PLASTIC STRIP MULCH ENHANCES RESPONSE OF SLASH PINE TO FERTILIZATION ON SANDHILLS SITE

GEORGE W. BENGTSON [1]

Pines are planted extensively on the droughty, infertile soils of the "Sandhills" provinces of the Southeastern Coastal Plain (3, 9), sometimes with disappointing results (8). Field fertilization experiments to increase the productivity of these plantings have commonly shown statistically significant but rather small growth responses to P or to NP fertilization (3, 7). Soil moisture deficits apparently limit response to fertilizers under field conditions on these sites since greenhouse trials, using the same soils and tree species but providing adequate moisture, have shown several-fold increases in dry matter production with appropriate fertilization (3). These greater responses to NP fertilization in the greenhouse are probably also influenced by more effective fertilizer placement (1, 4), the elimination of leaching of fertilizer constituents, especially N (2), and the absence of weed competition for nutrients, light, and moisture.

Since a waterproof, lightproof mulch might alleviate the problems of vegetative competition and nutrient leaching associated with fertilization of young pine plantations on these sites, Paul Peperzak installed an experiment at the TVA forest fertilization research area in Citrus County, Fla., in the winter of 1963-64 to study the effects of black polyethylene mulches used in combination with fertilizer. This paper reports the results of this experiment.

Methods

The experiment was installed on Sandhills land in Citrus County, Fla. The chemical and physical properties of the soil are typical for the Lakeland series,[2] except that its texture is perhaps somewhat finer than average and its P content-due to the proximity of phosphate rock outcrops and phosphatic soils in the vicinity-is much higher than usual for this series.

The area was cleared in 1963 by chaining the scrub oaks and rootraking the debris into windrows. The area was then double chopped. After site preparation, forty-eight 90-foot square plots were laid out in 8 blocks of 6 plots each. The plots in each block were assigned at random among the following treatments, which were applied in January 1964:

1. Control, no mulch, no fertilizer. Slash pine *(Pinus elliottii* Engelm. var. *elliottii)* seedlings (1-0) hand planted 6 by 10 feet using dibbles.
2. Plastic mulch, black polyethylene 1.5 mil thick, 4 feet wide in continuous 90-foot strips laid by machine (5). Seedlings hand planted through slits cut at 6-foot intervals in center of plastic strips laid 10 feet apart, center to center.
3. Plastic mulch, black polyethylene, 4.0 mil thick, 3 by 3 foot squares slit to the center, placed by hand after planting with tree at center, trees planted 6 by 10 feet.
4. No mulch, fertilized immediately prior to planting with diammonium phosphate (DAP, 21-53-0) at 300 pounds material per acre (63 lbs.' N, 69 lbs. P per acre). Fertilizer banded 4 inches deep and 12 inches from row where trees were to be planted.
5. Plastic mulch in 4-foot strips (as in 2), fertilized (as in 4).
6. Plastic mulch in 3 by 3 foot squares (as in 3), fertilized (as in 4) .

Some difficulties were experienced with the mulches in the period immediately after their application. The machine used to lay the strips did not effectively cover the edges of the plastic with soil, and considerable shovel work was required to

1 Research Forester, Soils and Fertilizer Research Branch, Division of Agricultural Development, TVA, Muscle Shoals, Ala. 35660.

2 Soil description: Lakeland fine sand, level to undulating phase; classification, Typic Quartzipsamment; drainage, well to excessive; slope, 0-5 percent; parent material, thick deposits of unconsolidated acid marine sands; physiography, Coastal Plain; erosion, slight sheet erosion; permeability, rapid. Soil analysis: (Ap horizon) pH 5.4, e.e.c. 2.7, organic matter 1.47 percent, total N (lbs. per acre 6") 680, extractable nutrients (extracted with NH_4OAc buffered at pH 4.8) P_2O_5 16, K_2O 24, CaO 126 and MgO 49 lbs. per acre.