EFFECTS OF SYSTEMIC INSECTICIDES ON THE GERMINATION OF UNSTRATIFIED EASTERN WHITE PINE, VIRGINIA PINE, AND LOBLOLLY PINE SEED VARY GREATLY

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Introduction

Systemic insecticides as applied to the seed of fiber, food, and forage crops have been investigated extensively during the past 15 years. Systemic insecticides now have a wide commercial use on cotton seed for planting. Small amounts of these materials adhere to the. seed coat, protecting the cotton seedling against thrips, aphids, and mites. Ivey et al. (1954) undertook some of the early work with organic phosphorous systemic and reported on the success of dithiophosphate compounds on cottonseed.

Little investigative work has been done on the potential of systemics on forest tree seed. Systemics nursery seedbeds and in direct seeding operas ns might protect against spider mites, sucking insects such as aphids, coccids, and certain bud- and leaf-destroying insects.

The present study observed primarily the phytotoxic effects of several systemics on germination of pine seed.

Procedure

Unstratified eastern white pine, Virginia pine, and loblolly pine seed were selected for this study from seed lots of 1963 or 1964. Each species lot was thoroughly mixed and divided into 11 parts, 10 received a systemic treatment and 1 served as a control. The insecticide dosage rate was based on the manufacturer's recommendation to treat 100 pounds of seed (table 1) , mostly cottonseed.

The seed samples were treated during the summer of 1965. Immediately after treatment, the seed were shipped to the Eastern Tree Seed. Laboratory in double lined polyethylene containers. The phytotoxic effects were evaluated by germination tests

TABLE 1.—*Chemical treatments used with all seed species*

Treatment No.	Treatment	Active ingredient per 100 pounds seed
		Ounces
1_____	Bidrin technical _____	2
2_____	Disulfoton technical ____	2
3_____	Bayer 25141 technical ___	2
4_____	Phorate technical _____	2
5_____	Phorate D-44 _____	6
6_____	Bidrin technical _____	2
7_____	Dimetilan EC-1 _____	2
8_____	Thiocron EC-3 _____	2
9_____	Zinophos EC-4 _____	2
10_____	Niagara 10242 WP 50%__	2
11_____	Azodrin WP 25%_____	4

prepared on the same day the seeds arrived at the laboratory.

The seed were germinated on a sand-perlite medium in covered plastic boxes at a constant 72 degrees F. and with 16 hours of light. Total germination of loblolly pine, Virginia pine, and eastern white pine required 44, 35, and 70 days, respectively. Percents of germination are reported on a full seed basis. Analyses were made on total germination, rate of germination (number of days to reach 90 percent of total germination) , and percent of abnormal germination.

Results

Virginia pine- No insecticide significantly promoted germination of this species. However, disulfoton, Bayer 25141, phorate technical, and Thiocron significantly reduced total germination (fig. 1) and delayed the rate of germination over that of the controls.

Eastern white pine- This species had the least apparent variation of all species germinated. Nia 10242 had a significant promotive effect on germination, while Azodrin was significantly detrimental (fig. 2).

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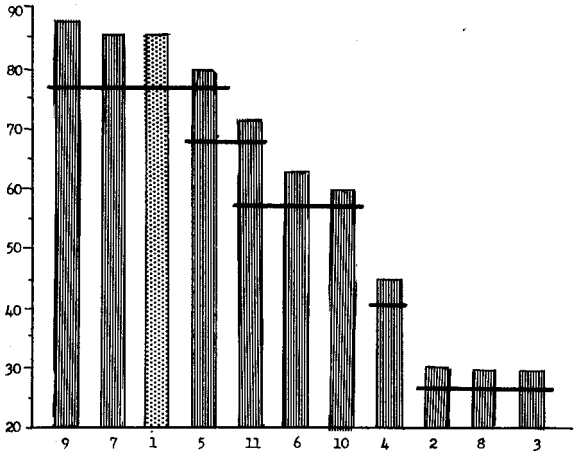

Figure 1.—Germination of Virginia pine seed after various systemic insecticide treatments. Means not connected by lines are significant at 1-percent probability level.

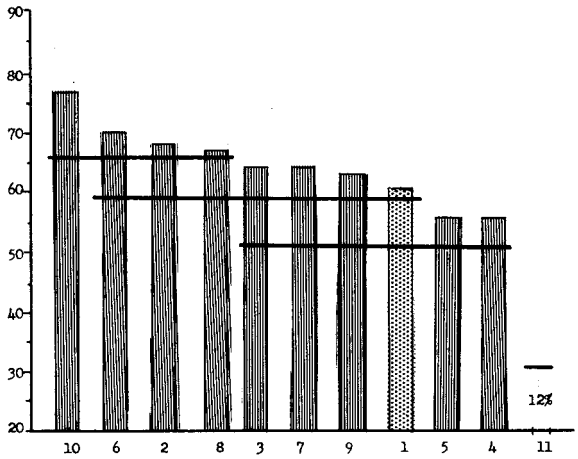

Figure 2.—Germination of eastern white pine seed after various systemic insecticide treaments. Means not connected by lines are significant at 1-percent probability level.

Since unstratified seed was used, the rate of germination was quite slow; however, Nia 10242 showed a significant promotive effect on the' rate of germination (table 2).

Loblolly Pine-Thiocron, Nia 10242, phorate D-44, : and Zinophos significantly promoted total germination and the rate of germination over that of the untreated control (fig. 3). Bidrin, Bayer 25141, phorate technical, disulfoton, and Azodrin significantly inhibited germination of loblolly pine seed. Dimetilan did not promote nor inhibit total germination but did significantly increase the rate.

TABLE 2.—*Effects of treatments on rate of germination*

Treatment	90 percent of total germination		
	Virginia pine	White pine	Loblolly pine
Control	14	60	41
Disulfoton	29	60	—
Bayer 25141	32	60	—
Phorate technical	29	60	—
Phorate D-44	11	60	27
Bidrin	14	63	41
Dimetilan EC-1	11	60	27
Thiocron EC-3	29	63	27
Zinophos EC-4	11	60	23
Niagara 10242 50% WP	17	49	20
Azodrin 25% WP	17	63	—

In addition to total germination for each species, the rate of germination or the number of days to reach 90 percent of total germination for each treatment was also determined (table 2).

Discussion and Conclusion

In this study phytotoxicity varied not only among chemicals, but also among species with any given chemical. As an example, Azodrin proved to be phytotoxic at the concentration used for all species except Virginia pine. Bidrin promoted the ger-

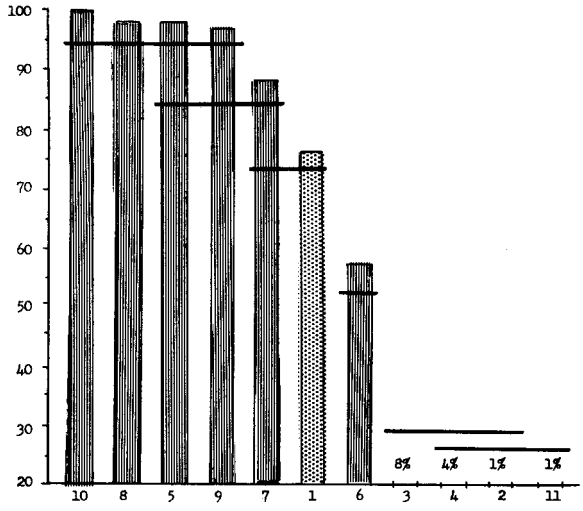

Figure 3.—Germination of loblolly pine seed after various systemic insecticide treatments. Means not connected by lines are significant at 1-percent probability level.

TABLE 3.—*Summary of chemical effects on seed germination*

Chemical	Virginia pine germination		White pine germination	
	Total	Speed	Total	Speed
Disulfoton technical	—	—	0+	0
Bayer 25141 technical	—	—	0	0
Phorate technical	—	—	0	0
Phorate D-44	0	0+	0	0
Bidrin technical	0—	0	0+	0—
Dimetilan EC-1	0	0+	0+	0
Thiocron EC-3	—	—	0+	0—
Zinophos EC-4	0	0+	0	0
Nia 10242 50% WP	0—	0—	++	++
SD 9129 25% WP	0—	0—	—	0—

Legend: — reduced at 1-percent level.
++ increased at 1-percent level.
0 not significantly different from controls.
0— noted nonsignificant reduction.
0+ noted nonsignificant promotion.

mination of white pine but substantially reduced e germination of Virginia and loblolly pine.

Bidrin and Nia 10242 showed significant promotion of germination on white pine seed, and significant reduction in the germination of Virginia pine seed. Loblolly germination was promoted by treatment with Thiocron, Nia 10242, phorate D-44, and Zinophos.

The only promotive effect on the rate of germination was that by Nia 10242 on white pine, and Dimetilan, Thiocron, phorate D-44, Zinophos, and Nia 10242 on loblolly pine seed. Differences were noted in the detrimental effect between species. Azodrin reduced the rate of germination of white pine, while Thiocron reduced the rate of germination of Virginia and white pine. No chemical reduced the germination rate of loblolly pine.

Summary

This study, designed to evaluate the phytotoxicity of 10 systemic insecticide formulations on three species of tree seed, showed that phytotoxicity not only varied among chemicals, but also among species, when a single chemical was evaluated (table 3).

Therefore, the seed treatment recommendations at specified rates are made as follows: *1. Eastern white pine*-the use of these systemics will not result in phytotoxicity: Bayer 25141, Bidrin, Dimetilan, disulfoton, Nia 10242, phorate (technical and D-44), Thiocron, and Zinophos; Bidrin and Nia 10242 can be expected to have a promotive effect on germination. 2. *Virginia pine*-the use of these systemics will not result in phytotoxicity: Dimetilan, phorate D-44, and Zinophos. *3. Loblolly pine*-the use of these systemics will not result in phytotoxicity: Dimetilan, Nia 10242, phorate D-44, Thiocron, and Zinophos; Thiocron, Nia 10242, phorate D-44, and Zinophos can be expected to have a promotive effect on germination.

Literature Cited

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