THIRAM IMPROVES FIELD GERMINATION OF COVERED LONGLEAF SEED

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Arasan, a commercial fungicide containing thiram[2] as the active ingredient, is commonly used in a repellent coating of pine seeds for protection against birds in direct-seeding operations. The seed coating also contains endrin to repel insects and rodents and a latex sticker to hold chemicals to the seed.

For some time it has been known that thiram usually depresses laboratory germination of seed of all southern pines.[3] The effect has been attributed to high chemical concentrations accumulating in laboratory dishes, where seeds are closely spaced. But field germination is unimpaired, presumably because, there are fewer seeds per unit of area, and chemicals are washed away as they leach off the seed.

This study was conducted to learn if thiram is likely to affect germination in row-seeding operations. When sown in rows, seeds are usually spaced close together and covered with varying amounts of soil. Longleaf pine seed was chosen because it is sensitive to thiram and germinates rapidly.

Methods

Coatings equivalent to 0, 2, and 8 pounds of thiram (as Arasan 42-S) per 100 pounds of seed were tested. The high level is recommended for direct seeding. To assure that endrin and latex would not influence the response, these chemicals were applied to all seeds at rates recommended for the repellent formulation. The seed was fresh and 98 percent sound.

A simulated field test was made in beds of sandy loam soil under a polyethylene shelter that excluded rain. Treatments consisted of sowing on the surface and of covering seeds with 1/4, 3/4, and I inch of soil. To determine if sowing density influenced the response to thiram, half the seeds were spaced 1/2 inch apart and half 2 inches apart. Thus there were 24 treatments: Three coatings, four sowing depths, and two spacings. Each treatment was replicated four times.

Plots were rows 6 inches apart, each containing 50 seeds. Soil was thoroughly wetted at 5-day intervals during the 63-day test period (germination was negligible after 40 days). This schedule provided ample moisture for germination at lower depths, but the soil surface dried out so rapidly after each watering that germination at zero depth was low. On fast-drying soils, seed covering is essential for adequate germination.

Laboratory germination was evaluated in covered trays containing a sand-vermiculite medium kept moist continuously. The trays held 100 seeds apiece, spaced *1/4* to *1/2* inch apart. The three coating treatments had three trays each. Germination was tallied through 45 days.

Results and Discussion

Simulated field germination was significantly influenced (0.05 level) by depth of sowing, repellent coatings, and the interaction of these factors. Under a covering of soil, repellent-coated seeds germinated significantly better than untreated seeds, with increases averaging 13 and 8 percent for the 2- and 8-pound rates, respectively, (table 1) The difference between the high and low rates of thiram was not significant.

Differences were greatest at the s/-inch depth, where germination averaged 25, 35, and 52 percent for the 0-, 8-, and 2-pound rates, respectively. Presumably the thiram protected the seed from harmful soil fungi, but identification or isolation of pathogens was not attempted.

Germination of surface-sown seed was 7 percent -so low that the effect of thiram could not be sat-

[1] Formerly at the Southern Forest Exp. Sta. USDA Forest Serv., where the work was done.

[2] Tetramethylthiuramdisulfide.

[3] Mann, W. F., Jr. Preparing seed for direct seeding. Direct seeding in the South, 1959, a Symposium, pp. 52-519. Duke University. 1959.

TABLE 1.-*Germination of longleaf pine seed, coated with three dosages of thiram and sown at different depths under rainshelters*

Depth of seed covering in inches	Thiram per 100 pounds of seed		
	None	2 pounds	8 pounds
	Pct.	*Pct.*	*Pct.*
0	4	10	7
1/4	26	21	35
3/4	25	52	35
1	16	31	20
Average:			
All seed	18	28	24
Covered seed	22	35	30

isfactorily appraised.

Spacing had no significant effect on germination, which averaged 25 percent for seeds 1/2 inch apart and 22 percent for those at the 2-inch interval.

In the laboratory, by contrast, germination declined as concentration of thiram was increased. Germination averaged 66, 61, and 42 percent, respectively, for the 0-, 2-, and 8-pound levels (table 2). Of the seed that did not germinate within 45 days, the proportion that was sound increased significantly with the amount of thiram.

The action of thiram on seed may depend on the environment. In the laboratory, the 8-pound treatment may have killed the weaker seeds and caused others to become dormant. Under the simulated field conditions, physical and biological processes in the soil may have reduced thiram's phytotoxic effect but still leave sufficient fungicide to control disease.[4]

In general, a light coating of thiram appears best for maximum germination of covered longleaf seeds. But heavier coatings are required for protection against birds. The currently recommended rate of 8 pounds of thiram per 100 pounds of seed provides excellent overall protection, and the slight phytotoxic effects from this high rate can be ignored.

[4] Richardson, L. T. The persistence of thiram in soil a its relationship to the microbiological balance and dam off control. Can. J. Bot. 32: 335-346, illus. 1954.

TABLE 2.—*Laboratory germination and condition of ungerminated longleaf seed after 45 days*

Thiram per 100 pounds of seed	Germinated seed			Ungerminated seed		
	Normal	Abnormal	Total	Sound	Rotten	Empty
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
None	66	11	77	5	15	3
2 pounds	61	12	73	14	11	2
8 pounds	42	11	54	20	24	2