BIOLOGICAL ASPECTS OF LONG-TERM SCALES OF OAK (QUERCUS ROBUR L.) IN LITHUANIA

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Abstract

For the study of the radial growth of Lithuanian oaks 44 plots were selected and up to 75 samples were taken. From each of them by increment borer. The samples (early and late wood separately) were measured utilising an MBS - 2 microscope. In order to supplement the earlier made series and to evaluate results obtained samples were taken in 24 experimental plots. For the determination of the influents of age, relief, selective categories on radial growth, samples were also taken from young trees of different selective categories. In the stands where the relief is distinctly expressed (> 10 - 20 m), samples were taken both from trees growing on the top of a hill and the foot of it. For the evaluation of the change in long-term scales radial growth dynamics ten - year means were calculated for the whole tree growth period. The curves of the growth course show that there are no considerable differences in radial growth of early and late forms of oak, and no considerable differences in the radial growth of the tree belonging to the negative selective category. Oaks of different ages growing in the some stand, in the some period grow similarly. The described results allow an assumption that synchronism of oak growth is associated with the hydrological regime in the soil of a certain mechanical composition.

Keywords: earlywood, latewood, categories on radial growth, tree growth period, synchronism of oak radial growth oak stands

INTRODUCTION

Annual radial growth of Lithuanian oaks has been investigated in Dendroclimachronological laboratory since 1971 and is constantly being supplement with the newest data. According to the national forestry assessment data from 1st January, 1991 oak stands hardly make up 1.7 % of all forests. This resulted not the lack of growth sites for oaks, low increment or value, but on the contrary - great demand for oak wood determined the cut of oak stands in Lithuania. When selecting temporary experimental plots it was hard to find the ones that cover the whole territory of Lithuania and that would be close in age. Most of the oak stands have survived in the richest clayey soil of Middle Lithuania.

MATERIAL AND METHODS

For the study of the radial growth of oak 44 experimental plots were selected and up to 75 samples were taken from each of them by increment borer. The samples (early and late separately) were measured utilising an MBS-2 microscope. The comparison of growth in different plots shows that the picture varies and this impelled to look for the reason as this could not be explained by diversity of habitats and rarest types. The reason was looked for in the soil : it was by a geological bore as deep as possible, the levels of soil and ground water were determined. At the same time samples were taken in order to supplement the earlier made series and to evaluate the results obtained. This kind of investigation was made in 24

experimental plots. For the determination of the influence of age, relief, selective categories on radial growth, samples were also taken from young trees of different selective categories. In the stands where the relief is distinctly expressed (> 10-20 m), samples were taken both from trees growing on top of a hill and at the foot of it. For the evaluation of change in long-term growth dynamics ten-year means were calculated for the whole tree growth period.

RESULTS AND DISCUSSION

One of the ways to determine peculiarities of radial tree growth is to calculate similarity (synchronism) percentage among the objects of comparison (Bitvinskas, 1974). This kind of calculations were made between all 44 experimental plots. And only the evaluation of the soil investigation data explained the reason why some oaks growing in a further distance have more similar growth course dynamics than the ones growing nearer. The most similar growth dynamics (>75%) is characteristic to oaks growing in the clayey soil where the ground water is deeper than 5 m. A very different growth course is characteristic to oaks if sand is under the surface clay layer though ground water levels are deeper than 5 m. Oaks grow similarly in the soil of different mechanical structure in case the ground water is found in the depth of 1.2 - 1.5 m. The described results allow an assumption that synchronism of oak growth is associated with the hydrological regime in the soil of a certain mechanical composition (Kairaitis, Karpavicius,1996). In order to reveal the growth course peculiarities the average of 10 year growth during all the growth time in the stand was calculated. This way allows to better reveal the peculiarities of the growth course, and yearly growth fluctuations are being avoided. Comparison of ten year dynamics of oaks growing in the same stand (Fig.1) leads to the inference that rather even growth course is characteristic to oaks growing on top of a hill (experimental plot No. 24). For those growing at the foot long-term growth fluctuations were much more expressive.

In order to reveal peculiarities of radial oak growth in Dukstai forestry 9^{th} quarter (Fig. 2) the trees of both oak forms were cored separately. The curves of the growth course show that there ere no considerable differences in radial growth. In the same stand the trees belonging to the negative (dwarfed) tree selective category were cored separately but considerable differences in the growth course were not noticed either.

The data from the experimental plots 16, 27 and 43 indicate that the hydrological regime of soil determines the course of the oak radial growth. Though the mechanical soil composition (sand, sandy loam) of the plots as well as the level of the underground water are similar, the stands of plots no. 27 and 43 grow on the banks of lakes, while no. 16 - on the plain.

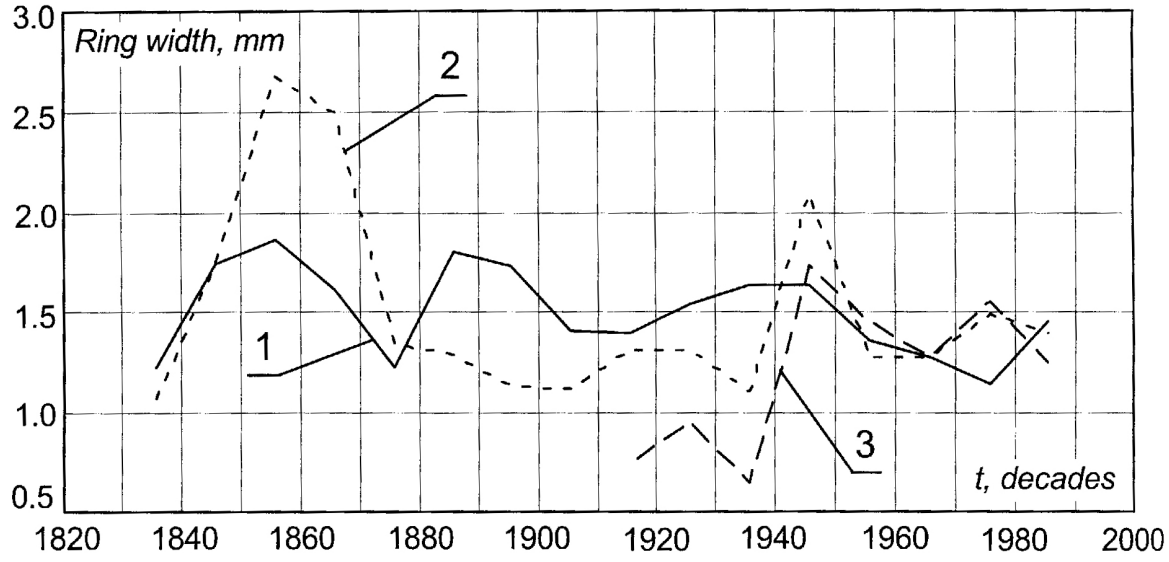

Figure 1. The course of the average ten years growth of test plot no. 24 : 1 - on top of the hill (normal), 2 - at the foot the hill (normal), 3 - at the foot (young trees)

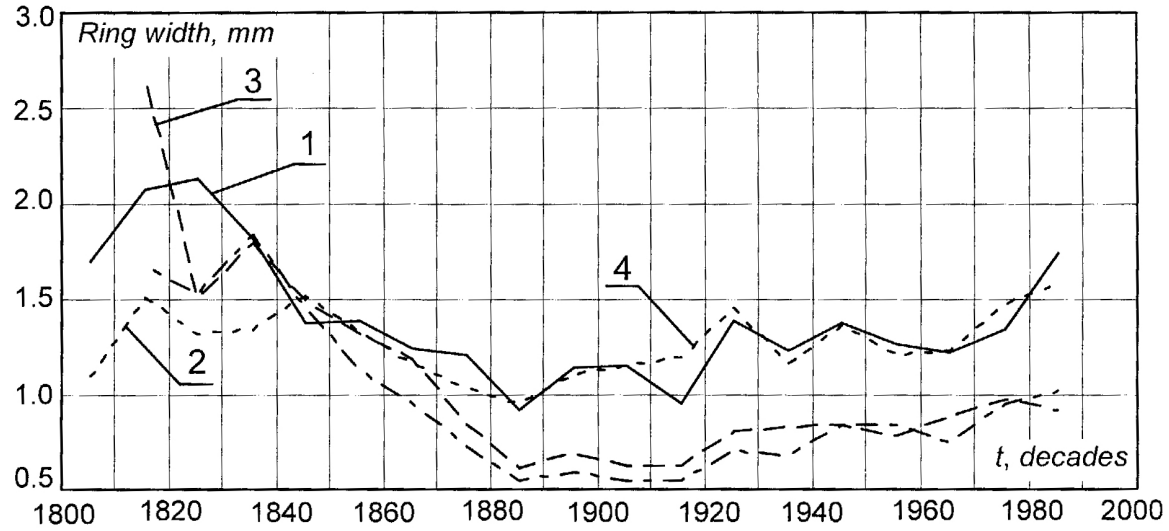

Figure 2. Dynamics of the radial growth of the early and late forms of oak Dynamics of the radial growth of the early and late forms of the oak (Quercus robur L.) at test plot no. 33:
1 - early form and 4 – late form (both normal);
3 - early form and 2 – late form (both choked)

According to results of R. Pakalnis investigations the fluctuations of lake water level have influence on tree radial growth (Pakalnis, 1975). Oak stands growing under macro relief conditions are also characteristic of specificity in the course of radial increment. The

percentage of similarity amogst the experimental plots and amongst individual objects is very low.

The results of the investigations will serve for the formation of long-term oak ring series.

CONCLUSIONS

Synchronism of oak radial growth, growth response to climatic factors (temperature, precipitation), the mechanical soil composition and the depth of the underground water influence nature and changes in long-term growth dynamics.

Oak (Quercus robur L.) stands even growing in different mechanical soil compositions where the ground water levels are high (up to 1.5 m) distinguish themselves for the most even long-term radial growth prognosis. The most distinct growth dynamic changes are characteristic to stands growing in hard clayey soil or in the soil of a lighter mechanical composition where the ground water is found in the depth of 2.5 m or deeper.

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