'HICKSII' YEWS AS A SUSTAINABLE SOURCE OF ANTICANCER COMPOUNDS

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Introduction

Taxol[1] is an effective anticancer drug identified in the 1960s from the bark of the Pacific yew tree, *Taxus brevifolia* Nutt. This slow-growing tree is native to the temperate northwestern United States and adjacent Canada: its range extends from southern Alaska to northern California and east to Montana. Taxol is also found in small twigs, roots and needles of *T. brevifolia* and several other *Taxus* species. A number of these species, including *T. x media* 'Hicksii', are commercially available from nurseries. They grow faster than the native species and produce useful amounts of Taxol.

Other compounds with a complex ring structure like the one in Taxol, collectively known as "taxanes", are found in many yew species. Although other taxanes do not generally have anticancer activity, the other taxanes may be used for synthesis of Taxol.

Taxanes, like many other secondary plant products, may be synthesized by plants in response to environmental or biotic stress. Environmental stresses such as ultraviolet light, heat or drought may, therefore, enhance taxane biosynthesis. Stressful environmental conditions increase hormones such as abscisic acid (ABA) which affects root growth and plant survival under water-stressed conditions.

Landscape yews thrive in the Snake River plain of eastern Oregon and southwestern Idaho, annually producing large masses of growth. The major objective of this project was to study the effects of water stress on the amount of Taxol or other taxanes and ABA made by the landscape yew, *T. x media* 'Hicksii', a cultivar with high Taxol content. Water stress could be monitored and controlled effectively in the dry desert climate at the Malheur Experiment Station in Ontario, OR. The shrubs could be managed commercially for repeated harvesting in hedge rows.

Shrubs were supplied with controlled amounts of water from June through August of 1996, 1997 (Shock et al., 1998; Hoffman et al., 1999), and 1998. The amount of taxanes extracted from the experimental shrubs receiving each of three irrigation

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[1]Taxol® is a registered trademark of Bristol-Myers Squibb. Taxol's "generic" name is paclitaxel.

treatments was compared. Soil and plant water potentials and the degree of stomatal closure were compared, and changes in the concentration of ABA were determined.

Another objective of the 1998 trial was to determine whether water stress during the previous summer would reduce the growth of new leaves and thus reduce the harvestable biomass. This report addresses only the research concerning the new leaf growth response to water stress.

Materials and Methods

The new growth on ten branches in each of the middle three shrubs in each plot was measured on June 25. The new growth consisted of twig and leaf growth that occurs in one flush in the spring each year. The production of new leaves is restricted to this single flush of growth.

All other procedures were the same as in 1996 and 1997. Each year minimal, moderate, and severe water stress was applied from June through August. Growth was measured on stems from April through May of 1998 at which time the shrubs were well irrigated.

Results and Discussion

There was no significant difference in new leaf growth between water stress treatments in 1998. The time period during which the new growth occurred was before the start of the 1998 water stress treatments and at a time when any soil moisture differences between treatments from the previous years' trial would have been moderated by winter and spring precipitation. Consequently, the yield of leaf material within 1998's growing season was not affected by water stress. However, whether water stress could reduce the growth of the shrub during the season, such as growth in diameter of the main trunk or roots, is unknown.

Literature Cited

Hoffman, A., C.C. Shock, and E.B.G. Feibert. 1999. Taxane and ABA production in yew under different soil water regimes. HortScience: in press.

Shock, C.C., E.B.G. Feibert, A. Hoffman, A. Heck, and A. Kirk. 'Hicksii' yews as a sustainable source of anticancer compounds. 1998. Oregon State University Agricultural Experiment Station Special Report 988:84-88.