TULIP POPLAR SEEDLING PRODUCTION

By

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When Bob Redett asked me to talk at this meeting I noted on his memorandum that he wanted me to talk between 20 or 30 minutes. After receiving the schedule for this meeting, I noted that I was the last speaker for the day. I immediately decided to make the talk 20 minutes long, and I'll try and keep to that.

Tulip Poplar, to me, ranks just behind the growing of Large Tooth Aspen in difficulty in receiving good stands. Some years good stands are received and other years very poor. In my mind, the quality of Tulip Poplar seed has depreciated in the last few years. Whether this is due to the large spread use of agricultural chemicals and sprays , I don't know . Perhaps it is effecting the insects that help pollinate the Tulip. Perhaps someone here shares a similar feeling on this subject.

Tulip Poplar (Liriodendron Tulipifera), the Procurement of Seed. The 2 out of 3 state nurseries, located in Ohio, growing Tulip Poplar,Marietta and Zanesville, are quite fortunate in being located in the southeastern part of the state which is a heavy industrial, logging area. A great deal of Tulip Poplar is cut in this region. Local sawmill operators are contacted usually within one hour's drive from the nursery. From these operators, the names of loggers and the areas they are cutting in are obtained. The sawmill operator knows which loggers are cutting Tulip Poplar and informs us. Personal contact is made with these loggers. We have had very, very good cooperation from these men. We usually supply them with nursery addressed postcards and they can inform us when they are starting to cut the Tulip. These contacts have been built up over the last 12 or 13 years and usually we can go back year after year to the same men and find out if they are cutting Tulip. Also we are well acquainted with previous areas that have been collected from and also from certain trees .

Another valuable source of information of potential seed areas are the industrial foresters such as those working for the power companies and reclamation as sociations . They are in the field almost daily and they know the areas being logged or where a good Tulip source is located. Many times the coal companies foresters contact us and tell us of areas of Tulip Poplar that are being cut down ahead of the stripping shovels.

The time of collection of Tulip Poplar seed is very, very important. As a rule, seed collection should not start until after the first week of September in order to allow seed ripening. There is considerable variation among seed trees as to the percent of good seed, dates of seed maturity, etc. The trees appear to hold this pattern from year to year in relation to each other, although, seed quality and dates of maturity may vary due to weather factors . Although seed can be collected too early before maturity, on the other hand it can be collected too late after maturity. In general the late collection of seed after the maturity date, will decrease the quality of the seed. This is because the seed that disperses first is the best quality seed from the tip of the cones. The seeds which are retained until the last are of inferior quality.

At this time, I would like to interject the results of an experiment conducted by Charles McKnight, one of the assistant superintendents of the Marietta State Nursery. In 1962, three Tulip Poplar trees were selected for seed collection. On two of these trees, the seed was collected as early as July 17th. The third tree collection started on October 24th. Of the original two trees that were mentioned, the collection date had to stop on one of them October 18th because the seed was depleted. On the other two trees the collection date extended until November 17th. Of all three trees, seed was collected from them each week. Each of these weekly seed lots were kept separate and sown separately in nursery beds . Cutting tests were made also on each seed lot. The seed was left in the seed beds for two years and counts were made in May, June and July on the number of seeds that had germinated. These same counts were made the next year also. It was interesting o note, of th- seed collected the first two weeks of July E.n d the first week of September that there were no germination at all in the seed beds. The maximum germination on the first tree was received from seed collected on October 12. As for the second tree, the peak was reached with the seed collected on November 17th. As for the third tree, the s eed collected on October 24th was the best.

This brings me to methods of collection. Both Marietta and Zanesville go in behind the loggers and collect the seed. Usually the loggers will make a special effort to cut the seed trees for you so that you may collect the s eed. Marietta also follows the practice of spreading tarps under certain seed trees and shaking the trees to collect the seed. Some years Tulip seed is very plentiful and some years the seed is practically non-existent. Many times in our areas, we will receive a late frost as late as May 9th where the temperature drops down to 22 degrees. This , of course, kills the Tulip flower for that year. However, in 1964, the Zanesville State Nursery collected 1,358 bushels of Tulip Poplar.

This brings me to the cone handling. As the Tulip Poplar arrives back at the nursery, it is either taken to the seed extractory and spread out in screens at the drying shed to air dry or it is placed in cold storage until it can be processed. Usually the cones tend to open quickly if the weather is warm and windy. I have also found that after placing the cones in cold storage and then bringing them out in the warm air that they will pop open very, very quickly. After the cones are thoroughly dry, they are run through the hammer mill and broken up into individual seed. There always has been a slight doubt in my mind on this practice. I sometimes wonder if we aren't harming the seed by running it through the hammer mill. After the cones have been broken up, the seed is spread out and thoroughly mixed with shovels, so that we may have a uniformity of seeds. Caution should be taken so that the seed is not piled too high or thick to cause heating and thus destroying the viability. After it is felt that the seed is thoroughly dried in late October or early November, it is placed in stratification pits. The size of the Marietta pits are 105 feet long by 5 feet wide by 3 feet deep. The Zanesville pits are 6 feet deep, 6 feet long and 6 feet wide. Six to 8 inches of seed are placed on the bottom of the pit, thoroughly tramped, and then enough sand placed on top just to cover the seed. This process continues until the pit is full and then 12 inches of sand is placed on top. The top layer of the sand usually exceeds the top edge of the pit. However, as the rains come down on the top of the pits and the seed wings rot, the sand slowly sinks into the pit. After a few years, the original level of sand will be approximately 2 feet below the top of the pit.

Before stratification, cutting tests are made and they will average between 8 and 10 percent good seed. Why is the viability so low on Tulip Poplar seed? Research at the Central States Forest Experiment Station showed that yellow poplar trees yield seed of low viability because of insufficient pollination. Most pollen is incompatible with styles of the same trees. Some cross-pollination is no more effective than self-pollination while for others cross-pollination may result in most of the seed being viable. Chances for good seed are better if they have been cross-pollinated. Little, if any, wind pollination takes place. Most pollination is done by insects. The stigmas are receptive for only 12 to 24 daylight hours. Rain and other weather conditions unfavorable to insect flight cause a reduction of the percentage of viable seed due to insufficient pollination.

This brings us to the sowing of Tulip Poplar seed. I believe it is the general consensus of most nurserymen that the desirable density for Tulip Poplar is 20 per square foot or thereabouts. That brings us to the question of how much seed to sow to get this density. Marietta sows between 2 and 3 pounds of stratified seed for 48 square feet of bed area. Zanesville sows between 18 to 25 pounds for 400 square feet of bed area. On the other hand, Greave and Barton state in their TVA Nursery Operations Guide, that they sowed 32 bushels of stratified seed, mixed with sand, to 400 feet of seed bed area. The Department of Agriculture's Woody Plant Seed Manual states that it should be sown at a rate of 50 to 75 seeds per lineal foot. Whatever the rate that is sown, I am convinced that a lot of my failures are due to not enough seed being sown. After sowing, it is much easier to thin out your seed beds, but you cannot put the seed in. The time of sowing at Zanesville is usually the last week in October or early November, although Greave and Barton state that they sow Tulip Poplar in January, February or as late as April in Tennessee.

I myself, favor a slightly heavier soil for Tulip Poplar than for other species. It helps retain the moisture which is so vitally needed in the germination of Tulip. The pH should be approximately 6. The ground is treated with 250 pounds of 33-1/3% ammonium nitrate and 300 pounds of 12-12-12 and then shot with Methyl Bromide gas for weed control. A few years ago someone put forth the theory that the reason the Tulip Poplar stands were not as good as they used to be was because of the use of the Methyl Bromide gas. We ran an experiment where we shot one area with Methyl Bromide gas and the other area was not treated with any weed control. Both areas were seeded with the same Tulip seed and at the same rate. In the spring of the next year when the seed germinated, the treated area had over twice as many trees in it as the untreated area.

I am thoroughly convinced that stratified seed should be sown rather than fresh seed. Germination is quicker and more even than with fresh seed. Gus Lindstrom, former research forester with the old Central States Experiment Station made a thorough study of fresh versus stratified seed and came to the same conclusion as I did. There are exceptions to this but they are rather rare. I planted a Tulip seeding in 1954 with fresh seed since we were out of stratified seed. The seed germinated so thickly that I was forced to thin the beds.

Marietta weighs their seed out and broadcasts it by hand, rakes it in, rolls it and then covers it with one inch of sawdust, mulches it down and then covers the mulch with shades to hold it for the winter. Zanesville basically follows the same pattern only instead of sowing by hand they use the sawdust spreader originally designed by Michigan State University to sow the seed. The only alteration we made on the sawdust spreader was changing the shaker screen from 3/8 inch to 1/2 inch. By experimenting, we found the correct sowing rate for three year old stratified seed was obtained by using third gear, 700 RPM, on a Ford 3000 tractor. The main objective I was after by using this sawdust spreader was the uniformity of sowing. Some nurseries use a modified manure spreader to sow this Tulip Poplar seed. One other procedure that I use is that after the beds have been made cultapacker is rolled over them lengthwise to produce a corrugated surface. This helps keep the surface sown seed from being blown away. It also gives a row effect to the beds since the seed will fall into the cullapacker depressions. The beds are rolled to press the seed into the ground, mulched with 3/4 inch of sawdust, and then rolled again. They are covered with straw and shades for the winter. This species is the last one to germinate in the spring. When germination is observed, the shades are removed and the straw is left on for the seed to germinate up through, and help retain moisture. Irrigation is started immediately and the beds are kept moist. To me, this is one of the most important procedures, that the beds are kept moist at all times until the seed is fully germinated. Too much Tulip Poplar seed dries out and is lost. While I was looking through the Woody Plant Manual on this species, I noted with some surprise that it states that Tulip should be shaded. This, of course, would help retain moisture in the beds. I have never tried this but I plan to in the future.

The annual weeding is done throughout the summer and usually after the trees have grown to some size , when the leaves are spread out there are few weeds in them. We have few problems with insects or disease in Tulip Poplar. Usually it is given a weekly general spray of malathion and captan. Most of my losses in the seed bed come from rabbits eating the young seedling after they germinate. This , however, is a rather minor loss.

Lifting the Tulip Poplar crop is done in the fall because it is in heavy ground and if we waited until springtime we might not be able to get into the ground due to frost or moisture conditions. Lifting of stock is not done until we have had one or two heavy frosts and the leaves are

off the Tulip and the trees are fully hardened off. If this procedure is not followed, they may be damaged in the heel-in yard. The trees are brought in after lifting, graded, tied in bundles of 25 and then heeled-in in a sandy area for the winter. In the spring when the ground thaws out, we can pull the trees out, roll them up and ship them immediately.