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Determination of Elastic Constants for Scots Pine Grown in Turkey Using Ultrasound

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Abstract : This study investigated elastic constants of scots pine (Pinus sylvestris L.) grown in Turkey by means of ultrasonic waves. Three Young's modulus, three shear modulus and six Poisson ratios were determined at constant moisture content (12 %). Three longitudinal and six shear wave velocities propagating along the principal axes of anisotropy, and additionally, three quasi-shear wave velocities at 45° with respect to the principal axes of anisotropy were measured using EPOCH 650 ultrasonic flaw detector. The measured average longitudinal wave velocities for the sapwood in L, R, T directions were 4795, 1713 and 1117 m/s, respectively. The measured average shear wave velocities ranged from 682 to 1382 m/s. The measured quasi-shear wave velocities varied between 642 and 1280 m/s. The calculated average modulus of elasticity values for the sapwood in L, R, T directions were 11913, 1565 and 663 N/mm2, respectively. The calculated shear modulus in LR, LT and RT planes were 1031, 541, 415 N/mm2. Comparing with available literature, the predicted elastic constants are acceptable.

Keywords : elastic constants, prediction, Scots pine, ultrasound
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