of every horticultural enterprise that wishes to survive and succeed in the future.

LITERATURE CITED

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STICKING *TAXUS* AS UNSTRIPPED CUTTINGS, AN UPDATE

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The following is an update on how we are processing and handling *Taxus* cuttings at Zelenka Nursery.

At the Grand Rapids IPPS meeting in 1982, you saw approximately ½ of our *Taxus* crop stuck as unstripped cuttings and the balance stuck traditionally as stripped cuttings. We talked about the reasons and what we had found out to that point on the tour. We have refined our process to balance labor efficiency with rooting efficiency.

The early 1980's saw an imbalance in growth. Production was increasing faster than sales, so we were looking at ways to reduce labor while keeping our quality up. In November 1980, an R&D project was initiated to stick 5,000 cuttings of two Taxus cultivars as unstripped cuttings. The goal was to decrease the cost per cutting by $0.001 cents, while not reducing quality. That first year's experiment was successful, so we increased it in 1981 to 5,000 cuttings of 4 Taxus cultivars. This showed even more favorable results. We not only received a labor savings, but we saw a better rooting percentage on the unstripped than on the stripped cuttings. This prompted us to stick ½ of the crop in 1982 as unstripped. After evaluating that crop, we decided that all cultivars, except *T. cuspidata* 'Densiformis', would be stuck unstripped.

Let me regress a moment, to explain how we were processing the cuttings. They were taken by hand off 5-year liners in the fields. Terminal and basal ends were cut (leaving the cutting 6 in. long), hormone-treated, and stuck in the benches with bottom heat. The only difference was that the stripping action was eliminated. This was a significant decision, not only because of labor savings, but from an insurance point of view. We had several medical cases of "Carpal Tunnel Syndrome" that had been associated with clipper usage and the stripping action.

Enthusiasm over the successes of this project prompted us to carry it further. In 1982, we tried harvesting cuttings with a modified combine. That proved successful in labor savings. So in 1983, we increased the magnitude of our test. By 1984 we were taking as many cuttings by machine as possible. Limiting factors were shortages of stock plants and some cultivars that were not compatible with combine harvesting.

We were still making changes in the preparation room. Since we were still having too many "Carpal Tunnel" cases, we were advised to look at alternative methods of making cuttings without clippers. We ended up putting the cuttings into bundles as they came out of the crate, cutting the basal ends of the bundles with a band saw, standing the bundles upright in blueberry lugs, and cutting the tops even with an electric hedge trimmer. The lugs were dipped into sinks of hormone and then stuck in the propagation bench. Our increased labor efficiency culminated with last year's crop of 2.1 million cuttings processed and stuck in 10 days. However, speed is not everything and refinements have to be made. Some problems have to be worked out to increase quality and minimize risk.

Obviously, the faster an operation is, a greater chance of carelessness exists. Two things we had to watch were the cuttings drying out and/or heating up. Because the combines were harvesting the cuttings faster than we could haul them to the cooler, the tendency was to stack too many bags on a pickup. Then to make room in the cooler the bags were stacked as high as possible. The pressure on the bottom bags caused the cuttings to heat up and start molding. The bags required an extra handling step, so we started putting cuttings directly in bulk crates. This made unloading the cuttings into the cooler and bringing them out again much easier with a forklift. It was also a means of stacking the cuttings to the ceiling without putting pressure on the bottom of the stack. The cuttings we hand cut were also dumped into bulk crates in the field and handled the same way. The biggest drawback to this was desiccation. Each truck had two bulk crates on it which took the cutting crew 2 hours to fill. The crates were covered with white poly for transport. The cooler was kept at 85 to 90% humidity with a Baanson humidifier and the temperature was set at 35°F. After all the cuttings were taken from the field, the preparation and sticking began.

Our standard cutting length was 6 in. By making the cuttings in mass, uniformity of cutting length suffered. Branched cuttings were going through the process without getting trimmed as well, and that caused nonuniform sticking density in the benches. At times, if the person operating the hedge trimmer tried to speed up, the bundles would pull out of the lug and be cut shorter than the desired 6 in. Quite by accident we found out that 4-in. cuttings rooted as well as the standard 6-in. cuttings. This gave us second cuttings out of leads that would have yielded only one and it increased air flow around the cutting at bench level as if the density had been decreased.

Most of the cultivars rooted better as unstripped cuttings, when all the conditions were the same. I mentioned earlier that all cultivars except *T.* 'Densiformis' were stuck unstripped. We kept trying different variables and finally found that decreasing the hormone level from that of our normal program for *T.* 'Densiformis' brought the rooting percentage back up to our previous level.

Sticking the cuttings has been a little slower but not enough to change our rates. It has been trickier to space the cuttings more evenly and it takes a lot more supervision to be sure the depth of sticking is consistent.

In summary, about 10% of this year's crop was harvested with a machine, due primarily to a shortage of cutting wood. We are sticking all cultivars as unstripped 4-in. cuttings. We are still working on perfecting the band saw and hedge trimmer method but this year it will remain R&D. The cuttings will be made individually, screening out the branched cuttings that will require stripping. Hormone treatment will be done by bundle instead of lug and the sticking will be paced to finish in 15 days.

STOCKPLANT ETIOLATION AND BANDING FOR SOFTWOOD CUTTING PROPAGATION: WORKING TOWARDS COMMERCIAL APPLICATION

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Abstract. The technique of stockplant etiolation has made it possible to root cuttings of plants which previously could only be propagated by budding or grown from seed. The cost of producing rooted cuttings from etiolated stockplants is approximately $0.05 to 0.10 more per cutting than traditional cutting procedures. The practice of field etiolation can produce a finished plant in the same time as field budding. Greenhouse etiolation substantially decreases the time required to produce a finished plant.

REVIEW OF BASIC TECHNIQUE

The technique of etiolating stockplants prior to cutting propagation has been shown to yield markedly improved rooting percentages for plants previously considered difficult-to-root (1). Etiolation means growing plants in the absence of light or in very heavy shade as the term is commonly used in cutting propagation. The basic method involves covering dormant stockplants with black shade cloth when the buds are beginning to swell. Typically, greater than 90% shade is used because it is not necessary to achieve