

VAPOR-GARD AFFECTS SURVIVAL AND GROWTH OF OUTPLANTED PINE SEEDLINGS

by

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Abstract.--Results of studies designed to test effects of Vapor-gard applications to foliage of slash, loblolly, and longleaf pine seedlings on survival and height growth in outplantings are reported. Vapor-gard was applied at differing rates to determine if high rates were detrimental to seedling development or survival. Survival and/or growth were improved in some outplantings but not in all. High rates of application may reduce height growth!

Vapor-gard is a water emulsifiable organic material, di-1-p-Menthene, that forms a clear, glossy film after spray applications to plant surfaces. Once the spray film is set, it functions as an anti-transpirant and retards normal moisture loss without interfering with plant growth or normal respiration. The spray film is weather resistant and once applied will remain intact for several months. Only new growth is not protected after an application in late fall, thus eliminating the need for repeated applications in nursery operations. The material is applied in water without additional spreader but becomes viscous at low temperatures (like honey) and, consequently, should be stored in a warm environment and sprayed during relatively warm periods of the fall at a rate of one gallon per acre in about 20 gallons of water. The material is made by Miller Chemical and Fertilizer Corporation, Hanover, Pa. 17331.

METHODS, RESULTS, AND DISCUSSION

I'm not sure how Harry Bryan with Hiwassee Land Company's nursery at Chatsworth, Ga. heard about Vapor-gard but he began testing the material in 1983 and was so pleased with results that he and his company are using it operational after using it in several research studies. It was Harry's willingness to share his early test results that led me to begin testing the material in February, 1985. Following Harry's lead, I applied the material at one gallon per acre in enough water to cover foliage in test plots four feet by twenty feet on a bed of regular improved loblolly pine and a bed of East Texas drought resistant loblolly pine at Georgia Forestry Commission's Morgan Memorial Nursery near Byron. I applied the sprays with a Solo back-pack sprayer. Adjacent bed areas were left unsprayed to serve as checks. Seedlings were outplanted by machine in February and again in March on a site in Wilkinson County, Ga. as four randomized complete blocks with fifty seedlings per treatment-replicate-row (**4** treatments x 2 dates x 4 blocks x 50 seedlings = 1600). An additional site was chosen in Richmond county, Ga. on Fort Gordon because of it's droughty sand dune soil and outplanted by hand in March as **three randomized complete blocks with fifty seedlings pre** treatment- replicate-row (4 treatments x 3 blocks x 50 seedlings = 600). Survival and height growth were measured•after one year and after three years on the Ft. Gordon site. The Wilkinson county site was destroyed after the first year by bush hog mower because the study was in the way of the expanding Baldwin seed orchard. The following tables illustrate the improved benefits of Vapor-gard sprays when seedlings are outplanted on a droughty site (Ft. Gordon) or on a site that became drought-stressed after the second (March) outplanting.

TABLE 1. EFFECTS OF NURSERY APPLIED FOLIAR SPRAYS OF VAPOR-GARD ON SURVIVAL OF GEORGIA IMPROVED AND E. TEXAS DROUGHT RESISTANT LOBLOLLY PINE - FIRST YEAR-DATA.

TREATMENT	WILKINSON	WILKINSON	GORDON
	2/19	3/21	3/13
	%	%	%
VAPOR-GARD-Ga lob	87.6a	77.4b	71.3c
VAPOR-GARD-Tex lob	87.4a	79.1b	51.6b
Check-Ga lob	88.3a	53.5a	66.7c
Check-Tex lob	88.9a	50.6a	29.8a

Means in each column followed by a common letter do not differ at 95% level.

TABLE 2. EFFECTS OF NURSERY APPLIED FOLIAR SPRAYS OF VAPOR-GARD ON HEIGHT GROWTH OF GEORGIA IMPROVED AND E. TEXAS DROUGHT RESISTANT LOBLOLLY PINE - FIRST-YEAR-DATA.

TREATMENT	WILKINSON	WILKINSON	GORDON
	2/19	3/21	3/13
	(cm)	(cm)	(cm)
VAPOR-GARD-Ga lob	35.9a	33.3b	28.8b
VAPOR-GARD-Tex lob	40.1b	35.3c	28.4b
Check-Ga lob	34.4a	31.4a	24.5a
Check-Tex lob	45.6b	32.8b	25.9a

Means in each column followed by a common letter do not differ at 95% level.

TABLE 3. EFFECTS OF NURSERY APPLIED FOLIAR SPRAYS OF VAPOR-GARD ON HEIGHT GROWTH AND SURVIVAL OF GEORGIA IMPROVED AND E. TEXAS DROUGHT RESISTANT LOBLOLLY PINE - THIRD-YEAR-DATA. FT. GORDON TRACT ONLY

TREATMENT	HEIGHT (cm)	SURVIVAL (%)
VAPOR-GARD-Ga lob	93.3a	66.0c
VAPOR-GARD-Tex lob	85.0a	47.0b
Check-Ga lob	77.3a	63.4c
Check-Tex lob	90.7a	29.1a

Means in each column followed by a common letter do not differ at 95% level.

As Harry had found earlier, significant improvement in seedling performance is obtained on only some and not all sites. The above results, as I suspected after examining Harry's data, indicate that Vapor-gard improves survival and/or growth only on sites where trees are stressed due to drought or other causes. Seedlings planted on the Wilkinson tract in February were not stressed as much as were those planted on the same tract in March or those **planted on the Gordon tract. Growth** and survival were improved by vapor-gard in both cases but were not affected in the February planting. Survival of the E. Texas drought resistant loblolly was not as good as the Georgia loblolly indicating less drought resistance in this seed source than in the Georgia source. Harry has found a continued growth difference on sites where first year differences due to vapor-gard were evident but such difference disappeared on the Gordon tract after three years (table 3) but survival significance remained. This probably was caused by the large variation in tree growth even within treatment rows which relates to soil nutrient differences near old scrub oak stumps removed before planting.

gallons per acre is excessive although he found no reduction in survival caused by this rate of Vapor-gard.

In yet another study with Vapor-gard, the material was applied as foliar sprays to bare root longleaf in beds of Georgia Forestry Commission's Walker nursery and to 5 month old (too young for real comparison) container longleaf seedlings from Howard Waters of Jesup, Ga. Sprays were made at 1 gallon per **acre** in March, 1988 and outplanted **in** Dooly county Ga. in late March (6 months data). Sprays were directed at (1) container seedling foliage, (2) container top and seedling foliage, or (3) container top only.

TABLE 5. EFFECTS OF VAPOR-GARD ON SURVIVAL OF LONGLEAF CONTAINER AND BARE ROOT STOCK

TREATMENT	SURVIVAL (%)
Bare root check	77.0a
Bare root vapor-gard	85.0b
Container check	6.5c
Container VG- foliar spray	2.0c
Container VG- top and cont. spray	1.0c
Container VG- cont. top only spray	5.0c

Means followed by a common letter do not differ at 95 % level.

The container longleaf were about one month too young for outplanting according to Mr. Howard Waters and perhaps explains the poor performance in comparison to bare root stock in this study. The improved survival of longleaf due to vapor-gard is similar to that obtained in the other studies described in this paper in outplantings of slash and loblolly pine. Vapor-gard is applied operational in Georgia Forestry Commission nurseries to all species of pine.

A comparison study was made between Vapor-gard at 1 gallon per acre and Transfilm (another brand of anti-transpirant) at the same rate. Outplantings were made in 1987 in four randomized complete blocks with 50 trees per treatment row. No differences were found after one year in height or survival indicating that other brands of anti-transpirants are acceptable substitutes.

Another study was done in late February of 1988 in which Vapor-gard was applied to slash pine seedlings at 1 and 2 gallons per acre as a foliar spray and applied as a top dip at 1 %, 2 %, and 4 % solutions. Seedlings were outplanted by machine in four randomized complete blocks with 50 trees per treatment row. The following table reflects observations made in late May of this year.

TABLE 4. EFFECTS OF VAPOR-GARD APPLICATIONS TO SLASH PINE SEEDLINGS AT DIFFERING RATES AS FOLIAR SPRAYS AND TOP DIPS.

TREATMENT	SURVIVAL (%)	HEIGHT (cm)
Check	99.0a	24.4bc
Spray-1 gal	99.5a	25.1c
Spray-2 gal	100.0a	24.4bc
Top dip-1 %	99.5a	23.6b
Top dip-2 %	97.5a	22.0a
Top dip-4 %	98.5a	21.8a

Means in each column followed by a common letter do not differ at 95 % level.

Although the results are early and tentative it seems evident that top dips with 2 % solutions or higher is detrimental to growth of pine seedlings indicating that care needs be taken not to apply too much material. Harry found similar reduction in height growth on one of two sites used in a study comparing foliar sprays at 1 and 2 gallons per acre. His data suggest that 2