

## Impact of growth rate on the mechanical properties of Douglas-fir grown in Wallonia (Southern Belgium)

Caroline POLLET<sup>1</sup>, Jean-Marc Henin<sup>2</sup>, Benoit JOUREZ<sup>2</sup>, Jacques HEBERT<sup>1</sup>

<sup>1</sup> Gembloux Agro-Bio Tec, University of Liège, Gembloux, Belgium

<sup>2</sup> Walloon Agricultural Research Center, Laboratory of Wood Technology, Gembloux, Belgium

Timber is traditionally the main purpose of Douglas-fir in Europe. However, some uncertainties remain concerning the silviculture that should be applied in order to maximise girth growth rate (GR) without affecting the good mechanical properties of the wood. So, the present study aimed at assessing to what extent the GR of Douglas-firs grown in Wallonia influences the mechanical properties of wood clear samples. The modulus of elasticity (E) and static bending strength ( $\sigma_f$ ) were measured according to NF B51-016 and NF B51-008 and are discussed according to the ring width measured on the samples, as well as on the growth rate of the trees and of the stands, for both juvenile and mature wood. This assessment will help to provide silviculture guidelines for foresters.

The experimental material was derived from 11 Douglas-fir stands distributed all over Wallonia, Southern Belgium. At the time of felling, the age of the stands ranged from 41 to 69 years old. In each stand, six trees were felled, their girth varying from 120cm to 179 cm. As a consequence of the sampling methodology the growth rate of the trees ranged from 3 mm to 7 mm. From the 66 butt logs, 274 and 884 clear samples were taken in the juvenile and mature wood respectively.

This research evidenced that:

- Whatever the GR, the mean values of E and  $\sigma_f$  in the juvenile wood are 20% lower than those in the mature wood;
- At the tree level, the mean E and  $\sigma_f$  of the samples taken from trees with ring width >5mm are about 10% lower than those of the samples taken from trees with ring width <5mm, whether considering juvenile or mature wood;
- At the stand level and regardless to the type of wood (juvenile/mature), the mean E and  $\sigma_f$  of the samples originating from stands with mean girth increment >3cm/year are respectively 5% and 9% lower than those of the samples originating from stands with mean girth increment <3cm/year.

This observation should lead the forest manager to consider carefully silvicultural practices that would induce a too fast juvenile growth; high growth rate in the mature wood do not appear to be a problem considering the properties studied here. One should however take into account the impact of the growth rate on the singularities of the boards.

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