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# FORMULATION, RATE AND SEASON OF APPLICATION EFFECTS OF HEXAZINONE (VELPAR) GRIDBALL ON OAK TOPKILL[1]

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## ABSTRACT

Hexazinone [3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,2H)-dione] gridball was tested for site preparation on a loamy sand soil. The gridball was applied in the 1 and 2 cc formulations at 0.56, 0.84 and 1.12 kg ai/ha in a completely randomized design with three replications in April, June, and August 1978. After two growing seasons the I cc gridball had a slight performance advantage over the 2 cc gridball for the April application, but overall oak (*Quercus* sp.) topkill from the 1 cc gridball was not significantly different from topkill caused by the 2 cc gridball. Only the highest rate applied approached the minimum acceptable topkill level of 80%. The April and June applications gave similar results, and both were better than the August application. The Alabama 24-C label probably needs to be changed to allow higher application rates for site preparation on loamy sand soils.

## INTRODUCTION

Hexazinone has been extensively tested in the South for weed control since the early 1970's and has proven useful in silviculture. Many questions still remain, however, about which formulation of the gridball and what rate and season of application are most effective.

This study determined how hexazinone affected oak topkill for three rates of both the 1 cc and 2 cc gridball applied at three different times of the year.

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[1]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 trade 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.

## MATERIALS AND METHODS

The study area is located on a Troup loamy sand dominated by oak, 73% of the stems, especially scrubby post oak (Q. margaretta Ashe), 56% of the stems. Blackgum (Nyssa sylvatica Marshall.), 12%; hickory [Carya ovalis (Wang.) Sargent], 8%; sassafras [Sassafras albidum (Nuttall) Nees.], 6%; and dogwood (Cornus florida L.), 2%, were also present. Plots had an average of 9276 hardwood stems/ha with a groundline diameter of 1.25 cm or more. Stems smaller than 1.25 cm at groundline were not counted.

Hexazinone gridballs containing 10% active ingredient in the 1 cc and 2 cc formulation were applied to 0.04 ha plots at three rates and three replications in a completely randomized design on April 24, June 19, and August 14, 1978 for a total of 54 plots (Table 1). Pelletized formulations require rainfall to activate the herbicides by washing them into the ground. For hexazinone, about three inches of rain was needed for activation in this study. The April application was activated May 6, the June application July 7, and the August application September 25.

Measurement plots of 0.01 ha were centered in each treatment plot. Because plots were contiguous, a 10 m border lay between measurement plots. Within measurement plots, hardwood stems were randomly tagged with numbered metallic labels up to a maximum of 40 stems per plot.

Treatment effectiveness was evaluated in August 1979. Topkill was estimated to the nearest 10% and recorded for each tagged specimen. The data on percent topkill were then subjected to analysis of variance. When there was a significant F test at the .05 level, Duncan's Multiple Range Test was applied to treatment means at the .05 level. The plot means were also regressed against application rate for each of the three times of treatment. The linear regression model was then used to predict the treatment level needed for specified levels of topkill.

## RESULTS AND DISCUSSION

Table 2 gives results of this study. Variation within treatments was very high.

Formulation. No significant differences exist between the means for the 1 and 2 cc gridball treatments at equivalent rates, but results from the May and July treatments suggest a trend. The means for the 1 cc gridball treatments are higher than the means for the 2 cc gridball for equivalent rates at nearly all rates tested during May and July. Variation in treatment response among replications was high for both formulations, but it was much greater for the 2 cc treatments than for the 1 cc treatments. The difference in range of treatment responses between the 1 and 2 cc formulations indicates that decreasing the gridball size results in more consistent results. Use of smaller gridballs would allow the use of more gridballs per hectare and increase the probability of herbicide reaching a root system. Because there was no significant difference between the 1 and 2 cc formulations tested in this study, a ½ or ¼ cc gridball should be tested for site preparation.

The treatment means were consistently higher for the 2 cc than for the 1 cc gridball in the September treatments. This anomaly, in view of the May and July results, is most easily explained by examination of the activation rainfall pattern for the three treatment times. The May treatment received enough rain for gridball activation in 12 days and the July treatment in 18, but the September treatment did not get enough rain for activation until 42 days after application. The 2 cc gridball places twice as much herbicide as the 1 cc gridball does at the point of application for the same amount of activation rain. When the activation rain falls in small amounts over a long period of time (as in the September treatments) the 2, cc gridball is more likely to deliver a toxic level of chemical than the 1 cc gridball at any given point in time and the 2 cc treatment is, therefore, more likely to result in topkill. Thus, the optimum gridball size will be dictated by whether a small gridball that is 10% herbicide *can* deliver a lethal dose under all rainfall conditions.

Rate. The 1.12 kg rate was better than the .56 kg rate for all formulations and treatment times, except for the May treatment in which the 1 cc, 0.56 kg rate was not different from either the 1 cc or 2 cc, 1.12 kg rate. Similarly, the intermediate rate was not different from either the high or low rate except for the July 1 cc treatment, which was significantly lower than the 1 cc, 1.12 kg and the July 2 cc treatment, which was significantly higher than the 2 cc, .56 kg rate. Though the lowest acceptable level of competition reduction for a cost-effective chemical treatment is not well defined for either site preparation or pine release, a figure of between 80% and 100% is probably reasonable. The greater the pine productivity needed, the nearer the figure will be to 100%. If 80% is accepted as the minimum level, only the highest rate tested in May and July would have been acceptable on this site. This rate is also the highest rate prescribed by the Alabama State Label (24-C) for site preparation. Hexazinone could not be used legally on this site if more topkill is required.

The linear regression of rate vs topkill suggests that to achieve 90% topkill on this site would have required 1.34 kg ai/ha; 100% topkill would have required 1.57 kg ai/ha. The Alabama label probably needs to be expanded to 1.64 kg ai/ha for sandy, loamy sand, or sandy loam soils, if the user is going to have some choice in rates for sites with difficult competition control problems.

Season. Timing of application is important in herbicide use. As Table 2 shows, September treatments were less effective than those of May and July. The September treatment was evaluated after 1 full growing season while the May and July evaluations follow nearly 2 growing seasons. Topkill in the September 1978 treatment did not progress much after June 1979, and additional topkill is not expected to develop in 1980. Thus the differences in response between the May and July treatments and the September *treatment* are probably not due to differences in elapsed time between treatment and evaluation. This study could not determine how much area, rainfall pattern, or physiological state affected the oak topkill for the September treatment. Soils in the July and September treatment areas were similar with mean clay contents of 3.17% and standard deviation of 1.20 for July and mean clay content of 3.19% and standard deviation of 1.13

for September. Late summer application is probably unwise; but if it is necessary, the rate could be increased to make up for reduced effectiveness. Regression analysis of data from September treatment indicates 1.5 kg ai/ha would have achieved 90-100% topkill on this site if activated by September. Much consideration should be given to local rainfall patterns for the projected time of hexazinone application.

Table 1. Formulation, grid dimension, and application rate of hexazinone gridballs for site preparation in 1978 on Troup loamy sand in Autauga County, Alabama.

| Formulation (cc) | Rate (kg ai/ha) | Grid Size (M) |
|---|---|---|
| 1 | .56 | 1.8 x 1.8 |
| | .84 | 1.5 x 1.5 |
| | 1.12 | 1.3 x 1.3 |
| 2 | .56 | 2.6 x 2.6 |
| | .84 | 2.1 x 2.1 |
| | 1.12 | 1.8 x 1.8 |

Table 2. Percent topkill of all oak species two growing seasons (one for September treatment) after hexazinone gridball application for site preparation in 1978 on Troup loamy sand.

| Formulation (cc) | Rate (kg ai/ha) | Activation Date | | |
|---|---|---|---|---|
| | | 6 May | 7 July | 25 Sept. |
| | | % Topkill[1/] | | |
| 1 | .56 | 63 ab | 57 b | 33 c |
| | .84 | 73 ab | 50 b | 47 bc |
| | 1.12 | 83 a | 90 a | 63 ab |
| 2 | .56 | 57 b | 47 b | 37 c |
| | .84 | 70 ab | 83 a | 63 ab |
| | 1.12 | 80 ab | 83 a | 77 a |

[1/] Means in the same column followed by the same letter are not significantly different at the .05 level as determined by Duncan's Multiple Range Test.