

year failed before March 15th. This is a serious problem and forced us to abandon the use of the white plastic. However, it is possible we used an inferior grade of plastic in our tests.

I think that the advantages of the white plastic are too many to ignore, especially in the cold climates where it would be impossible to prevent the soil ball of container grown ornamentals from freezing solid without artificial heat. The white plastic would allow a slow thawing process that would probably be more beneficial than quick temperature changes. However, the same result could be obtained by heavily shading clear plastic.

CORLISS INGELS: What thickness of plastic do you use?

GIL NICKEL: Four mil. We start covering October 15th.

MODERATOR TINGA: Our next paper is on the storage of budwood, scions, and rooted and unrooted cuttings. I will ask Hugh Steavenson to start.

HUGH STEAVENSON: Regrettably our good friend Darrell Holmes could not be with us today. Fortunately we have Jim Law who is the production manager of Stark Brothers who grew up in the nursery business and is working right in this very subject. So I think it is very fortunate that Jim could be here to read Darrell's paper and handle any comments.

STORAGE OF ROOTED CUTTINGS, UNROOTED CUTTINGS, SCIONS AND BUDWOOD

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I am sure that many of you, perhaps all of you, have had much experience in storing ROOTED CUTTINGS, UNROOTED CUTTINGS, SCIONS AND BUDWOOD and probably have just as good a method as we, but I will try to give you complete information on our methods.

First — ROOTED CUTTINGS:

We do not have occasion to store great quantities of rooted cuttings for any period of time, but we do store rooted cuttings of Crimson Pygmy Barberry and several varieties of Taxus. These are stuck as semi-hardwood cuttings in greenhouse propagation benches during September. We carry them in the benches until about the first of February, then dig and wrap 100 per bundle in moist sphagnum moss and two millimeter polyethylene. We tie the wrap with a rubber band. We do not put the polyethylene over the tops. In fact, the tops of the Barberry cuttings are above the polyethylene about one-half inch, and the Taxus cuttings may be from one-half inch to three inches above the poly., depending on the length of the cutting that was rooted.

We then pack these bundles of wrapped cuttings in standard greenhouse flats, store them in refrigerated storage on shelves, and carry the temperature at about thirty-six degrees.

I might add that in addition to the above we carry several thousand rooted cuttings in outside propagation beds in two to three inches of sand where they were rooted during the summer. These cuttings root on down into the soil. We put lath shades on the beds and cover the beds with wheat straw about the middle of November. The cuttings are carried over winter in this manner, and as they begin to take on new growth in the spring they are either planted direct to the field or potted and set in coldframes and carried over until the following spring.

UNROOTED CUTTINGS:

GREEN WOOD CUTTINGS —

I might comment briefly on green wood cuttings to say that we do not attempt to store them. There are occasions when we do *carry* them up to several days as we take cuttings at times from our stock blocks faster than they can be worked up and stuck in the propagation beds.

We have tables in the basement of our Propagation House work room. The tops of these tables are of $\frac{1}{2}$ inch hardware cloth, and we run a mist line about eighteen inches above the table tops. We spread the cuttings out on these tables and place an electronic leaf just above them. With this method we can carry the cuttings over a weekend, or for several days, and have found that they will remain in excellent condition until we can get them worked and stuck.

We use this same method to carry Juniper cuttings for grafting. It is necessary to cut Juniper cuttings when the temperature is above freezing, and we like to cut enough to run our grafters for several days since we sometimes have several days when the temperature does not get above freezing.

DORMANT CUTTINGS —

I do not suppose that anyone has any trouble storing dormant cuttings, but to comment upon our methods I would advise that we handle dormant cuttings of only Honeysuckle, Poplar and Willow. We make cuttings seven inches in length, tie them about 100 per bundle, and pack in graft boxes (these are wooden boxes 19 x 19 x 35 inches). We pack the cuttings in good moist shingletow. These boxes of cuttings are then stored in refrigerated storage in thirty-six degree temperature.

The cuttings are usually made in early October, and we usually plant them three to four weeks later. However, if weather does not permit us to plant them all we carry them as mentioned above until we can plant them during the early spring.

SCIONS:

Scions referred to at this time consist of Apple, Flowering Crab, and possibly Pear, French Lilac, etc.

We try to take our scions from our stock blocks during December and January when temperatures are above thirty-two degrees. We tie the scions 250 per bundle as they are cut in the field, then take them to the seedling storage, which is a basement room that is frost proof but not refrigerated.

We place a thin layer of wet sphagnum moss on the floor and then pound the moss into the butt ends of the bundles of scions. These scions are then stored on shelves in this basement room until we finish grafting about March 10th.

BUDWOOD:

The storage of budwood will undoubtedly be much more interesting to many of you than the rest of this paper, so I will attempt to go into some detail regarding same.

The past several years we have stored and used *dormant budwood* on Plum, Prunus, Pear, Apple and Flowering Crab in the fruit tree group; *Prunus glandulosa alba* and *rosea*, also *Cornus elegantissima*, in the ornamental shrub group; Ash, Catalpa, Elm, Honeylocust and Linden in the ornamental tree group.

The budsticks are cut from stock block trees during late December and early January, at which time the trees are completely dormant. The budsticks are taken to a workroom where they are sorted, washed and tied fifty sticks per bundle.

The budsticks of the fruit tree and ornamental shrub group are then wrapped in wet newspaper and placed in a polyethylene bag. We use special poly. bags of .002 millimeter material that are ten inches wide and forty inches long.

We use poly. bags without air holes for the storage of budwood. The bag is tied securely at the top to make it airtight. The poly. bagged budsticks are then stored in cold storage at 28 degrees from January until about June 15th., at which time we start to bud the Plum and Prunus.

The ornamental tree budsticks are handled differently in that we place a small amount of slightly damp sphagnum moss at the butt end of the bundle of scions and then place them in the polyethylene bags. These poly. bagged budsticks are then placed in cold storage at "above freezing" temperatures of about 34 to 36 degrees.

We do not put moist newspaper around these ornamental tree budsticks as we do not freeze these.

Going back to the fruit tree and ornamental shrub budwood that we freeze, or rather carry at a 28 degree temperature, I should mention that as we get ready to use this budwood we select the budwood that we expect to use the following day and remove it from the 28 degree storage to the 34 to 36 degree storage so that it will thaw out gradually for about 12 to 18 hours before being taken to the budding field where

temperatures are at times as high as 90 degrees.

In general we get a much better bud stand with the dormant buds than with green buds, particularly on the Thornless Honeylocusts and the Plum and Prunus. We can also bud earlier in the season and get this budding out of the way before green buds are ready to use on other budding.

I am sorry it is not possible for me to attend this meeting this year, but if anyone has any questions and would care to write to me in care of Mount Arbor Nurseries, Shenandoah, Iowa, I will be happy to answer to the best of my ability.

MODERATOR TINGA: I am always surprised at the amount of hand labor required in these operations. My objective is to eliminate just as much hand labor as we can. Very often this means changing species and systems. But, if hand labor is the problem I think it is and is going to be, I think everyone has to think in terms of eliminating whole steps in production if that's necessary in order to come out on the net profit side. The next talk that we have will be seed bed treatments prior to seeding by Mr. Ralph Shugert.

SEEDBED TREATMENT PRIOR TO SEEDING

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Dr. Tinga, President Vermeulen, Society members and honored guests:

It is a real pleasure to discuss with you this morning the most fascinating, perplexing, and at times incomprehensible, phase of plant reproduction . . . seedling propagation. Over the years we have heard excellent papers presented covering many aspects of seedling production, and it is my intent today to discuss a few techniques we use at Plumfield Nurseries in Fremont, Nebraska.

Our seedling operation is divided between seed beds and seed rows, and most of the remarks and slides will concern the former. The field which encompasses our seed beds is very level, and the soil texture is quite sandy. There are approximately thirty acres of seed beds in this field. Perhaps I should pay more attention to the soil pH, and to N., P., K., but I don't — except that based on previous soil tests, we are quite high in both Potash and Potassium. These results are compiled on a response based on field crops. Soil pH is rather confusing due to the fact that one section of our field of seed beds, a strip seven hundred feet long, will show a pH variation from 7.1 to 8.0. The same species are seeded in this area, and little if any difference can be noticed in the growth of 1-0 and 2-0 seedlings. Perhaps a comment on weed control, that shall follow might provide an answer to this pH variation.