

The effects of heat treatment on physical and technological properties and surface roughness of Camiyanı Black Pine (*Pinus nigra* Arn. subsp. *pallasiana* var. *pallasiana*) wood

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Abstract

Heat treatment is often used to improve the dimensional stability of wood. In this study, the effects of heat treatment on physical properties and surface roughness of Camiyanı Black Pine (*Pinus nigra* Arn. subsp. *pallasiana* var. *pallasiana*) wood were examined. Samples obtained from Yenice-Zonguldak Forest Enterprises, Turkey, were subjected to heat treatment at varying temperatures and for varying durations. The physical properties of heat-treated and control samples were tested, and oven-dry density, air-dry density, and swelling properties were determined. The mechanical properties of heat-treated and control samples were tested, and compression strength, and Janka-hardness were determined. A stylus method was employed to evaluate the surface characteristics of the samples. Roughness measurements by the stylus method were made in the direction perpendicular to the fiber. Four main roughness parameters, mean arithmetic deviation of profile (R_a), mean peak-to-valley height (R_z), root mean square roughness (R_q), and maximum roughness (R_y) obtained from the surface of wood were used to evaluate the effect of heat treatment on the surface characteristics of the specimens. Significant difference was determined ($p = 0.05$) between physical and technological properties, and surface roughness parameters (R_a , R_z , R_y , R_q) for three temperatures and three durations of heat treatment.

Based on the findings in this study, the results showed that density, swelling, compression strength, Janka-hardness and surface roughness values decreased with increasing treatment temperature and treatment times. Increase in temperature and duration further diminished technological strength values of the wood specimens. Camiyanı Black Pine wood could be utilized by using proper heat treatment techniques without any losses in strength values in areas where working, stability, and surface smoothness, such as in window frames, are important factors.

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1. Introduction

Camiyanı Black Pine (*Pinus nigra* Arn. subsp. *pallasiana* var. *pallasiana*) grows naturally in Yenice Region Turkey. It is determined that the heartwood ratio for Camiyanı Black Pine is more than 50% in comparison to the sapwood

in Yenice region. Camiyanı Black Pine grows naturally in Elekdag, Dursunbey, Tosya, Daday, Tavsanlı and Yenice regions of Turkey with the total area of 30,000 ha. The average habitat altitude is 866 m and prefers calcareous with stone and sandy-clay soils. It is a primary forest tree species with an average of 30 m height; rarely reaching 50 m (Berkel, 1970; Gündüz, 1999).

This species is preferred in the forest industry because of its relatively large and distinct heartwood in comparison with other pine species. The reason for that is the color

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