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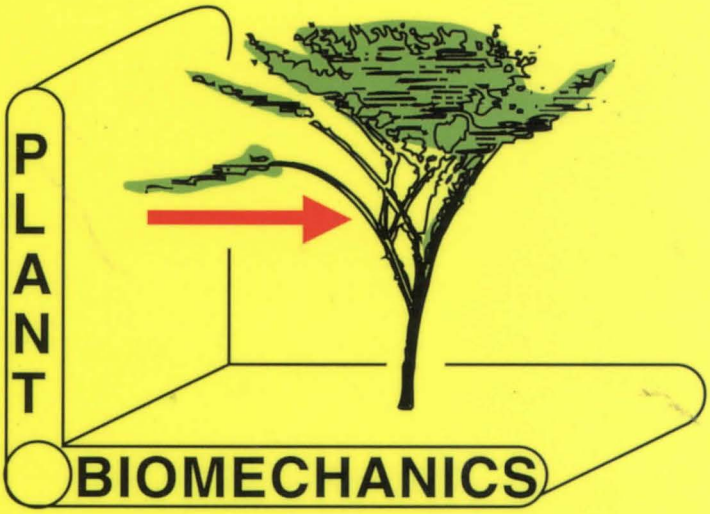

Résumés – *Summaries*

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TWO FIELD MEASUREMENT TECHNIQUES FOR APPRAISING THE LONGITUDINAL GROWTH STRAINS AT THE STEM SURFACE.

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Growth stresses originate in surface growth strains (= maturation strains), induced in cambial layers during the differentiation and maturation of new cells, impeded by the mass of the whole trunk. The longitudinal residual growth strains at the stem surface, named **L**ongitudinal **R**esidual **S**train of **M**aturation (**LRSM**), is appraised by stresses ("growth stresses") release on stem periphery by means of cutting in the wood located under the cambium. This cutting is supposed to release locally, in the measured spot, existing stresses in the stem, and thus, the observed strains are proportional and have opposite signs to the initial stresses.

Two different methods using special sensors are used for the determination of the longitudinal residual strain of maturation :

1> The single drilled hole method, using CIRAD sensor (Fig 1). It's a classical technique for measuring residual stresses in elastic materials [1], [2], [3]. The metrological principle consists in measuring dimensional changes in fibre direction near a single drilled hole. The recorded value is a displacement (δ) that is proportional to the LRSM (α_L) :

$$\alpha_L = - \phi \, \delta$$

where ϕ is a variable that depend on : hole diameter, reference distance of measurement, moduli of elasticity (E_L and E_T), shear modulus parallel to the grain (G_{LT}) and Poisson coefficient (ν_{LT}).

2> The two grooves method, using Wap's sensor (Fig 2). This method uses a classical extensometric sensor (manufactured by HBM - Germany) [2], [3], [4]. The total longitudinal stress is relieved by sawing two grooves above and below the sensor. After this operation we achieve the longitudinal residual strain of maturation.

In spite of the difference between the position of the measurement spots (it's impossible to realise two measurements on the same place), there is a highly significant correlation between the values achieved by the two methods (Fig 3).

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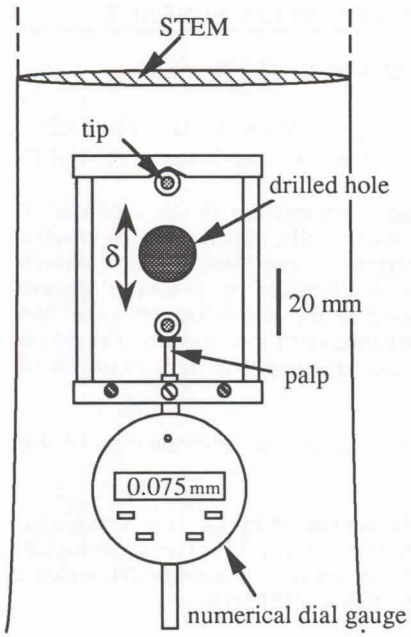

Fig 1 : single drilled hole method
(**CIRAD sensor**)

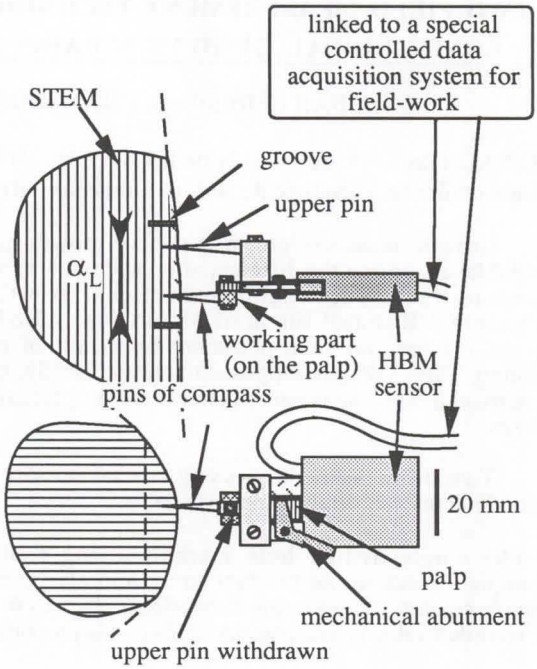

Fig 2 : two grooves method
(**Wap's sensor**)

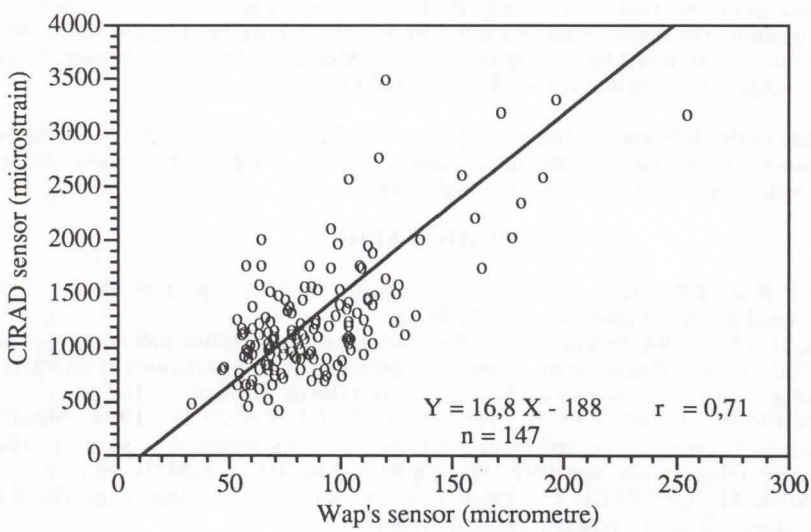

Fig 3 : correlation between the values achieved by the two methods on *Eucalyptus* clones.
For each point the sensors are situated on the same generatrix with a distance of about 20 cm one from the other.