RESULTS OF NURSERY MANAGEMENT ON A HEAVY-TEXTURED SOIL

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The Westvaco Nursery is located in the Coastal Plains near Summerville, South Carolina. Construction of the old nursery began in 1957 and was completed in early 1958. Seed were sown for the first crop in April, 1958.

The nursery originally covered 49 acres of seedbed area and was divided into four compartments of about 12 acres each. Annual

production was visualized at 20 million seedlings, with a 1:1 rotation.

The topography of the site was very irregular, making it almost impossible for controlled surface drainage. Some sections had slopes ranging from 3 to 6 percent, resulting in serious erosion problems; while some areas tended to puddle.

Soil series within the nursery are Tabor, Dunbar, Bladden, Coxville, and Caroline. Generally, the top soil was a heavy sandy loam averaging in depth from 8 to 12 inches, with a few out-croppings of clay loam. This *was* underlain with a tight sandy clay loam subsoil which becomes brick-like when dry and *gummy* when wet.

INITIAL MANAGEMENT PRACTICES

Initial management practices while working on a 1:1 rotation on alternate years were as follow:

1. Cut and fill low areas with land leveler. Apply sawdust from 1-inch to 2 inches thick. Subsoil to a depth of about 20 inches in a rectangular pattern on 2-foot centers.

2. Fertilize and lime as recommended by consultants.

3. Sow cover crop of peas or soybeans at rate of 1+ bushels per acre in June, and turn under during September or October.

4. Form beds by making paths with middle busters and shaping with rototiller.

PROBLEMS IN MANAGING HEAVY-TEXTURED SOILS

Major problems were encountered when trying to work heavy soils under adverse conditions. Some are as follow:

1. When the moisture content in the surface soil is ideal for tillage, the subsoil *is* often too wet, resulting in subsoil compaction.

2. The heavy soil tends to develop clods which need to be broken into smaller units by weather and machines. The weathering process is generally too slow in a nursery operation. Our planting season is often restricted because of heavy rainfall.

3. The continuous use of a rototiller to break up clods and shape beds tends to drastically change the structure of

the soil, creating unfavorable aeration conditions. The very tight structure of the subsoil results in slow subsurface drainage and waterlogging; thus removing air from the soil. Poor soil aeration results in plants suffering from lack of oxygen in their root zones, while restricting the availability of essential nutrients to the plant.

4. Tractor usage following heavy rainfall causes compaction and rutting paths, setting up impervious water basins. Subsequent tractor trips along these path areas cause heavy damage to the seedlings where splashing sand or mud hits them.

5. Root-pruning to control top growth of seedlings was unsuccessful because the soil was disturbed to the extent that irrigation and rainfall failed to settle the ground enough to avoid seedling mortality.

6. Shaking the plants to remove excess soil from the roots often resulted in destroying part of the fibrous root system.

7. Loss of sand by erosion and removal with seedlings resulted in a change of texture from a heavy sandy loam to a clay loam.

ATTEMPTS TO MODIFY MANAGEMENT PROBLEMS ON HEAVY SOILS

Some of the attempts made to try to improve the structure and drainage of the soil:

1. A feasibility study was made by the Soil Conservation Service to use draintile to remove excess moisture. The study concluded that the soil was too tight to obtain effective drainage.

2. High spots were cut and moved to low areas with a leveler in order to improve surface drainage.

3. Shallow V-ditches were constructed in low areas, giving some relief; but lateral movement of the water was very poor.

4. Subsoiling helped the compact subsoils but its benefit was only temporary.

5. Four inches of coarse sand was mixed deeply into the soil on a small area to evaluate its effect on loosening the soil and improving the drainage. The sand showed no evidence of improvement over the normal procedures.

6. Pine bark, at the rate of 2 inches, was thoroughly mixed into the soil on a small area in an effort to increase the organic content and improve the structure of the soil. No significant advantages were determined from this experiment, although it probably would have been an asset to us if we had continued the practice. The high cost of hauling and spreading the bark, coupled with a close supply of sawdust, caused us to abandon this source of organic matter.

7. Sawdust, at the rate of 1- to 2-inch thickness, every other year tended to keep the organic matter content within reasonable limits.

MODIFIED NURSERY USE

In 1962 our seedling requirements were dawn to 5 million annually; so the decision Was made to place one-half of our seedbed area into a seed orchard. During the period of low production, coupled with an emphasis on cost reduction, the only areas given intensive treatment were those selected to raise our 5 million seedlings.

Within a few years our seedling requirements increased to 12 million seedlings annually. About 17 acres of land were required to produce this number of seedlings. This meant that we had to utilize about 70 percent of the seedbed area annually, resulting in two (and sometimes three) crops being raised in succession on portions of the nursery. As a result, sections of our nursery went for 2 and 3 years without the benefit of a cover crop or of any other organic material. The organic matter content dropped to 1.5 - 2 percent and both the texture and structure of the soil deteriorated.

In summary, I would like to point out that you can raise good, healthy seedlings on heavy soils with proper rotations and soil rebuilding, although it is a very questionable undertaking. Fertility and organic levels can be maintained within acceptable working limits without too much difficulty with proper rotations. Soil texture will probably deteriorate over a period of time. Working these heavy-textured soils with equipment under conditions other than optimum creates problems that are "trying" to cope with. The use of a rototiller to smooth lumps from seedbeds adds to the complexity of maintaining reasonable soil structure.