Viability of seeds sown with an aerial multiple-row seeder

James P. Barnett and T. W. Chappell

Respectively principal silviculturist. Southern Forest Experimentation Station. USDA Forest Service. Pineville.La..: agricultural engineer. Southern Forest Experimentation Station, USDA Forest Service, Auburn, Ala.

An aerial multiple-row seeder can sow loblolly pine seeds without damaging viability. Only seeds that strike an unusually hard object are damaged. Excessive soil penetration does not occur, and stratified seed germinate better than unstratified.

Although aerial broadcast seeding has proven highly efficient and economical for reforesting large tracts in the South, dropping seeds in rows would make aerial seeding even more advantageous. An aerial multiple-row seeder is being developed at Auburn University for the Southern Forest Experiment Station,

The machine will operate from a helicopter and simultaneously sow three rows, approximately 12 feet center to center, when seeds are ejected at a 25-foot altitude. Seeds should be coated with clay to obtain a uniform shape and to improve aerodynamics. When ejected, they are given an initial downward velocity of 60 mph to achieve proper spacing and to reduce deviation within the rows. Speed at impact is 53 feet per second. Because the coating process might reduce viability, and ground impact might damage seeds or cause excessive soil penetration, tests were conducted to determine seed viability after coating and sowing. Aerial sowing was simulated by mounting the seeder on the rear of a pick-up truck and ejecting seeds so that velocity at impact was 53 feet per second.

Methods

Seeds were 1972 (fall) collections of Louisiana loblolly pine *(Pinus taeda* L.) that were kept in cold storage for 8 months and then shipped by air freight to Germain's, Inc., Los Angeles, where they were coated with bright red clay to obtain easily recoverable spherical pellets 1/4-inch in diameter. After coating, the seeds were dried at 90°F for 6 hours and shipped back to Louisiana. Since such exposures often reduce viability and re-induce dormancy in fully imbibed stratified seed, both stratified and unstratified were tested. Three replications of 28-day stratified and unstratified seed were coated, and the pellets were stored for 1 month before seeding.

To test viability and penetration under a variety of sowing conditions, seeds were ejected on five surfaces ranging from soft to hard: (1) a disked, light sandy soil; (2) a disked, heavy loam soil; (3) a sandy soil (light) with brush and grass cut by a rotary brush cutter; (4) a loam (heavy) with brush and grass cut; (5) a concrete slab. Seedbeds were prepared 2 months before sowing to allow for soil stabilization. Seeding was in late August 1973, after heavy rains had raised soil moisture content to winter levels. For each surface, the plot was a 40- to 50-foot segment of a row, long enough to allow recovery of about 200 seeds. After duplicate 100. seed samples were recovered from each treatment-replication, coatings were washed off and germination tests conducted.

As a control, three 100-seed replications each of stratified and unstratified seed, both pelleted and unpelleted. were given standard germination tests. Total germination was expressed as a percentage, and peak value (PV) and germination value (GV) were calculated as described by Czabator :

$$GV = (PV)(MDG)$$

where

PV = maximum value of cumulative germination percentage divided by days of test

MDG = mean daily germination

Results and Discussion

Pelleting re-induced dormancy in stratified seed, but did not damage viability. In both pelleted and unpelleted samples. stratified seed consistently germinated better and faster than unstratified (table 1).

'Czabator. F.J. 1962. Germination value: an index combining speed and completeness of pine seed germination. For. Sci. 8: 386-396.