DISCUSSION

There is much remaining to be learned about goldenseal. However, the amount of scientific information that has been gained in the past few years demonstrates that commercial propagation and production of many medicinal herbs provides an opportunity for enterprising nurserymen. As selection is made for plants with higher concentrations of essential ingredients, clones will develop. Asexual propagation techniques have the potential to rapidly increase the production efficiency of the medicinal herb industry.

Medicinal Plants with a Potential Niche Market for Propagators

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We shall be discussing the genus *Taxus* as one of many plant genera that produce anticancer compounds. Literature tells us that *T. baccata* produces a medicinal compound Docetaxel trademarked as Taxotere® by Rhone-Poulenc Rorer as an investigational drug. This evening our discussion will be relevant to Paclitaxel, which is sold as Taxol® by Bristol-Myers Squibb. Early on, in the mid 1980s, sadly the FDA only designated *T. brevifolia* our Pacific yew, as the only approved source of Taxol®. This dastardly act meant ripping the bark from 100-year plus trees thus killing the trees. Thankfully, this no longer is the case, since *T. brevifolia* is currently a threatened species. Today the only *Taxus* biomass source is from the nursery community. This biomass, which must be extracted and purified to obtain medical compounds, could be whole plants, roots (only), branches (only), or needles from current year's growth. We will briefly discuss the nursery role in each of the above and offer some suggestions to avoid pitfalls should you sign a contract with a pharmaceutical company.

I wish to caution all my nursery community friends that transactions with biotechnology companies are far different than dealing "with our own". Over the years, I have learned first hand that most of these people have never seen a nursery, never seen a taxus plant, generally have no agricultural knowledge, no knowledge of plant propagation, and the list goes on! If you are approached, ask many questions as to what type of biomass they are requiring, including cultivar (which is very, very important) as well as biomass condition (green or dry), and then have them submit a contract as to conditions. After you review the contract, have your attorney review same prior to signing. Sadly, a simple purchase order, which we deal with daily, will not suffice. My friends, I can't stress that point enough, it is extremely important! Do not sign a contract which only pays you on Taxol® percent of concentration, since this varies dependent upon time of year, nitrogen uptake levels, and cultivar, etc. Today, the cultivar of choice for Taxol® is *T.* ×*media* 'Hicksii', however, I am sure that not all *T.* ×*media* cultivars have been studied.

The various options we have as growers include the following:

- Entire plant (roots/tops) — contract, prior to planting, to grow close-spaced for 3 to 5 years, clean harvest, generally not dried but shipped as green biomass.

- Roots only — from cull plants, fields ready to fallow. In our experience, this biomass must be dried (we use corn driers) and chipped prior to shipment. Certainly not a sustainable source of supply, but a viable means of cleaning a farm to fallow.
- "Tops" only — again from cull plants. Contract may stipulate branch caliper (no larger than 11/16 inches, etc). Contract may allow green biomass if stored in refrigerated storage with minimum/maximum temperature and humidity regimes. Contract may call for dried tops at precise drying temperatures and durations.
- Needles — obviously a sustainable supply source. Contract may call for only current season's growth. We harvest with a combine built by the OARDC engineering department at Wooster, Ohio. If you are harvesting from salable or future salable plants, you should dictate time of harvest. In our nursery's program the only time frame we accept is 15 May to 15 June.
- Lease/Contract — This is simply leasing acres to the drug company, and you plant and maintain the crop for them. You must be careful on language to cover plant death, etc. Also all cultural activities must be detailed. You will definitely need an attorney to help you draw up this contract.

In all of the above, you set the price, not the drug company. Any of the above are very labor-intensive so it is mandated that you use a loaded labor rate. This figure will cover fringe benefits, depreciation, etc. Next step is to determine your gross margin. An example could be: calculating a 40% gross margin might mean marking up your loaded labor rate by 60% to 70%. We most certainly have a potential niche market with taxus. Once again, I do caution you to be very careful entering into an agreement with these drug companies. This is a new venture for the nursery community and no one should experience a not-for-profit venture.

In keeping with our society motto, if I personally can assist you, please ask!