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PRELIMINARY TRIAL WITH ANTRHAQUINONE

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INTRODUCTION

Anthraquinone is a bird repellent and was once sold in the United States under the trade-name Morkit ®. Research with this chemical was conducted during the 1950s at Pineville, LA. In one study, caged meadowlarks refused to eat seed coated with Morkit (Mann and Durr 1955). Initially, high rates of anthraquinone were used (e.g 25% g/g or 25 pounds of anthraquinone per 100 pounds of seed). However, during the mid -1950s, Morkit became unavailable in the United States and nurseries started using other alternatives such as crude anthraquinone and thiram (Meanley et al. 1956).

Today, many nurseries rely on thiram as a bird repellent. In one direct-sowing study, thiram treated seeds produced 5,580 seedlings per acre compared to 306 seedlings from non-treated seed (Meanley et al. 1956). Many nurseries treat pine seed with a 1% thiram treatment (1 pound of active ingredient per 100 pounds). In pine nurseries, the most commonly used formulation is 42-S Thiram®. Thiram has an oral LD_{50} (rat) of 2,950 to 4,430 mg/kg and anthraquinone has an oral LD_{50} greater than 5,000 mg/kg.

Athough some nursery managers continued to use anthraquinone (Rowan 1970), no tests with anthraqinone in forest tree nurseries were conducted after 1970. Anthraquinone was recently labeled for use in conifer nurseries and ornamental nurseries to repel geese (FlightControl®) and other birds (Avipel®). A gallon of this product sells for about $220. The FlightControl® label indicates a gallon will treat 1 to 2 acres. The company has plans to label their product for use on agronomic seed. For this reason, loblolly pine (*Pinus taeda* L.) seed were tested to see if the new formulation affects the rate of germination.

METHODOLOGY

An experiment was conducted at the Auburn Coop greenhouse during the 2003 growing season. Loblolly pine seed were obtained from the Alabama Forestry Commission and were sprayed with FlightControl Plus® at rates of 0.1%, 1% and 3% (weight of anthraquinone/weight of seed). Since this product contains 50% anthraquinone, this amounts to rates of 2, 20 and 60 g of product per kg of seed, respectively. Since one gallon of FlightControl Plus® weighs 10 pounds, this amounts to English rates of 0.16, 1.6 and 4.8 pints of product per 100 pounds of seed.

After treatment, treated and non-treated seed were kept in plastic bags at 36° F overnight. On August 14, 2003, seed were sown three to a cavity in 1.5" diameter by 3.5" deep conical plastic cells that were filled with sand. Five, 120 seed replicates were sown per treatment. Treatments were randomly distributed on one greenhouse table. Germination counts were conducted 15, 21 and 33 days after sowing.

RESULTS

When applied in a liquid formulation at 1% to 3%, anthraquinone did not affect germination of loblolly pine seed in a greenhouse (Table 1). Treatments did not affect either the rate of early emergence (day 15) or total germination (day 33). Average germinations for 2, 3 and 4 weeks after sowing were 16, 37, 53%, respectively (Table 2). The location of the replications in the greenhouse had an effect on emergence but this effect was not apparent at the end of the study. It appeared that germination was slower in blocks exposed to more sunlight (resulting in higher temperatures).

MANAGEMENT IMPLICATIONS

Rates of 1% anthraquinone have been effective in repelling blackbirds in rice (Cummings et al. 2002). The Coop will submit this data to the chemical company in hopes of adding pine seed to the proposed seed-treatment label.

REFERENCES

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Meanley, B., W.F. Mann and H.J. Derr. 1956. New Bird Repellents for Longleaf seed. Tree Planters' Notes 28:8.

Rowan, S.J. 1970. Analysis of the cause and extent of losses in slash and loblolly pines in two Georgia Nurseries. Tree Planters' Notes 21(4):20-22.

Table 1. Analysis of Variance for germination of loblolly pine seed as affected by anthriquinone.

Source	df	Days after sowing		
		15	21	32
		Probability of a greater F-value		
Replication	4	0.0454	0.0247	0.1486
Treatment	3	0.4310	0.5822	0.7969
Error	12			
Linear	1	0.7789	0.2363	0.3532
Quadratic	1	0.2021	0.5620	0.8548
lack-of-fit	1	0.3231	0.7312	0.8229

Table 2. Germination of loblolly pine seed as affected by anthriquinone.

Treatment rate		Days after sowing		
	(g anthraquinone/kg seed)	15	21	32
		%		
0	0	12.5	33.0	52.2
0.1%	0.1	16.8	36.0	51.0
1%	1.0	18.5	39.7	52.3
3%	3.0	15.5	41.1	56.0
(LSD)		*9.4*	*17.0*	*13.7*