Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 03-03

THE GERMINATION OF LONGLEAF SEED IN ARTIFICIAL MEDIA BY FAMILY AND SEED TREATMENT.

by
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INTRODUCTION

This study evaluated three seed treatments to enhance the germination of longleaf seed that were sown in artificial media in typical container cells. Since the registration for Benlate was withdrawn, the Coop has screened several fungicides and disinfestants with very little promise for economic control (Carey et al. 2001). However, the seed treatments evaluated here and in a similar but full season study at Goldsboro, NC, (see Research Report 03-02) economically improved the seed efficiency of orchard collected longleaf seed.

METHODOLOGY

The same seed source was used here and at North Carolina but the containers, the media, the sowing and the seed treatments differed. Cones were collected from three clones at the Bladen Lakes seed orchard in North Carolina on Oct 9, 2001, transported to Auburn and placed in open tubs till seed shed naturally. Seed were collected from the tubs and placed in plastic bags kept at 4° C till sown. Four seed treatments were applied to seed taken from storage on May 15, 2002. Approximately 400 longleaf seed with wings (40 gm) of each half-sib family received each of three treatments and a fourth group was treated only with distilled water. TOPS® 90 (38% Captan, 13% PCNB, 8.5% Carboxin and 13.5% thiophanate-methyl) was applied at 23.5 oz product/100 lbs as a surface treatment to surface moistened seed and distributed evenly by mixing in a plastic bag (a treatment used at Goldsboro) and the same amount used to surface treat 40 gms of seed (0.58 gm product) was mixed with 500 ml of water (producing a 0.12% ai w:w aqueous suspension) was used as a 20 minute soak, Thompson M® (thiophanate-methyl) was applied as a 10 minute soak in a 2.5% ai suspension, and the control treatment was a 10 minute soak in 500 ml of water. After treatment, each half-sib family by treatment lot was allowed to surface dry on the laboratory table for two hours and divided into five subsets of approximately 50 seed each and placed back in storage (4° C). Seed were sown in an Auburn greenhouse over the next two days by a single sower.

One sower single-sowed five 40-cell container racks with seed for each seedlot by treatment combination. Containers were filled with a premixed peat/pearlite media (Premeier® Pro-Mix) and seed sown by holding the wing and pressing them about a quarter inch into the media. Sown containers were randomly distributed on two greenhouse tables and kept moist through germination. Germination was recorded 15 and 21 days after sowing. Germination was analyzed for the effects of family, and for fungicide using SAS GLM. Differences between means were assessed using SAS Duncan's.

RESULTS

Means by orchard clone and by fungicide treatment are presented in Table 1. The three orchard clones collected in 2001 (137, 119 and 135) ranked as in previous years for pitch canker symptoms at the orchard. That is, symptoms were most severe for clone 137 (?0.05) and least severe for clone 135 with clone 119 intermediate. Clone 119 has been variably closer to 137 or 135 in different years but always intermediate if not significantly different (Carey et al 2000). Among surveyed clones with 4 or more ramets were 170 trees in 21 clones. Therefore, about 25% of ramets are for clones ranked similar to 137 in pitch canker symptoms. In this study, not including seed from clone 137 increased germination about 5%. The fungicide treatments improved germination compared to not treated seed but did not differ from each other. Treatment effects by half-sib family are presented in Table 2. Germination did not differ for not treated seed from clone 137 compared to clone 119 but treatment improved 137 more than 119.

Table 1. Percent germination of container sown longleaf seedlings at Auburn by seed orchard clone and seed treatment in 2002.

Variable	Level †	N	Day 15*	Day 21
Clone	135	4	64.4 a	72.9 a
Clone	119	4	35.3 b	39.5 b
Clone	137	4	33.0 b	44.1 b
	lsd		*6.8*	*4.7*
Fungicide	None	3	34.9 a	44.7 a
Fungicide	Tops® 90 - (1.4% w:w on seed)	3	44.5 b	53.9 b
Fungicide	Tops® 90 - 0.1% ai soak	3	48.0 b	54.7 b
Fungicide	Thompson® M - 2.5% ai soak	3	49.7 b	55.5 b
	lsd		*7.9*	*5.7*

† To 40 gm of seed, the Tops® 90 was applied as 0.58 gm to wet seed (ie 1.4% w:w on seed) or as a soak with the 0.58 gm in 500 ml aqueous suspension (ie 0.1% w:w in water). 12.5 gm ai Thompson® M was applied in 500 ml aqueous suspension (ie 2.5% ai w:w).

* Percentage by 40 cell rack for 5 racks.

Table 2. Container longleaf seedlings per 40 sown seed by seed treatment and seed orchard source at Auburn in 2002.

		Percent germination on day 21 by treatment and orchard clone		
Treatment	Application	Clone 137	Clone 119	Clone 135
None	NA	34.6 a	34.6	64.8 a
Tops® 90	1.4% w:w to seed	44.8 ab	40.2	76.8 b
Tops® 90	0.1% ai soak	47.2 b	39.6	77.2 b
Thompson® M	2.5% ai soak	49.8 b	43.8	72.8 b
	lsd †	*10.6*	*9.4*	*7.9*

† The lsd is based on germination by 40-cell rack which (technically) is pseudo-replication since each lot by treatment was done in one batch.

MANAGEMENT IMPLICATIONS

The fungicide treatments increased production (averaged for the three families) by 10%. This is an increase of approximately 50,000 germinated seed per 100 lbs treated with 1.4 to 2.5 lbs of seed treatment. If production costs for container seedlings are $100/1,000 cells and revenue is $200/1,000 the expectations from Table 1, if all families are equally sown, is a $20,000 revenue increase for fungicide seed treatment (less the cost of 28 lbs of product plus treatment).

LITERATURE

Carey, Bill, Brett Runion, Jason Shelton, Steve Oak. 2000. Pitch canker severity by clone among Bladen Lakes longleaf seed orchard trees. In Proceedings SWFDW. June 2000-Sheperdstown, WV.

Carey, William, Scott Enebak and Steve Oak. 2001. Seed treatment with Benlate reduces *Fusarium* associated longleaf seedling mortality in containers. AUSFNMC Research Report 01-13. 4 pg.