



Applicability of thermography and increment coring for the determination of juvenile wood zone of Turkish red pine (*Pinus brutia* Ten.)

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Abstract: Utility and uniformity of wood within species vary depending on the differences between juvenile and mature wood. Juvenile wood shows different characteristic than mature wood and proportion of juvenile wood is an important topic for usage. The study was mainly carried out to investigate the applicability of thermography, as an efficient and a practical technique, for the determination of juvenile wood part in Turkish red pine (*Pinus brutia* Ten). In a standing tree moisture content is higher than fiber saturation point and the moisture content of wood varies with location from pith to bark depending on different wood parts such as heartwood, sap wood, juvenile wood, and mature wood. The main assumption was that any difference in moisture should cause differentiation of surface temperatures and these differences may be used as a practical way to separate juvenile wood zones. For this purpose increment core samples were collected from different age and type of *Pinus brutia* stands from Mediterranean region of Turkey. After removing increment cores from living trees, they placed into plastic tubes and stored in cooler bag to keep their moisture stable. Increment cores surfaces was monitored using FLIR I7 thermal camera at laboratory conditions. Thermal images were evaluated via image analysis system. The rings of the transition from juvenile to mature wood were determined by visual interpretation of cambial age profiles of ring density trait. Ring densities measured on increment cores via x-ray densitometry method. The juvenile period, which was separated according to x-ray density data, was compared to the findings of IR images. The thermal properties (thermal conductivity, and capacity) of juvenile and mature wood were different and, consequently the surface temperatures differed. The difference determined 85% of all investigated cores for 7-10 rings from pith. This was parallel to identified juvenile part with x-ray densitometry profiles. Results showed that thermography can be applied as a very promising and practical technique to separate juvenile period of investigated species. It is possible to apply this technique not only laboratory condition but also in the field with a portable IR camera.

Keywords: *Pinus brutia*, Thermography, Juvenile wood