Comparison of the dynamics of heartwood formation with conductive area (Pp) and ring conducting area (Pps) in Scots Pine (Pinus sylvestris L.)

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This paper presents the dynamics of the heartwood formation in relation to conductive area (Pp) and ring conducting area (Pps), as well as the correlation between these features, of Scots Pine (Pinus sylvestris L.) trees which come from post-agricultural lands and renewed forestlands. Tree stands of 2nd and 3rd age class located in Forest District of Świelskie, Forest Inspectorate of Gościno were subjected to research. The results of the carried measurements shows that there is a relationship between dynamics of heartwood formation and conductive area (Pp) and with the ring conducting area too.

Heartwood formation, conductive area, ring conducting, Scots pine

Introduction

The aim of the study is to identify and analyze the dynamics heartwood formation conductive surface (Pp) and the conductive surface ring (pps), and determine the relationships between them depending on the features, or lack thereof. The experimental material certified the samples from the three classes of diameter trees, representing three classes of stands Kraft II and III grew up in the age class of forest soils and conditions of former farmland.

Construction of the cross-section of pine in the second and third age class diversity allows heartwood zones and sapwood. Sapwood pine includes dozens of rings, occupying about half the cross-sectional area. As white, like the heartwood, sapwood width is expressed in cm or the number of annual rings of sapwood (Krzysik, 1974).

Construction of the annual ring has a division into two zones. Closer to the core area of early wood and closer to the bark zone latewood. The growth of early wood at the onset of the growing season. In many trees, the process of accumulation of early wood takes place before the formation of the leaves, the materials already accumulated up. At this stage, the main task is to lead the water in wood, and mineral salts dissolved therein. Therefore, early wood is composed of thin-walled components with a high light (Krzysik 1974).

Late wood resulting in a later stage of the growing season, plays a minor role in the transport of water. Leading role in the play wood mechanical functions, hence the construction of wood is different from the latewood and early wood, as they form a thick-walled components, and the light coils and blood is low (Krzysik 1974).

For pine early wood cross stands out bright color, hardness and less porous structure and a share of 65.95%. The largest share of the early wood is characterized by a grain in the central part of the trunk, and the farther from the core, the greater part latewood (Krzysik 1974).

Until recently, the area was identified conductive (Pp) of the surface occupied by the sapwood. But sapwood, as actively conducting wood area has in its late wood structures, which does not serve as conductor, but mainly mechanical functions. Therefore, this view is generalized and vague, and the conductive surface (Pp) is in fact less than a of sapwood surface and is the sum of all the early wood in the annual rings sapwood are (Nawrot i in. 2009).

As the surface of the conductive ring (pps) means the average area of early wood per one ring annual of sapwood (Nawrot i in. 2009).

Methods

The aim of the study was to determine the change in the size of the conductive surface (Pp) and the conductive surface ring (pps) at the time and heartwood formation dynamics in Scots pine (Pinus sylvestris L.) stands derived from class II and III century, growing in forest soils and post-agricultural land and an attempt to determine the relationships between these traits.

The research material from the Forestry Commission Forest Świelskie Gościno, forming part of RDSF Szczecinek.

Selection of the test stand was based on the description of the Forestry Gościno. All test stands are in forestry Świelskie. Tree stands represent the second and third age class with an area of more than 1 ha, increasing the habitat moist mixed coniferous forest, where the pine reaches and grading class, with different growing conditions - former farmland and forest soils.

Conventionally assumed that the class will determine the diameter the classes Kraft biosocial talking about the position of the tree, as follows: 1 class diameter - Kraft Class III, Class 2 diameter - Kraft class II, class 3 diameter - I Class Kraft. In addition to height and diameter at breast height of trees in determining the sample are taken into account also other features: a healthy and smooth crown and arrow without damaging healthy. Selected trees were subjected to multiple test measurements of height and diameter at breast height measured twice in the cortex (perpendicular).

Stems were divided into six-foot sections, cutting out the center of each circle several centimeters diameter (Fig. 1) The first disc was obtained from the stump, the second from the middle section of the first two meters, or 1 meter, three-meter from the middle of the second section, which is the height of 3m, each another puck from the center of the next section with a length of 2m. For dried under shelter discs, heartwood has become more visible.
Fig. 1. Schematic distribution of shots at six-foot sections

Counted on each of the discs and all the set number of grains completely colored rings heartwood. Sapwood wood grain number was calculated from the difference of all rings and rings heartwood. The dynamics of the ratio of rings expressed heartwood formation sapwood to heartwood, the share of rings heartwood in rings and rings by comparing heartwood and stem throughout sapwood.

All discs from selected to work 12 trees II and III class century, were measured in four directions, from the core to the boundary of the disc, the perpendicular diameters, of heartwood and of sapwood distinction, and of sapwood wood area were measured early and late each annual growth. Subsequently, data were collected for each disc were counted separately averaged and early wood surface in white, the conductive surface (Pp), expressed in cm², and then they were pooled for the entire stem. For each disc also counted ring conductive surface (pps), by dividing the conductive surface Pp, by the number of rings of sapwood, yielding an average conductive surface, attributable to the annual ring.

Results

Fig. 2 The relationship between the ratio of heartwood formation a conductive surface at a height of 1m trees stand three classes Kraft Class II in a growing age of forest soils.

Degree of dependence of two subjects in the work characteristics: factor heartwood formation from a height of 1m shots (you can contractually assume the height of 1m from the cut shear as the diameter at breast height tree standing) and a conductive surface (Pp) expressed in cm² for the four stands of second and third grade age grown on former farmland and forest soils, within which there are always three sample trees representing 1st, 2nd and third Kraft class, is expressed by the coefficient of determination R².

In the first step compared characteristics are summarized for each of the individual stands, for all classes of Kraft. The largest association was found in the studied traits stand age class II grew up in a forest soil (Fig. 3). The value of $R^2 = 0.9869$ speaks heartwood formation factor closely related to the size of the conductive surface (Pp). Lower, but still showing a fairly high correlation turned out to be coming from the subdivision stand 244C (age class II), the union of two features shown in Fig. 2 Second Slightly lower binding features characterized by stand age class III grown on forest soils, while in the stand on former farmland age class III there was no significant relationship studied traits (Fig. 4).

- Heartwood formation factor expressed as the ratio of the number of sapwood rings rings on the section 13m heartwood varies from 1.52 to 4.5 in the third porolnym stand age class. The stand of the same age class, but which grew in a forest soil values for 11m shooting range from 2.63 to 5.33.
- Heartwood formation dynamics depends largely on the climate, soil conditions, height of the test section of the shot, as well as the size of the crown.

- The largest conductive surface characterized by dominant trees, both in post-agricultural stands, and formed as a result of the renewal of the forest area.
- The size distribution of the conductive surface of the ring is in compliance with the order of classes Kraft. In the post-agricultural stands can be approximated times at which increases with increasing pps Kraft one class: the class II stands is 1.5, while for class III stands at 2 times.

- The strongest correlation between the dynamics of a conducting surface heartwood formation (Pp) and the conducting surface ring (pps) show pine stand age class II grown on forest soils. heartwood formation relationship dynamics and Pp is the $R^2 = 0.9869$ to $R^2 = 0.9907$, and the dynamics pps heartwood formation and is equal to: $R^2 = 0.9963$. The smallest binding characteristics of the respondents have a tree with stand age class III porolnego, assuming that the dynamics of the heartwood formation and Pp from $R^2 = 0.0014$ to $R^2 = 0.1191$, and the compound growth rate and heartwood formation pps value is: $R^2 = 0.3427$.

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Summary

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