

## SEEDBED MANAGEMENT

THOMAS S. PINNEY, JR.

Evergreen Nursery Co., Inc.  
Sturgeon Bay, Wisconsin 54235

Since the previous two speakers have discussed seed dormancy and stratification, this paper will assume that properly selected quality seed is on hand ready to plant. Furthermore, seed dormancy has either been overcome by stratification or will be in the field. This paper will deal with the system we use in seedbed management.

### PREPARATION OF LAND

We use corn as a green manure crop prior to planting. Soil fertility tests are used to determine the necessary fertilizer to insure a good crop. The corn is planted with a grain drill at the rate of 1-1/2 to 2 bu/A. Because of our short season at Sturgeon Bay, we are only able to plow down one crop during a summer. By mid- to late-August the corn is plowed under and 50 lbs of actual nitrogen per acre is applied to hasten breakdown.

In order to obtain maximum benefit from fumigation, it is necessary to keep good soil moisture for several weeks prior to fumigating. This allows weed seeds to germinate or at least soften up to the point where they are much more susceptible to the fumigant. When the corn is sufficiently decomposed in mid- to late-September, we prepare the beds for fumigation. Fumigation must be done when the soil temperature is above 50°F. We use a jelled fumigant consisting of 70% methyl bromide, 28.75% ethylene dibromide and 1.25% inert ingredients (Ferguson Fumigants, Inc., 93 Ford Lane, Hazelwood, Missouri 63042). This material is comparatively safe to handle. We also purchased canister openers and a metering device and then constructed our own three point hitch machine. The machine places the jelled gas approximately 6 inches in the ground, seals the surface with a roller, covers the bed with polyethylene and finally seals the edge of the polyethylene with dirt. We fumigate only the beds, leaving the aisles untreated. The polyethylene remains on for a minimum of 72 hours. Usually we remove it about a week prior to seeding in order to insure good aeration. Care must be taken in removing the polyethylene to insure that the unfumigated soil used to cover the edge of the polyethylene does not contaminate the bed area.

### SEEDING

Each seed lot we purchase or pick is assigned a lot number. This remains with it throughout its life in the seedbed and

transplant beds. As much detailed information as is available concerning each lot is recorded. Prior to seeding, germination tests are run on the evergreen seeds. Because it is difficult to run germination tests on deciduous seed in our system, we must rely upon the information furnished us from the collector. Many times this is not available because it is picked and sown almost immediately. We, therefore, must use past experience. A detailed schedule is developed which indicates what lot numbers are to be planted, the amount to be planted, the density at which it is to be sown, the total estimated bed footage required and seed coating to be used. As previously reported to this Society, we pellet almost all our evergreen seeds with methocel 4% sticker and thiram or captan fungicide. Recently we have begun to coat all of the smaller deciduous seeds with captan for visual ease in the seeding operation. We separate the seed into three groups; evergreens which are all held for 2 years, deciduous items held for 1 year and deciduous items held for 2 years. They are seeded according to these groups. This enables us to harvest blocks at a time.

We usually seed twice a year, planting our deciduous items in the fall and the evergreens in late spring or early summer. The seeding crew consists of two seeders, (one on each side of the bed) two counters, one recorder and one seed preparer and record keeper. The seed preparer and record keeper is the same person responsible for seed inventory, storage and the testing program. This person sees that the correct lots are fed to the seeders, the stakes identifying each lot are in place and draws a map showing the nursery, block, pipeline and bed footage of each lot. The recorder has a prepared schedule showing the lot numbers in sequence and the density at which they are to be sown. The recorder gives this information to the seeders for each new lot. They then proceed to seed by hand, one on each side of the bed. Immediately behind them, two to three people begin counting square foot sections of the seeded bed. The counting racks are divided into six sections for ease of counting. The counters sound off the density rate after each of their counts. This is heard by the seeders who adjust accordingly. The recorder writes down the amount of each count. This is totalled and averaged in the office after all of the seeding is done. This then becomes the actual seeded density count and is compared each year to our later field inventory density count.

Evergreen seeds are covered with beach sand and deciduous seeds with sawdust to a depth of 1/2 inch. We use a machine with a roller to apply the sand and a commercial flail type manure spreader to apply the sawdust. The sawdust is properly fortified according to fertility tests. This operation usually involves a crew of two people.

Shading racks 8 ft long are then laid directly on top of the sand or sawdust. In the case of deciduous items planted in the fall, these will remain on over-winter to prevent blowing of the sawdust and removed early in the spring as soon as our irrigation system is in operation. In the case of evergreen seedlings which are planted in late spring or early summer after the seeding is finished, we immediately begin to go through the area removing a row of shadings one at a time. Then a stake and wire system is installed and the shading replaced on the bed. The shadings are approximately 9 inches above the bed. We begin immediately to apply water and fertilizer through semi-permanent 2-inch aluminum laterals which are on 45-foot centers. Six beds are located between two laterals and the nozzles are 30 ft apart along the lateral, using Rainbird No. 20 heads with 1/8 inch orifices. Adjustable sprinklers are used on the ends to cut the coverage from 360° to 180°. As the seeds are germinating, water and fertilizer are applied two or three times a day depending on the environment. The object is to keep the sand or sawdust just moist with good water and fertility relations in the sandy soil below. One person is completely responsible for all of the watering and fertility practices for the seed beds from this point on. The shade racks remain on the evergreens for the first summer and are then removed to properly harden off the plants for winter.

### FERTILITY PROGRAM

As previously mentioned, the soil is brought up to a high fertility level prior to planting corn. We are especially concerned with phosphorus since it is expensive to add through our injection system. Once the seed is planted, all of our fertility program is done through our Milton Roy BIF Injector, designed by Soil & Plant Laboratory of Santa Clara, California. As the plants begin to germinate, we start out with a relatively low fertility program and gradually increase the levels of nitrogen and potassium during the summer. Since our soil is very sandy, we have little danger in developing too high a Solubridge reading for our conditions. Our normal schedule calls for two to three 1-1/4 hr injections per week. Built into our system are many fine safety features and we have as yet to have any burning in the field from malfunction. We use ammonium nitrate and ammonium sulfate as our nitrogen source and potassium chloride as our potassium source. We have just added a trace element injector to the system.

In our area the nitrifying bacteria seem to be very slow in returning to the fumigated soil. We, therefore, find it necessary to use ammonium nitrate early in the season and gradually shift to half ammonium nitrate and half ammonium sulfate. Under our conditions, we need the additional sulfur. The fertilization pro-

gram is stopped at the end of August. In late October or early November we will give a late fertilization to any seedlings which are going to remain in the field over winter.

### HERBICIDE CONTROL

We have been working with herbicides at our nursery since 1951 and still find we have a great deal to learn. The seed beds present a most difficult problem. The small, germinating, tender seedling is very much like the undesirable germinating weed. As has been reported many times, it is important to have the first set of true leaves on deciduous seedlings before using most herbicide materials.

We still find it the safest on evergreens to wait for the first herbicide application after the shadings are removed and they are hardened off for several days. We rely primarily on dacthal, propazine and diuron as our herbicides. We apply rates as low as 1/10 lb/A of active material of propazine and diuron. This has been highly effective in increasing the quality of control that dacthal will normally give. We use primarily paraquat to control weeds in the aisles and pipeline areas. The nozzles for spraying this material in the aisle are guarded so as to prevent drift into the beds.

### PESTICIDE

We use a preventative program on all seedbed areas. The only evergreen seedlings that require pesticide application are the pines. Two applications of 2 lbs/100 gal of water of Sevin 50% wettable powder plus spreader-sticker gives complete control of the pine shoot moth. The deciduous seedlings are sprayed every 10 days from mid-June through mid-August with Sevin, maneb, captan, Metasystox R and a spreader-sticker. A most important point is to use whatever combinations of insecticide and fungicide are needed to control the pests in the nursery.

### VISUAL AND ACTUAL FIELD INVENTORY

In late June a visual inventory is recorded to give the sales personnel a rough idea of what is available for sale that fall or the following spring. In August a detailed inventory is taken. At this time density counts are made with the same one square foot racks used at seeding time. The counts are again recorded for each lot number and average density for each lot is then established. The square footage is available from the maps, thus a total count is established. This total count is then discounted to allow for unsalable plants. The remaining salable plants are then divided into size categories and recorded in the permanent inventory. The office then records all incoming orders and keeps a running total of the availability of each variety and size.