Taxus Propagation at Meadow Lake Nursery for Taxol Production©

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It is an honor to present this paper to IPPS Western Region. Although last year I presented a workshop in Wilsonville, Oregon, on computer tracking of pesticides, and I have presented several papers and posters to the Eastern Region, this is the first paper I will present for the Proceedings as a member of the Western Region.

Meadow Lake Nursery is this year celebrating its 15th year as a family business. Todd and Cheroyl Erickson left Bailey's, Oregon, to try their luck in the liner business. Today they have put together a formidable team. One of the exciting things about Meadow Lake is the international feel. We have staff from eight diverse countries, super plants that originated in every corner of the world, and the technologies to grow them that are gleaned from ideas often far from home! Using a range of techniques, Meadow Lake propagates over 150 tree and shrub species from seed and many hundreds more cultivars by cuttings and tissue culture. About 50% of the liner production goes to the wholesale ornamental nurseries across the U.S.A. and Canada. The other half of the business is a leading producer of rootstocks for the fruit tree industry. This year we need almost 600 acres of Oregon farmland and 2 acres of greenhouse to supply markets.

Our involvement with medicinal plants was, until last year, limited to some of our *Ginkgo biloba* production. We were then approached by some neighbors about propagating their yews. The story of Taxol has been well documented in the Proceedings of the I.P.P.S. by the late Ralph Shugert. Ralph presented several papers on the subject to the Society and anyone contemplating growing pharmaceuticals would be well advised to read them all.

Meadow Lake Nursery's entrance into the *Taxus* biomass business commenced with a 4-month contract writing and signing phase. The propagation phase was, consequently, intensified as the optimum time to root the Japanese yew coincided with the contract negotiations. Prior to this we had been propagating yews and other evergreen cuttings at about 5 to 10 thousand per cultivar. Thus, we found ourselves bumping production of Hicks yew from 10,000 to 490,000. *Taxus* ×*media* 'Hicksii' propagation is well documented in the Proceedings. It is usually considered one of the easiest *Taxus* to propagate, however, to do a good job on almost half a million plants starting in March is somewhat daunting. Previous to this, our conifer medium had been 60% sand with peat and perlite. This was adequate but heavy and tended to be really hard on our rolling benches and the people trying to roll them. We decided to cut the sand to 15%. ProGrow (Tualatin, OR) mixes [sand, perlite, and grower's grade peat moss (15 : 80 : 5, by volume)] provide us with consistent blends.

The source of propagules for this magnitude of an order would, in any circumstances, give pause for thought, however, as it turns out our clients own a field with 230 thousand Hicks transplants planted over the previous few years. We used mostly clippers, but also hedge trimmers to stockpile enough cuttings for propagation and proceeded to harvest and refrigerate the rest of the field to encourage more new shoots for the upcoming growing season. This excess material was held in cold

Figure 1. Tractor-mounted device including a conveyor for harvesting biomass.

storage and eventually processed for a trial biomass shipment to the client (pharmaceutical plant).

For 2 years now we have dipped all of our softwood cuttings in a 2% solution of ZeroTol™ and we decided to dip all of our evergreen cuttings in production. The basal ends were dipped in Woods solution at approximately 2500 ppm and stuck into medium-filled Anderson trays that had vertical slits knifed into a spacing of 120 cuttings per tray. It is important that the knife marks are vertical – a stiff, heavy blade is preferable. It is also important that the medium be slightly premoistened and then watered in following sticking to completely fill any air pockets. Cuttings were not stripped of their lower needles, or wounded in any way.

The majority of the trays were placed on Conley rolling benches equipped with Delta-T hot-water heating. Shaded hoops facilitate temperature reduction of the tops on sunny days along with a light misting. Bottom heat should be set at 65°F and the tops should remain cooler than this until rooted.

It became apparent that we were going to need enough bottom-heated benching for approximately 120,000 cuttings more than we could fit on the heated benches available. This precipitated an exercise in lateral thinking that resulted in two innovations. Radiant heat under-the-bench heating for acclimation of tissue culture plantlets off season was featured this year as an ANLA new idea (Vancouver, B.C.). The spin off of radiant heat was created in less than a week and allowed us to put bottom heat under 60,000 Hicks yew cuttings in each of two Quonset-styled greenhouses with 50% shade. Mist was supplied by hanging Netafilm “Kiwis” orange nozzle/green spinner every 8 ft from black poly tube.

All *Taxus* plants were drenched with Chipco 26019 followed by Clearies 3336 a couple of weeks later. That was it, water as needed once rooting commenced and Peters' water-soluble fertilizer was injected at 100 ppm during the summer. Weaned into full sun at 80 to 90°F in July/August, we achieved over 90% rooting. The cuttings were then potted into 32-count trays and overwintered before growing on for outplanting in the Fall 2001.

In addition to propagating our client's plants for immediate expansion of a harvestable acreage, we agreed to maintain the plants in a healthy condition and subsequently to attempt mechanical processing of the biomass. We tried a few devices for this trial and were pleasantly surprised with a tractor-mounted machine customized by RES Equipment of Scotts Mills, Oregon (Fig. 1). Clippings were transferred by conveyor to 20-gal pots, hauled to field bins in the aisles, and immediately stacked in a refrigerated trailer for transport to the dryer.

Once dried, the biomass was chopped and packaged for shipment to the pharmaceutical plant for eventual use in the cure of ovarian and other cancers.

LITERATURE CITED

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