COVERING AFFECTS CONTAINER GERMINATION OF SOUTHERN PINE SEEDS

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Although covering seeds is common practice in many containerized seedling operations, it is detrimental to germination of slash and long-leaf pine seeds when the surface medium is kept continuously moist.

Covering seeds with granite grit, vermiculite, or a potting medium is recommended in many containerized seedling operations (*3*), (*5*), (*6*) to create a favorable environment for germination by keeping seed moist, to help radicle orientation, and to reduce development of moss and algae on the medium surface. However, preliminary tests have indicated that covering may be counter-productive and even retard germination of southern pine seeds. In this study, effects of covering with vermiculite were evaluated with longleaf (*Pinus palustris* Mill.) and slash pine (*P. elliottii* Engelm.) seeds that had received thiram fungicide treatments.

Methods

The responses of fresh longleaf and slash pine seeds to combinations of three covering depths, three fungicide treatments, and two methods of watering were evaluated. Seeds were sown in a 1:1 peat-vermiculite medium and covered with 0, ¼, or ½ in. of vermiculite. Fungicide treatments included a control, Arasan 42-S[1] alone, and Arasan with a latex sticker. Arasan was applied at 9.35 ml per pound of seed, a rate sufficient to control seedcoat surface microorganisms. Latex was applied at 3 ml per pound. The fungicide treatments were included because they can modify the response to covering by helping to eliminate a source of pathogenic microorganisms.

Two watering regimes were tested. One was an automatic misting system which resulted in very light watering many times a day, depending upon moisture loss by evaporation. The other was heavier watering by hand on an average of twice daily.

Testing was done under greenhouse conditions similar to those used in containerized seedling production. Temperatures ranged from 70°-75° F and supplemental light which increased the photoperiod to 16 hours was provided by fluorescent lights with an intensity of about 500 footcandles. One hundred seeds were sown for each of three treatment replications per species. The seeds were sown on an area of approximately 100[2] in., which is comparable to the spacing used in containers. Germination was recorded at 2- to 3-day intervals so that an evaluation of speed as well as completeness of germination were obtained. Data were subjected to analyses of variance with evaluation of treatment means by Duncan's Multiple Range Test at the 0.05 level of significance.

Although seeds were still germinating in some treatments after 28 days, germination after 28 days was not included in the results since it would have little practical use in establishing container-grown seedlings. The proportion of total germination by 28 days that occurred within 15 days was used as an index of the speed of germination.

Results

Longleaf Pine.–Germination after 28 days was fairly uniform among treatments, except for seeds in the hand-watered regime that were uncovered or covered to a depth of ¼ in. (table 1). In treatments in which a high percentage of seeds germinated, neither fungicide formulation affected germination. An Arasan seed coating was beneficial only in treatments involving hand watering of surface shown and ¼ -in. covered seeds. Neither Arasan coating nor covering were beneficial if the seeds were germinated under mist. When seeds were hand watered, covering with ½ in. of vermiculite improved germination.

The proportion of 28-day germination occurring within 15 days showed clearly the effects of both fungicide coating and seed covering (table 1). Arasan had no impact on proportion of germination occurring within 15 days. Germination under mist decreased proportionately as the depth of cover increased, averaging 91, 80, and 61 percent with 0-, ¼ -, and ½ -in. cover. Hand-watered seeds germinated much faster when covered with ¼ or ½

[1]A proprietary name of thiram.

Table 1.—*Germination at 28 days and proportion of 28-day germination occurring in 15 days*[1]

Watering method	Depth of cover	Seed treatment	Germ. at 28 days		Prop. germ. at 15 days	
			Longleaf	Slash	Longleaf	Slash
			Percent			
Mist	0	Untreated	76	96	95	95
		Arasan	77	85	91	74
		A. + latex	77	81	86	67
	¼	Untreated	78	69	88	72
		Arasan	80	50	80	50
		A. + latex	79	44	73	48
	½	Untreated	75	26	60	38
		Arasan	73	26	62	30
		A. + latex	74	26	60	19
Hand	0	Untreated	38	60	3	0
		Arasan	61	74	3	0
		A. + latex	60	64	5	0
	¼	Untreated	66	80	76	58
		Arasan	82	77	83	66
		A. + latex	73	72	74	56
	½	Untreated	80	67	78	46
		Arasan	81	56	70	48
		A. + latex	83	58	72	43

[1]LSD. 05 for germination percentages are 9.2 for longleaf and 21.2 for slash pine. Similar values for proportions germinating in 15 days are 15.6 and 12.0.

in. of vermiculite than when surface sown.

Slash Pine. – All treatments influenced germination of slash pine seeds. Highest germination occurred with uncovered seeds under the misting system, averaging 87 percent for all seedcoat treatments (table 1). When using the misting system, covering slash seeds reduced germination to 54 and 26 percent for ¼- and ½ -in. depths. The ½-in. cover resulted in lower germination than all other mist watered treatment combinations. Germination of hand-watered, ¼ -in. covered seed was lower than for misting uncovered seed, but better than for all other cover-watering combinations. Untreated seeds germinated better than those given either Arasan treatment.

When watered by misting, the proportion of seeds germinating in 15 days followed the same pattern as 28-day germination. Increasing depths of seed cover decreased the speed of germination. Hand-watered seeds performed best with ¼ in. of vermiculite covering. Surface-sown hand-watered seed completely failed to germinate. All mist-watered seed treatments germinated more promptly than hand-watered treatments.

Discussion

The effect on germination of covering seed varies with the type of watering regime used and, to some extent, with fungicide coatings. Although both species reacted somewhat differently to the treatments, there were similarities in trends. The most complete and rapid germination usually occurred when seeds remained uncovered and were watered by a mist system. When seeds were hand-watered, covering was helpful in obtaining germination. Covering of ¼ in. resulted in the highest germination of slash seeds, but ¼ in. covering was no better than ½ in. for longleaf. These data indicate that larger seeds can be covered to a greater depth than small ones. The beneficial effect of covering seeds and watering them by hand was probably due to the mulching effect of the vermiculite that retained moisture in its top layer.

With slash seeds, fungicide applications resulted in markedly lower germination. This has been observed before when seeds are treated with high levels of thiram to repel birds (*1*). Untreated longleaf seeds that were hand watered germinated less than all other treatments. This tends to confirm Jorgensen's (*2*) finding that thiram coating helps improve germination of covered longleaf seeds. Longleaf may react differently from the other species in this regard because its seedcoats are known to carry pathogenic *Fusarium* fungi (*4*).

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