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Investigating Changes of Biometric and Chemical Characteristics of Populus sp. Wood in Radial and Longitudinal Axes in Chalus

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Abstract

In this paper, biometric and chemical characteristics of *Populus sp.* wood and changes of them have been studied and analyzed with respect to the trees' radial and longitudinal axes. In this research, three healthy trees of *Populus sp*. were selected and cut in Chalus. Three discs were chosen from every tree and they involve specific parts like breast, half of tree height and beneath canopy. Experimental samples have been prepared from heart to bark and duramentoalburain order to measure biometric characteristics (fibre length, cross-section dimensions) and data resulting from two desired axes have been statistically analyzed. Research findings indicate that the length of *Populus sp*. yarns increases from heart to bark within radial axis but there is an irregular increase in longitudinal one. Regarding changes of fibre cross-section dimensions (fibre diameter, fibre cavity diameter and fibre wall thickness) in radial axis, regular, regular and irregular increases are to be observed for them, respectively and in longitudinal one, there are irregular, regular and irregular increases. Also, with respect to biometric coefficients such as Rankle, flexibility and mix up in the radial axis, changes of decreasing and irregular increasing and irregular increasing trends have been seen while in longitudinal one, these changes have been decreasing, decreasing and increasing ones, respectively. Considering chemical changes of *Populus sp*. wood from bottom to top, irregular decreasing, irregular decreasing and regular increasing changes were reported for such extractives as lignin, cellulose and ash, respectively.

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Keywords: Populus, cellulose, lignin, ash, fibre diameter, extractives.

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1. Introduction

It has been clearly shown that wood has been able to support lots of past human communities. It has had a variety of applications involving ship construction, housing, paper manufacture, plywood industry, fuel and vehicles.

Populus sp. is regarded as a species growing all over the world and due to its fast-growing feature and suitable quality, it plays significant roles in wood agriculture and is introduced as a valuable and industrial one. Therefore, paying attention to its characteristics along with recognizing and gathering more information on all related fields can enable us to apply it and other trees correctly. Given that wood production concerning industrial and forest species is limited in Iran while the country needs are significantly increased, studies on the species and their applications may prevent from the waste and vanishing of country industrial species and improve their applications.

In this research, Populus sp. species has been investigated and the most important qualitative features including fiber dimensions (length, cavity diameter, wall thickness) and biometric coefficients (Rankle, flexibility, mix up) as well as chemical characteristics (extractives, lignin, cellulose, ash) with regard to radial and longitudinal axes have been statistically analyzed. In this regard, some experts have conducted several studies as follows:

DoostHosseini and ParsaPjoh (1996) studied the changes of Carpinus betulus biometric characteristics regarding radial and longitudinal axes of tree and found that Carpinus betulus tree has longer yarns in those parts which are adjacent to bark and the curve of its changes is of an increasing trend in radial axis while tree has shorter yarns at the top of tree concerning the height as compared to bottom.

GolpoorLasky (1998) investigated the changes of yarn length concerning Alnus serrulata species with respect to radial and longitudinal axes in jungles of Nooshahr and results showed that yarn length is of ascending and decreasing trends for radial and longitudinal axes, respectively.

Cole (1966) has measured the soluble extractives amount in alcohol-benzene and realized that heartwood and long leaf wood may be more than the measured extractives of Pinus eldarica and Pinus Teda.

Seifi (2001) conducted several studies on Pinus eldarica wood and calculated chemical compounds' means as 52.62, 27.9, 1.64 and 0.47% for cellulose, lignin, extractives and ash, respectively.

Veisi (1999) addressed the changes of biometric characteristics for Parrotia persica in radial and longitudinal axes and the obtained findings demonstrated that yarn length is irregularly increased in radial axis but it has a decreasing trend in longitudinal one. Dimension variations (diameter, cavity diameter, wall thickness) are irregularly increasing in radial axis while they may be of decreasing, decreasing and increasing trends in longitudinal one, respectively. Biometric coefficients (Rankle, flexibility and mix up) show decreasing, decreasing and increasing trends for both axes.

2. Materials and Methods

According to the principles of D143 standard ASTM (1990), the desired trees have been specified and marked randomly as natural and healthy ones in Chalus. After numbering them, determining the cutting location and drawing geographical directions on the trunks, three selected trees were cut. Afterwards, three discs with the diameter of 30 cm have been prepared from each tree in order to take the experimental samples. Their distances involved breast as 1.30 m, middle height (L/2) and beneath canopy. Then, geographical direction was marked on the disc surface in order to avoid moisture exchange with the environment and moisture evaporation from the wood surface and consequently, cracks of bottom sections. Discs' cross-sections were painted by the means of a paint brush and then, they were put in plastic bags. It should be explained that discs having low thickness were chosen in order to calculate moisture content percent (%MC) of Populus sp. accurately. Afterwards, they were put in the melted paraffin to keep the moisture content. Thus,