TESTING SUPERABSORBENT TREATMENTS FOR LOBLOLLY PINE SEEDLINGS

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ABSTRACT.--Loblolly pine seedlings treated with superabsorbent root dips performed as well as the standard packing media (clay slurry) in field trials. No statistically significant differences were noted in either survival or height growth of seedlings whether packed in superabsorbents or clay slurry.

Additional keywords: *Pinus taeda*, survival, height growth, nursery practices.

Superabsorbents were developed in 1973 by researchers at the USDA Northern Regional Research Center in Peoria, Illinois. Superabsorbent is a generic name for a starch based polymer, made by chemically grafting man-made acrylic compounds to cereal grain starch and hydrolizing the combination. The resulting product swells into a gel capable of absorbing water hundreds of times the powder's weight. Since these polymers have been in the public domain, they have been tested for different agriculture uses such as soil additives, seed coatings, and root dips (Doane and Mayberry 1979; Copley 1980).

The potential use for such a water holding product is evident in forestry because of the large demand by tree nurseries for a seedling packing medium. Because of changing techniques and lifting practices, there is a need to constantly evaluate the effectiveness of new packing products that will keep seedling roots moist. Preliminary trials of superabsorbents have been carried out with generally successful results (Doane and Mayberry Ibid); however, these tests have been done on a small scale and there has not been enough operational testing. Conflicting reports have been received from large operational users.

Goodwin (1982) compared the results of three root dips applied just before planting; kaolin clay slurry, water, and Terrasorb® , and did not find any significant differences between survival or height growth after 1 year. Stein (1977) tested several packing media and found that Agricol®, a seaweed-base water absorbent, compared unfavorably with sphagnum moss, kaolin clay, water, or peat moss. Venator and Brissette (1982) tested several superabsorbents to determine if any of these products would increase loblolly survival over that of a standard clay slurry. In a Mississippi trial, clay dipped seedlings

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stored for 30 days performed poorly when compared to superabsorbents, which had a greater water holding capacity. In a Louisiana trial no differences between superabsorbent treatments occurred. Those results indicated the need for a larger scale evaluation of superabsorbent root dips. This paper summarizes such an additional test of the effects of superabsorbents on loblolly pine seedling performance.

METHODS

Three superabsorbent root dips were used as packing media to compare their effectiveness for maintaining survival and height growth over the current standard packing media of koalin clay. These treatments were: SGP®502S, a fine white powdery starch (supplied by the Henkel Corporation of Minneapolis, Minnesota) mixed at a rate of 0.5 of 1 percent hydrolized in water; Terra-sorb® 200, a brown flaky starch that looks like sawdust, (supplied by Industrial Services of Bradenton, Florida) mixed at a rate of 0.6 of 1 percent; and Waterlok®B100, a fine white powdery starch (supplied by the Grain Processing Corporation of Muscatine, Iowa) mixed at a rate of 0.5 of 1 percent in water.

In mid-January 1982, loblolly pine seedlings were lifted, graded according to Wakeley's (1954) grades 1 and 2, dipped in one of the superabsorbent treatments or sprayed with kaolin slurry, and packed approximately 500 per Kraft-polyethylene bag at the International Paper Company Nursery near Bluff City, Arkansas. The bags were stored in the nursery cold storage room before being shipped as part of a regular delivery to Springhill, Louisiana.

As a phase of a cooperative study, the seedlings were planted at an 8 x 8 foot spacing by personnel from Superior Forestry Services, of Leslie, Arkansas. Hodads were used as planting tools. Seven complete blocks of randomized row plots, each containing 100 to 150 trees, were planted. Survival was measured at 6 months and 1 and 2 years after outplanting. Heights, measured to the nearest 0.1 foot, were measured after I and 2 years in the field.

RESULTS

The first survival check was made in June 1982. These measurements served to determine whether initial mortality was a response to poor planting, animal damage, or some other problem. Because of the narrow range in survival, no statistically significant differences were detected. Seedling survival at this time ranged from 96 percent for the Terrasorb to 98 percent for the SCP-502S (table 1). The first-year survival dropped due to a drought in August and September. The first-year survival for all treatments differed only 2 percentage points--74 to 76 percent.

Since the local dry season typically begins in July and extends through September, stress is most likely to cause seedling mortality during this period. Therefore, the first-year survival count reflects the ability of seedlings that are alive in June to stay alive during the dry summer months. In 1982, a localized drought was very severe for the months August and September and this resulted in relatively high mortality among the seedlings.

Table 1.--Survival, heights and growth of loblolly seedlings tested with superabsorbents and planted in January 1982 near Springhill Louisiana

Treatments	Survival	Heights
	--------percent--------	------feet------
	6 months	First year
Kaolin slurry	97	1.5
SGP502S	98	1.4
Terrasorb 200	96	1.4
Waterlok B100	98	1.3
	1 year	Second year
Kaolin slurry	76	3.5
SGP502S	76	3.3
Terrasorb 200	75	3.2
Waterlok B100	74	3.2
	2 years	Growth
Kaolin slurry	72	2.0
SGP502S	71	1.9
Terrasorb 200	68	1.8
Waterlok B100	69	1.9

The seedlings most affected were those that had grown the most before the onset of the drought. Samples of the dead seedlings were taken to a laboratory for pathological analysis, but no particular problems were noted.

After two growing seasons, seedling survival ranged from 68 percent for the Terrasorb to 72 percent for the clay slurry. Again, there were no significant differences in survival among any of the treatments. Thus, the superabsorbent treatments resulted in the same protection as the control treatment of kaolin clay slurry. It would appear that from these results superabsorbents can be safely used on an operational scale. Additional tests should be made to determine the optimum storage time for seedlings treated with superabsorbents.

No statistically significant differences in seedlings' heights were noted nor were there differences in percentage increase of height between years (table 1). Thus, this study shows that superabsorbents do not have any affect on seedling growth, at least when compared to the kaolin clay slurry.

It should be noted that other types of superabsorbents--in particular, those with higher water-absorbing capacities--remain to be evaluated in operational trials. However, at this time, it would seem that the use of a particular root dip should be determined by economics of both the raw product and the cost of its integration into the packing operations.

CONCLUSIONS

Results of this study indicate that seedlings packed with superabsorbent root dips survive and grow as well as those in kaolin clay slurry, the current packing media standard. Usage should be determined by economics and the relative ease of application.

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