9
2.0	4.02	1.12	1.9 x 1.9
		2.24	1.2 x 1.2

Table 2. Percent defoliation of water oak three months after hexazinone treatment for site preparation in July 1980 on a sandy loam soil

Pellet Size (cc)	Rate (kg ai/ha)	Defoliation[1/] (%)
0.5	1.12	62.5 ab
	2.24	87.9 a
1.0	1.12	55.9 b
	2.24	68.9 ab
2.0	1.12	57.4 b
	2.24	59.2 b
Control	0.00	1.4 c

[1/] Numbers followed by the same letter are not significantly different at the .05 level by Duncans' Multiple Range Test.

Table 3. Percent of water oak stems that will die during the next growing season as a result of hexazinone treatment

Pellet Size (cc)	Rate (kg ai/ha)	Percent
0.5	1.12	24
	2.24	56
1.0	1.12	24
	2.24	30
2.0	1.12	27
	2.24	32

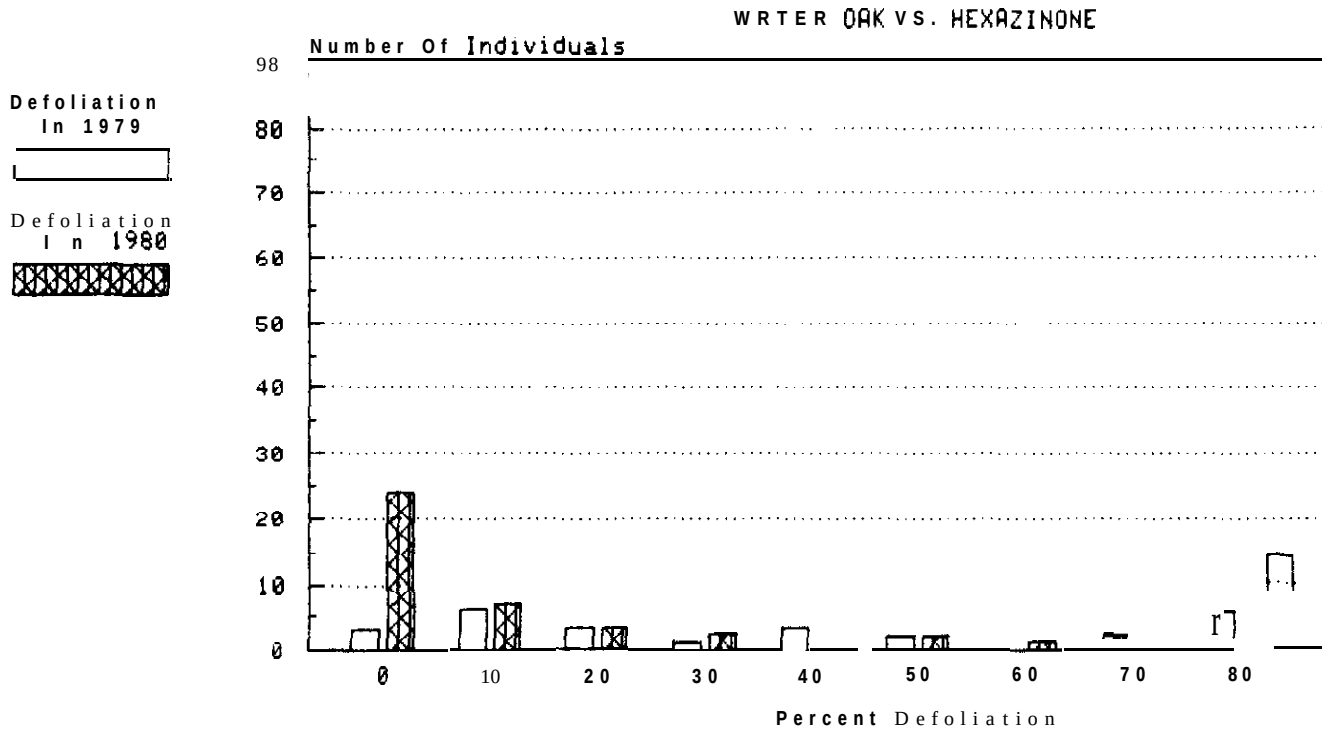

Figure 1. Comparison of the number of water oaks in defoliation categories and 2 growing seasons (1979 and 1980 respectively) after hexaz treatment on a sandy loam soil.