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Branching Out
from the Canadian Forest Service - Laurentian Forestry Centre

Fast-growing tree plantations: a source of bioenergy

Fast-growing tree plantations have been of interest to foresters for decades. More recently, hybrid poplar and willow plantations have attracted attention as good sources for bioenergy. In order to increase biomass yields per unit of surface area, it is important to examine to what extent plantation density can be increased.

Photo : NRCan

Growth: a key issue

Information regarding productivity, which is essential for assessing plantation profitability, includes data on growth, physiological processes, and on the structure and morphological characteristics of the crown and foliage.

Researchers from the Canadian Forest Service and the Université du Québec en Abitibi-Témiscamingue have studied the growth and performance of various hybrid poplar clones and willow species. They also measured photosynthesis, evapotranspiration and crown growth as indicators in order to compare the acclimation potential of different hybrid poplar clones and willow species in high-density plantations.

Abitibi-Témiscamingue: an experimental land

One of the research initiatives was undertaken with the perspective of using abandoned farmland in Abitibi and elsewhere in Canada. Ten years ago, the researchers set up designs in different climatic regions in Abitibi in order to compare the growth of various hybrid poplar clones in pure or mixed stands, to test the effect of density on their growth and to examine their water-stress tolerance.

The researchers found that:

- Even in the challenging conditions of the boreal forest, some clones measured almost 2 m after just 3 years of growth.
- The morphological and physiological data from some clones widely used in Canada (*P. maximowiczii* x *P. balsamifera* and *P. balsamifera* x *P. trichocarpa*) indicated their ability to grow under high-density conditions.

Photo: NRCan

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Greenhouse or field testing: a matter of time

Fieldwork conducted for the purpose of selecting the most productive hybrid poplar clones takes several years. We have to wait until the trees grow, and the growth season lasts only a few months. To accelerate the selection process, greenhouse testing was undertaken in 2009 to develop criteria indicative of the productivity potential of different hybrid poplar clones and willow species. Using this approach, selection work can be done year round and generate faster results.

Can these greenhouse results be applied to actual field conditions? There is no simple answer, as field conditions are much more complex than those in the greenhouse. However, according to the researchers, greenhouse testing makes it possible to implement a strategic pre-selection process for hybrid poplar clones or willow species to be tested in the field, which in turn helps to accelerate the selection process and thus lower research costs.

A growing phenomenon

Plantations of fast-growing species would have significant economic potential in terms of bioenergy due to the short period of time required to obtain substantial biomass yields. These research activities will make it possible to obtain physiological performance indicators and to identify the species or clones that maximize biomass production. These data will help to assess the profitability of fast-growth plantations.

• It is important to consider water-stress tolerance when choosing a hybrid poplar for a particular region.

Photo: NRCan

Useful links

Poplar Council of Canada:
http://www.poplar.ca

Réseau ligniculture Québec:
http://www.rlq.uqam.ca

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