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Forest shrub fights cancer - and may help Northern Ontario farmers

Researchers with MNR and several other organizations are hopeful that ongoing studies on Canada yew, a common Northern Ontario forest shrub, will help provide a sustainable supply of *paclitaxel*, a chemical used to make one of the most valuable cancer drugs in the world.

These researchers include Tom Noland, a tree biochemistry scientist with OFRI. He says, "We also hope that Canada yew will become a commercial crop for some farmers in northern Ontario, an area that desperately needs new economic opportunities. It's actually better ecologically to harvest *paclitaxel* from farm-grown yew than from the forest, as many wildlife species use this shrub for food and cover."

He explains that *paclitaxel* is used to make Taxol®, one of the best-selling chemotherapy drugs in the world, with almost US \$1 billion in annual sales. Taxol® is used to fight breast and ovarian cancer and certain types of lung cancer.

"However, it takes several tonnes of yew foliage to produce a small amount of *paclitaxel*," Noland says. "Due to its complex chemical structure, *paclitaxel* is difficult and expensive to synthesize, so it is more economical to extract it from natural sources."

Why Canada yew?

Paclitaxel was first discovered out west in Pacific yew, but to extract the chemical you had to destroy the tree. With Canada yew, you can extract the *paclitaxel* from the foliage through a light shearing every few years, which causes little harm to the plant.

Another advantage of Canada yew over its cousins is it produces relatively large amounts of *paclitaxel* and similar chemicals, known as taxanes, which could have other medicinal uses.

As part of the Canada yew research, Noland and his research team have been collecting Canada yew plants from around Ontario to find the genetic families with the highest amounts of *paclitaxel*, so they can produce many new *paclitaxel*-rich seedlings.

How is the Canada yew research going?

"This research is pretty much on track," Noland says. "Most of the work will be finished within a year. It's a slow process, though. It takes a year to propagate yew and two to four years to get enough stock to start plantations. Elite material, which is yew that grows quickly and has the highest *paclitaxel* concentrations, can take even longer to produce."

“In addition to seeking out and producing trees that produce high amounts of paclitaxel, we are investigating how best to harvest Canada yew foliage and what growing conditions are best, for example, what soil type do these shrubs prefer, and how close together should we plant them?”

To date, Noland has learned that yew plants that received compost, fertilizer, and compost plus mulch treatments grew significantly better than those in the unfertilized, unmulched control plot. Once he and his collaborators are done collecting and analyzing their data, Noland will be able to recommend which growing conditions result in the highest amounts of paclitaxel.

The project has been drawing much attention from pharmaceutical companies, particularly since worldwide demand for paclitaxel is expected to increase. Bioxel Pharma is a partner in the project, as are the Canadian Forest Service, Thessalon First Nation BioCentre, Whelan Resources, Forest and Land Control, and the Upper Lakes Environmental Research Network (ULERN). Bioxel retains rights to further develop the most promising yew families.

Some unexpected obstacles ... with antlers and hooves!

Although the research is going well, Noland and his research team have had to overcome some obstacles. For example, deer browsing became a problem. “Our first area was planted by June 2004, and in spring 2005, deer had browsed just about every yew plant at the OFRI arboretum,” he says. “Both moose and deer seem to rely on yew in late fall and late winter.”

However, Noland and his collaborators came up with resourceful ways to deal with the problem. Using an electric fence, a lathe shade screen, and a dog, they were able to control the browsing at the OFRI arboretum, the Thessalon First Nation bio-centre, and the farm plantation, respectively.

“One thing we learned is that yew plants are resilient,” he says. “They bounced back well from the deer browsing, which is a valuable characteristic.”

What's next?

This year's work plan includes assessing individual yew plants in August, harvesting in September, and measuring the harvested plants in October and November. Look for Noland's published results in early 2009.

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