MACROSTRUCTURE OF SCOTS PINE WOOD FROM UNRIPE FOREST STANDS GROWN IN CONDITIONS OF DRY FOREST

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Attempt was undertaken to characterise macrostructure of wood of Scots pine (*Pinus sylvestris L.*), which was grown in extremum ecological conditions , that is in habitat conditions of dry forest .This macrostructure has been expressed by the average width of annual increment, width of late wood, share of sapwood and heartwood in the volume of stems of the trees.

Key words: dry forest,macrostructure of wood, year increment in thickness, share of late wood.

INTRODUCTION

However the percentage of dry forests in the area of forests in Poland is about 3.5% (Praca zbiorowa 1990) and can be estimated as rather low, but in the last 20 years Forest Taxation Bureau officers , from rather unknown reasons qualified into fresh forest stand type series of forest stands growing in rather unfavourable conditions on the terrains of so called "Puszcza Nadnotecka".This can be seen on the old maps of forest district Sieraków (Forest management plan of Sieraków).

The evaluation of quality of wood of our basic forest creating species growing on rather poor soils is very interesting and has some potential advantages from the point of view of future afforestation of abandoned by agriculture terrains.

The scope of this paper is an attempt to determine quality of wood expressed as macrostructure of Scots pines from unripe forest stands , which were grown in conditions of forest stand type dry forest. The obtained results could be the base of rational assignment and use of wood raw material

harvested in course of some intermediate cuttings by Forest Districts managing in "Puszcza Nadnotecka".

EXPERIMENTS

For the experiments was used wood of pines from unripe forest stands grown in conditions of dry forest on the terrain of forest district Sieraków, forest division Gospódka Selected accordingly to the method of thickness classes Urich II(Grochowski 1973) sample trees were about 30,40, and 60 years old. For each plot three sample trees were cut.After marking on the stem of each tree the north direction they were cut down and from each tree were cut out discs , starting from the butt in distance 50cm, and further after each 1m to the end of the stem.Besides that was also taken disc on the breast diameter that is 1.30 m above ground level.

Discs after delicate drying (to expose heartwood in natural way) were used for measurements of thickness of sapwood and heartwood on the two rectangular diameters (north-south,and east-west)Using those measurements was calculated ring of sapwood and roll (or cone) of heartwood in each of 1m long section of particular stems.The butt discs were used to calculate the age of trees ,while discs from breast diameter were used for evaluation of the widths of annual increments and widths of latewood.

At determining the annual increments (growth rings) was applied measuring microscope, accuracy of measurements was 0.01mm. When analysing results were used arithmetic means for the percentage of sapwood and heartwood and widths of annual increments and zone of late wood, calculated from three sample trees for each forest stand.

RESULTS OF INVESTIGATIONS

The macrostructure of wood was characterised in this work by the growth rings occurence,percentage of the late wood in the annual increment, and percentage of sapwood and heartwood in the stems of the trees. Results of the measurements were tabulated in the tables 1 and 2. Occurence of growth rings was diversified in dependence upon the development stage of the forest stand connected closely with the age of trees (table 1).

In the youngest forest stand (30 years) the average width of growth ring was was small and reached 1mm,and the variation of this feature was considerable what is stated by calculated variation coefficient equal 46.1%. At trees in the age of ca 40 years was observed distinct increase of average width of growth ring in relation to the one from 30 years old trees, what without doubt can be linked with culmination stage in the growth of this species.The 60 years old trees have shown decrease of the width of growth ring - average width was in this case 1.24mm (table 1) The variability of this feature at 40

and 60 years old pines was lower, what verifies table 1.The percentage of late wood in the annual increment is in the same degree connected with the age of trees. Older pines (40 and 60 years old) have the wood with slightly higher percentage of late wood (table 1), the variability of this feature of the macro-structure decreased together with the age of trees.In the wood of 30 year old trees calculated coefficient of variation was 43.2% and in the 40, and 60 year old trees respectively 13 and 8 %.

Table 1
Tabela 1

Average occurence of growth rings and share of late wood in wood of Scots pines (Pinus sylvestris L.) growing in conditions of forest type - dry forest
Przeciętna słoistość i udział drewna późnego w drewnie sosen zwyczajnych (Pinus sylvestris L.) z drzewostanów przedrębnych rosnących w warunkach siedliskowych typu lasu boru suchego

Age of trees (years) Wiek drzew (lata)	Measures Miary	Macrostructures feature Cecha makrodtruktury	
		Year increcement in thickness Przyrost roczny grubości	Share of late wood Udział drewna późnego
30	Minimum value Wartość minimum (mm)	0,47	0,18
	Maximum value Wartość maksimum (mm)	1,30	0,47
	Arithmetic mean (mm) Średnia arytmetyczna (mm)	1,00	0,35
	(%)	100	35
	Variation coefficient Współczynnik zmienności (%)	46,1	43,2
40	Minimum value Wartość minimum (mm)	1,45	0,55
	Maximum value Wartość maksimum (mm)	1,92	0,69
	Arithmetic mean (mm) Średnia arytmetyczna (mm)	1,61	0,60
	(%)	100	37,3
	Variation coefficient Współczynnik zmienności (%)	16,5	13,0
60	Minimum value Wartość minimum (mm)	0,86	0,40
	Maximum value Wartość maksimum (mm)	1,48	0,47
	Arithmetic mean (mm) Średnia arytmetyczna (mm)	1,24	0,44
	(%)	100	35,5
	Variation coefficient Współczynnik zmienności (%)	26,7	8,0

The percentage of sapwood and heartwood is very distinctly related to the stage of forest stand development,that is to the age of trees.Up to thirty years the percentage of heartwood was low and was properly 3.3% (at 30 year old)

and 5.4 (at 40 year old). At the trees 60 year old percentage of heartwood increased up to 12.1%. On the base of such results it can be stated that the wood assortments from pine forest stands, harvested in cuts in 30 -60 year old trees are mainly sapwood.The percentage of sapwood ballances from ca. 97-87% in such habitats. (table 2).

Table 2
Tabela 2

Average volume of wood of the stems and percentage of sapwood and heartwood
at Scots pines (Pinus sylvestris L.) growing in conditions of forest type dry forest
Przeciętna objętość drewna strzał oraz udział bielu i twardzieli u sosen zwyczajnych (Pinus sylvestris L.) z drzewostanów rosnących w warunkach siedliskowych typu lasu boru suchego

Age of trees (years) Wiek drzew (lata)	Measures Miary	Volume Objętość		
		Total Całkowita	Sapwood Biel	Heartwood Twardziel
30	Minimum value Wartość minimum (m³)	0,00374	0,00374	0,00000
	Maximum value Wartość maksimum (m³)	0,01976	0,01875	0,00100
	Arithmetic mean (mm) Średnia arytmetyczna (m³)	0,01017	0,00983	0,00034
	(%)	100	96,7	3,3
	Variation coefficient Współczynnik zmienności (%)	83,2	80,3	173,2
40	Minimum value Wartość minimum (m³)	0,02025	0,01847	0,00089
	Maximum value Wartość maksimum (m³)	0,07965	0,07468	0,00497
	Arithmetic mean Średnia arytmetyczna (m³)	0,04526	0,04280	0,00246
	(%)	100	94,6	5,4
	Variation coefficient Współczynnik zmienności (%)	68,0	67,2	89,5
60	Minimum value Wartość minimum (m³)	0,03824	0,03391	0,00433
	Maximum value Wartość maksimum (m³)	0,12629	0,10946	0,01683
	Arithmetic mean Średnia arytmetyczna (m³)	0,07387	0,06494	0,00893
	(%)	100	87,9	12,1
	Variation coefficient Współczynnik zmienności (%)	62,8	60,9	77,0

Wood especially from unripe forest stands is characterised by such features which are often called cyclical heterogenity (Kollman and Cote 1968)There are described two kinds of such heterogenity radial an axial- both bound with the growth cycles ,they are hindrance with the uses of wood for construction purpouses. (Pazdrowski and Spława -Neyman 1996, Spława-Neyman and Wojcieszyn 1995; Spława -Neyman and Pazdrowski 1995). Very important from the point of view of uses of such unripe wood for construction purpouses

is very low durability of pine sapwood against biological corrosion. As such raw material got from rather young trees 30-60 year old is a potential risk material for some uses in construction , serious warning is to be expressed (Spława -Neyman and Wojcieszyn 1995). Therefore some treatments with preservatives are to be recommended.

CONCLUSIONS

1. Occurence of growth rings , percentage of sapwood and heartwood, and variability of those features of macrostructure is to the some extent related to the age of trees.

2. Percentage of sapwood and heartwood in the volume of stems of pines, and variability of both kinds of wood is related with the age of trees. With the age of trees increases percentage of heartwood, but never exceeds 50%.

3. Characteristics of the features of macrostructure of raw material from unripe trees,necessitates new kind of approach from customers to such wood.

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MAKROSTRUKTURA DREWNA SOSNY ZWYCZAJNEJ Z DRZEWOSTANÓW PRZEDRĘBNYCH WYROSŁYCH W WARUNKACH BORU SUCHEGO

Streszczenie

Celem pracy była próba dokonania oceny jakości drewna sosen zwyczajnych z drzewostanów przedrębnych , wyrosłych w warunkach boru suchego.Jakość drewna wyrażono takimi cechami makrostruktury jak: słoistość drewna, procent drewna późnego w przyroście rocznym, grubość oraz procent bielu i twardzieli w miąższości strzał drzew.

Badania wykazały ,że wiek drzew zdecydowanie wpływa na poszczególne cechy makrostruktury drewna. Fakt ten należy uwzględnić w dalszym przerobie i przeznaczeniu sosnowego surowca drzewnego pozyskiwanego w ramach realizowanych cięć w drzewostanach przedrębnych rosnących w warunkach boru suchego .

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