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MACROSTRUCTURE OF SCOTS PINE TIMBER FROM UNRIPE FOREST STANDS GROWN IN CONDITIONS OF FRESH MIXED BROADLEAVED FOREST

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In this paper characterised was structure of Scots pine (*Pinus sylvestris* L.) timber from unripe forest stands , which were grown in conditions of mixed broad-leaved forest. This macrostructure was expresed by average width of growth rings , width and share in annual increment of summer wood, share of sapwood and heartwood in the volume of tree stems.

Key words: fresh mixed broadleaved forest, width of growth ring, sapwood, heartwood, volume of stem

INTRODUCTION

In the conditions of economy forests in Poland, Scots pine forest stands are growing as well on habitats extremely poor that is on dry forests habitats , as on rich like fresh mixed broadleaved forests or hardwood forests, where this forest creating wood species is without doubt an alien floristic element. On this habitat can be found pure pine forest stands , what can be taken as breeding fault (Praca zbiorowa 1998a).

The share of area of mixed fresh broad-leaved forests in total area of State Forests in 1997 was 13.3% (Praca zbiorowa 1998b). In general in Polish forests dominant are coniferous species (78.4%) ,in that Scots pine (70.6%),which there has found most favourable climatic conditions in her Euro-Asiatic distribution. (Praca zbiorowa 1998b). Unripe pine timber , classified as middle size timber , that is round raw material with diameter in butt end up to 24cm without bark accordingly to the Polish Standard PN–91/ D- 95018). Such timber is harvested mainly as the result of thinnings,and other economy works, and also in smaller part in course of clear cuttings.

In the year 1997 has been harvested in State Forests 19941.9 thousands of m^3 of large timber net, in that in unripe forests 12230.4 thousands of m^3 (Praca zbiorowa

1998b). Technical properties of middle size timber from such forest habitat are till to this time unsatisfactorily known and elaborated , what very often is the cause of improper application of such timber.

The scope of presented there studies was an attempt of evaluation of quality of middle size timber from unripe forest stands , which have grown in conditions of habitat of fresh mixed broadleaved forest. Quality of timber was expressed by its macrostructure ,that is size of annual increments it is growth rings , share of summer wood ,and also by the share of sapwood and hardwood in volume of stems.

MATERIALS AND METHODS

Studies were made on the area of Wielkopolsko –Pomorski region in forest stands of age 30,40,and 60 years, which have grown in conditions of fresh mixed broadleaved forest.

In selected forest stands were made sample plots . On particular sample plots were measured breast diameters of all trees ,and heights accordingly to frequency in adopted thickness classes. When characteristics of thickness and height has been obtained on the base of Urich II method (Grochowski 1973),were established dimensions of sample trees and were selected in terrain. In each age class were chosen three test trees. After marking on their stems North direction , they were cut, and sample discs and logs were obtained namely: discs from butt, breast diameter ,and every 1 m of length . The discs were used to determine rings of sapwood and roll of heartwood. Said measurements were made in two directions- North –South ,and West – East. The obtained results enabled to calculate the volume of sapwood and heartwood in particular 1 meter long sections ,and total volume of each stem On the butt discs was measured age of trees despite to the records in Forest District ,while on discs from breast diameter height was measured width of growth rings and width of the zone of summer wood .To do those measurements the bench microscope was used. Measurements were made with the accuracy up to 0.01 mm .For the analysis of results were applied arithmetic means, share of sapwood and heartwood in stems of pines , and width of growth rings and zone of summer wood. Said means were calculated for three test trees from every forest stand in adopted age classes.

RESULTS

The macrostructure of wood of pines grown on the fresh mixed broadleaved forest were characterised by growth rings ,share of summer wood in annual increment, and the share of sapwood and hardwood in stems. Average width of growth ring was in the range of 1.75 up to 2.02 mm. The wider growth rings were found at younger pines,

while thinner at older ones (60 years old). The calculated coefficients of variation of this feature of the macro-structure were in the range of 12.8 to 22.9% ,and the lower was at the pines 40 and 60 years old, and the higher at pines in the age of 30 years (Table 1). The share of the zone of summerwood was in range of 28.2 to 36.0 %. The higher share of summerwood occurred at 60 years old pines. Variability of this structural feature of timber rather low (11.2%) was found in 40 years old forest, and higher (18.2%) in 60 years old forest stand –see Table 1.

Table 1

Tabela 1

Average occurence of growth rings and share of summerwood in Scots pines wood from unripe forest stands from fresh mixed broadleaved forest

Przciętna szerokość słoi rocznych i udział drewna późnego w drewnie sosny zwyczajnej z drzewostanów przedrębnych z lasu mieszanego świeżego

Age of tree (years) Wiek drzew (lata)	Measures Miary	Macrostructure feature Cecha budowy	
		Year increment Przyrost roczny	Share of summerwood Udział drewna późnego
30	Minimum value [mm] Wartość minimalna [mm]	2.56	0.43
	Maximum value [mm] Wartość maksymalna [mm]	2.54	0.84
	Arithmetic mean[mm] Srednia arytmetyczna [mm]	1.92	0.57
	[%]	100	29.7
	Coefficient of variation [%] Współczynnk zmiennosci [%]	22.9	33.5
40	Minimum value [mm] Wartość minimalna [mm]	1.79	0.52
	Maximum value [mm] Wartość maksymalna [mm]	2.38	0.66
	Arithmetic mean [mm] Srednia arytmetyczna [mm]	2.02	0.57
	[%]	100.0	28.2
	Coefficient of variation [%] Współczynnik zmienności [%]	12.8	11.2
60	Minimum value [mm] Wartość minimalna [mm]	1.42	0.50
	Maximum value [mm] Wartość maksymalna	2.14	0.78
	Arithmetic mean [mm] Srednia arytmetyczna [mm]	1.75	0.63
	[%]	100.0	36.0
	Coefficient of variation [%] Współczynnik zmienności [%]	17.0	18.2

The share of sapwood and heartwood in volume of stems of the pines grown in conditions of fresh mixed broad-leaved forest stand is closely bound with the development stage of this stand – that is with the age of trees. In the 30 year of life of pines , the share of heartwood in the stem was about 4 %, what will be indicating that heartwood formation process has started relatively not long ago. Accordingly to the literature pine in Poland starts formation of heartwood after 20 years of life (Hejnowicz 1973, Krzysik 1974). Together with the increase of age of pines the process of creation of heartwood increased what in effect revealed as increase of heartwood in volume of stems. The pines in the age of 40 years have had 9% of heartwood ,while 60 years old have 18% -see Table 2.Simultaneously share of sapwood in stems lowered with the age of trees.

Table 2

Tabela 2

Average volume of the usable stems and percentage of sapwood and heartwood at Scots pines from unripe forest stands growing in conditions of forest type – fresh mixed broadleaved forest

Przeciętna objętość drewna strzał użytkowych oraz udział bielu i twardzieli u sosen zwyczajnych z drzewostanów przedrębnych rosnących w warunkach lasu mieszanego świeżego

Age of trees (years) Wiek drzew (lata)	Measures Miary	Volume Objętość		
		Total Całkowita	Sapwood Biel	Heartwood Twardziel
30	Minimum value [m^3] Wartość minimalna [m^3]	0.02390	0.02372	0.00018
	Maximum value [m^3] Wartość minimalna [m^3]	0.10850	0.10264	0.00583
	Arithmetic mean [m^3] Średnia arytmetyczna [%]	0.05604 100.0	0.05410 96.5	0.00194 3.5
40	Minimum value [m^3] Wartość minimalna [m^3]	0.10830	0.09748	0.01082
	Maximum value [m^3] Wartość maksymalna [m^3]	0.29044	0.26976	0.02068
	Arithmetic mean [m^3] Średnia arytmetyczna [%]	0.18487 100.0	0.16804 90.9	0.01683 9.1
60	Minimum value [m^3] Wartość minimalna	0.14119	0.10430	0.03689
	Maximum value [m^3] Wartość minimalna [m^3]	0.53917	0.45559	0.08358
	Arithmetic mean [m^3] Średnia arytmetyczna	0.31423 100.0	0.25766 82.0	0.05657 18.0

In recapitulation, it is to be stressed ,that the wood raw material from unripe forest stands grown in conditions of fresh mixed broadleaved forest , felled in the process of thinnings ,is characterised by the mean width of growth rings about 2 mm and share of summerwood from 28 to 36%.This kind of raw material above all it is sapwood with

the share from 82 to 96%. When comparing formation of heartwood share in stems of pine trees grown in conditions of fresh mixed broadleaved forest with results obtained from habitats fresh coniferous forest and fresh mixed coniferous forest (Pazdrowski and Spława-Neyman 1997,1998), it is to be stressed that up to 30 years of age the pines on mentioned habitats the process of heartwood was similar. The dynamics of this process on more rich habitats was higher.

CONCLUSIONS

1. Macro-structural features of pines from unripe forest stands on the fresh mixed broad-leaved forest are changing together with the age of trees. This influence revealed in various ways and intensity.
2. Such timber is characterised by average width of growth ring in limits of 2 mm, and share of summer wood zone from 28 to 36%. While sapwood share in stems was in limits 82 to 96%.
   This fact of great share of sapwood is to be considered in their use due to very low durability against biological corrosion.

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MAKROBUDOWA DREWNA SOSNY ZWYCZAJNEJ Z PRZEDRĘBNYCH DRZEWOSTANOW WYROSŁYCH W WARUNKACH LASU MIESZANEGO SWIEŻEGO

Streszczenie

Przeprowadzono badania makrobudowy drewna sosny zwyczajnej (*Pinus sylvestris* L.) wyrosłej w warunkach lasu mieszanego świeżego. Makrobudowę wyrażono przeciętną szerokością słoja rocznego, szerokością i udziałem w słoju rocznym drewna późnego oraz udziałem bielu i twardzieli w objętości pni sosen. Badania wykazały ,że cechy makrobudowy drewna sosen zmieniają się wraz z wiekiem drzew. Surowiec drzewny pozyskiwany w ramach wykonywanych cięć przedrębnych w drzewostanach sosnowych z siedliska lasu mieszanego świeżego charakteryzuje się średnią słoistością wynoszącą 2 mm, udziałem drewna późnego w słoju rocznym od 28 do 36% oraz udziałem bielu od 82 do ponad 96%.

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