

The Influence of Climate Factors on the Length of the Crown and Spatial Distribution of Oak Trees (*Quercus Frainetto Ten*) to the Total Annual Increment in Culture

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Abstract

All climate aspects have been analyzed, affecting the crown and the growth of the oak trees (*Quercus frainetto Ten.*) and studied, both biotic and non-biotic factors, in the Šumadija region. The cultures Oak trees (*Quercus frainetto Ten.*) were studied on five experimental fields, aged 30, and 50, and 70 years and it was found

- 1) long crowns
- 2) medium crowns
- 3) short crowns

The analysis climate factors on the complete growth calculation also followed. The stand structure, thickness, height, structure by basal area and volume structure are shown. Curved lines are put as a significant indicator. In the end, there's the conclusion and the process of tending for each experimental field, as well as the suggestion for better growth. One of the goals of the research was, to see how Length Affects Crown with Different Age On the Growth of Oak Trees.

Keywords: Crowns; cultures; Oak; Šumadija

Introduction

Oak trees (*Quercus frainetto Ten.*) cultures on the territory of the Republic of Serbia spread in numerous natural conditions, depending not only on geographical, orographic and climate factors, but also on geological base, terrain type and herbal communities [1]. Black pine cultures can be found on the ground like limestone, dolomite, serpentine, silica stone, with high influence on their structure in terms of certain floristic elements, habitat and the stand solvency [2]. Therefore, black pine cultures became very important in forest theory and practice. However, it is of no slight importance that huge part of oak cultures is located in other habitats, with the so-called ecological value, of rather higher value. In other words, oak cultures are found in the terrain with all soil potential completely used [3].

The area oak cultures in Serbia occupies 32.500 ha, which represents a huge surface, considering one species only. The total (*Quercus frainetto Ten.*) wood volume occupies 2,099.385 m³, which has great potentials, ecological and economic value. Current volume growth in the past 10 years was 1,435.154 m³. All these

facts are considerable and encouraging, although they require an important scientific inclusion yet (National forest inventory) [4].



Figure 1: Areas of research are shown in 3 experimental fields where research has been conducted.

Material and Methods

The research area is forest management area of Kragujevac,

which consists of the forestry unit in Gornji Milanovac and the one in Kragujevac as well. Concrete measures of oak cultures were carried the area of Gruža, Lepenica and Jasenica forest, which belongs to the forestry unit of Kragujevac. The forest in Gruža-Lepenica area spread in the area of 2949 ha, of which 285 ha stands for the oak cultures (Forest Managerial Basis) [5], making 10 percent of the total number, mostly of which being of oak cultures.

Description of the habitats: The area of research spread in the altitude of 400-470 m, with the slopes from gentle to moderately steep by 5 to 20 degrees, with western, and southwestern exposure. The forest cover is partially represented with unfavorable process of humification, the dead forest litter, considerably identified substrate of clay, the ferruginous and quartz sandstone, as well as the serpentinite.

Since the oak cultures spread relatively on large surfaces, and obtain adequate and relevant results, the Methodology of forestry research is applied. Presently there are three 3 permanent sample plots on 25 acres (50 m x 50 m) as the best aspects of forest science experimental field sample system, square-shaped, best reflecting the situation on the ground [6]. General hectare factor comes to 4, since in forestry all sizes are measured in hectares. Diameters are measured in all the trees, twice crossed and the result was given in the arithmetic mean. All the trees were measured with a height altimeter by Blume-Leis's. Based on the height of the trees, the altitude curve and the volume of trees for each field were calculated throughout the experimental field. In each instance, drilled thickness is 5.

Climate Šumadija and Explored Areas

The Šumadija climate can be described as moderate-continental with more or less pronounced local characteristics. The spatial distribution of climate parameters is conditioned by geographical position, relief and local influence, precipitation, as a result of combination of relief, distribution of air pressure of larger proportions, exposition of urbanization, etc.

The climate of the explored area is rather continental to moderate continental. Climatic conditions differ from one another depending on altitude, relief and exposure. The mean annual temperature is 11.8° C. The freeze-free period is 180-215 days. The period of sunshine is 2100 hours a year. Maximum and minimum temperatures ranged in their absolute amount of 41.7° C - (-37° C). It can be concluded that there are high temperature fluctuations. The hottest months are July and August, and the coldest January and February.

Mean annual **precipitation** amounts to 681,9 mm, and the most frequent winds and baskets are winds. There is a negative

impact of snow and wind, snow and wind fractures are noticeable. (Data Source: meteorological yearbooks RHMZ.)

Presler's drill is used to take samples to calculate the growth. Finally, the most important thing is the length of the red crowns, with the aforementioned altimeter, in order to see their effect.

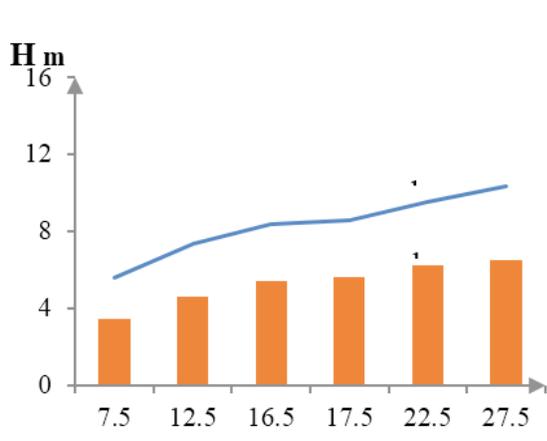
One of the goals of this work is to study the relationship between the culture of black pine of different ages and different soil types, and together with its impact on their growth. Thus, in accordance with the methodology of research in forestry, in each experimental field soil profiles were excavated, in order to perform a complete analysis of the soil physical and chemical properties, and to determine the type of soil.

As far as the ecological issues in the research area are concerned, they can be divided into two factors: abiotic and biotic. Ecological factors occurred to be complex and with constant impact on the culture on big black pine. The first one include the impact of all living beings, plants, animals and others, the abiotic factors include (the orographic factors), climate and soil. The influence of man (anthropogenic factor) also occurred as an important factor, [7] In order to study the floristic composition and phytosociological determination of the origin of the study stands, phytocoenological capture at all sample plots was obtained by the method of Braun-Blanquet's.

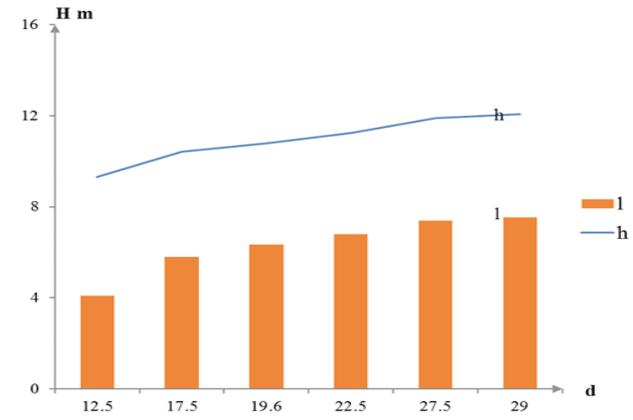
Concerning the crown of trees, especially those of conifers and black pine which should be fostered in his youth, since later in the age of the tree it would be difficult to be repaired. Black pine tolerated care measures in a rather better way that the white pine, on account of specific features of the black pine [8] Some scientists believe that the issue of crowns of trees are the most important question in the modern silviculture.

Results

The results showed that the cultures of oak in the research area have shown that a significant and important influence on the growth of the crown of trees, because the decreasing length of the crown, and reduced growth, with increasing length of the crown, and increases the gain, but only to some border. For too long and with large crowns, trees have a higher number of branches, thus ingrown knots, in turn, indirectly reduces the power increment tree. It has been shown that the optimal length of the crown of 1/3 to 2/3 the depth of the tree. Below 1/3 length tree growth is reduced, because simply lower the assimilation apparatus. Over 2/3 of the length of the tree growth is gradually decreasing due to a moment ago that reason. In the following charts, the average length of the crown, and experimental fields were given in the pictures, comparing it with the altitude curve from a given experimental field.

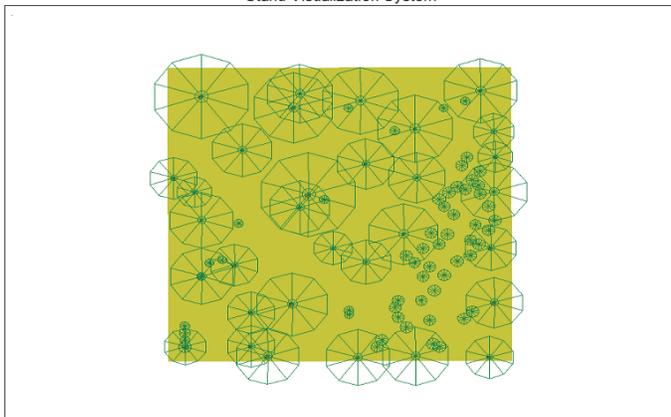


In Figure 2, we see, height curve of trees is marked in blue-line, and orange color, is crown length in the first experimental field. In the first part of the graphics, with the growth curve of height, increasing the length of the crown. Since it is a young culture, it shows that that in young trees, the orientation for the light, the higher floors in the stand. In the second part, for the crown, has a gentler slope. This means that in the higher trees differentiation and growth of a particular crown occurred, therefore the increase increment.



In Figure 4 the second experimental fields, it is evident that the amount height curve of trees is marked in blue-line, and orange color, is crown length is given the length of the crown in the second field of view. It can be seen that the greater the difference between the height curve and the length of the crown curve than in the first experimental field. The reason for this is tending and thinning, but quickly and increase in the length of the crown was found, with increasing length of crown, grow and increase.

Stand Visualization System



In Figure 3 shows the spatial distribution Oak, S cultures trees in the first experimental field.

Explanation: The figure shows the spatial distribution of oak cultures trees in the first experimental field. This culture is 30 years old, and it is normal to have the largest number of trees in relation to the culture of 50 or 70 years. Due to the large number of trees, there is a competitive struggle for a better position in a stand of trees, the struggle for light, which is natural.

Stand Visualization System

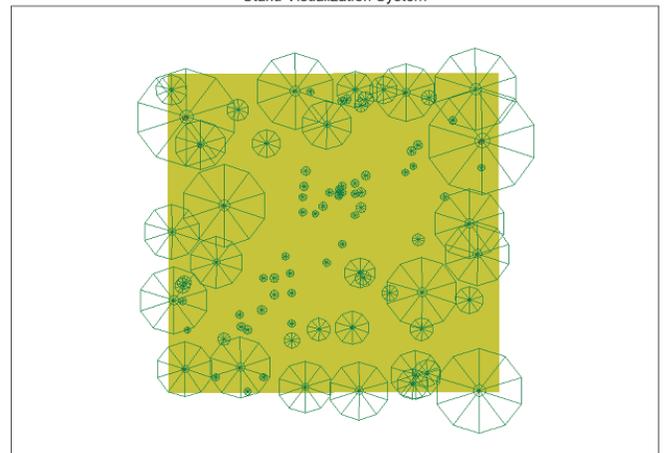


Figure 5: The figure shows the spatial distribution of Oak's cultures- trees in the second experimental field.

Explanation: The figure shows the spatial distribution of Oak's cultures trees in another experimental field. This culture is 50 years old, and it is normal to have a smaller number of larger trees in relation to the culture within 70-year-time, and a small number in relation to the culture of the first experimental field within 30 years. The culture with a thinning-care measure produces long and higher crown.

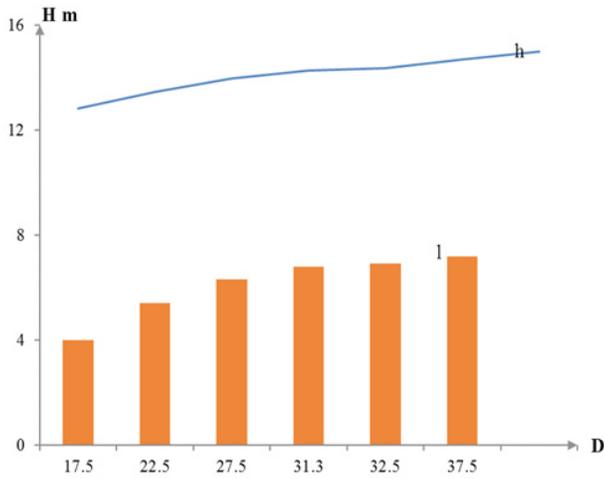


Figure 6: In this third, experimental field - height curve of trees is marked in blue-line, and orange color, is crown length. Greater heights were noticed, due to an older stand. Length crown-orange color, do not have much higher values than in any other field because they are not taken appropriate care in the time. Care measures affect the increase in the length of the crown. It proved that the curve length of the crown is gradually increasing, until the end.

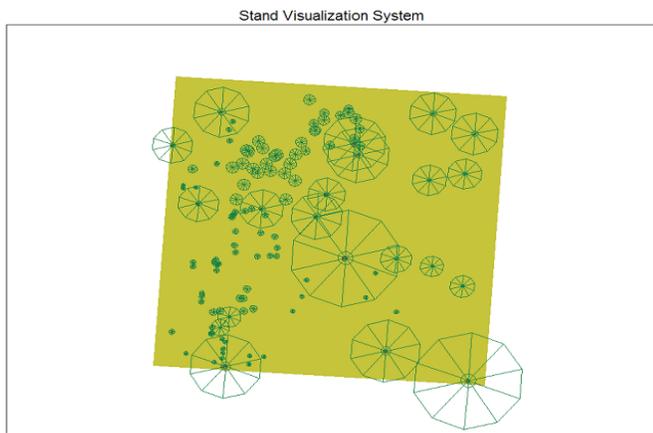


Figure 7: The figure shows the spatial distribution of Oak,s cultures - trees in the third experimental field.

Explanation: The figure shows the spatial distribution of- Oak's

cultures - in the third experiment field. This culture is 70 years old, and it typically has the smallest number of trees, with two thinning's during the life of culture and smaller points marked with young oak cultures trees.

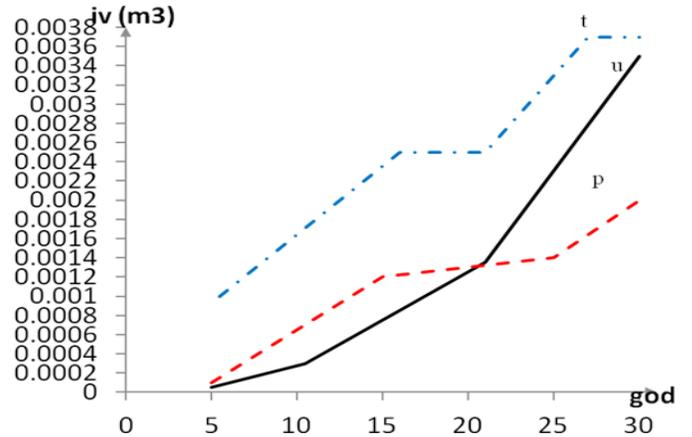


Figure 8 : Experimental field 1 (30) years - Volume growth (Black colour line) - overall increment (Blue colour line) - average increment (Red colour line) - current increment

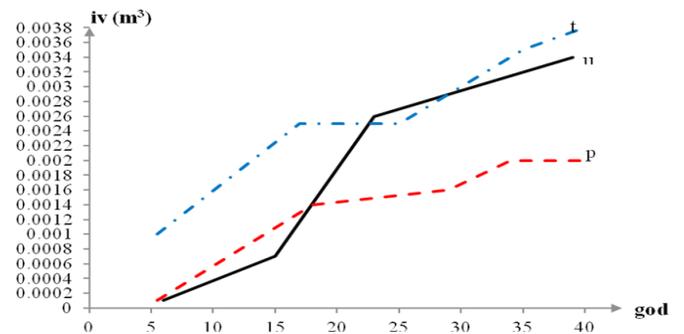


Figure 9 : Experimental field 2 (50) years - Volume growth (Black colour line) - overall increment (Blue colour line) - average increment (Red colour line) - current increment

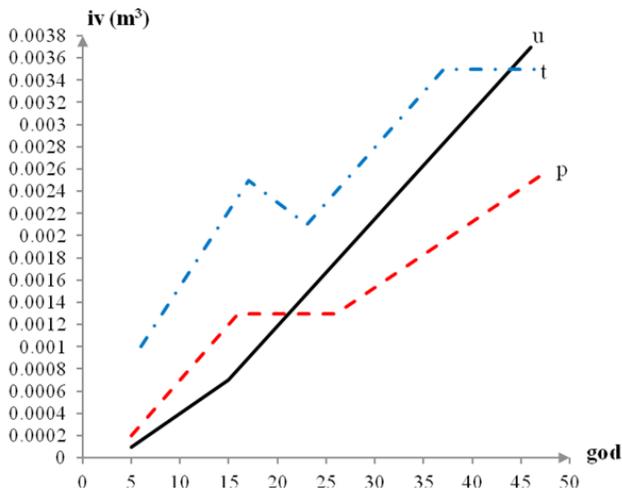


Figure 10 : Experimental field 3 (70) years - Volume growth
 (Black colour line) - overall increment
 (Blue colour line) - average increment
 (Red colour line) - current increment

Discussion

Based on the above, it can be discussed over the great influence is climate factors, the size of the Crown-canopy of black pine, as well as the spatial distribution of trees, all together affecting the total volume increment. Great influence is due to youth culture of black pine, a large number of trees in the same area, as well as the fact concerning the ancient cultures, with a large number of trees, the less the crown, and lower the current volume in growth. In the cultures over 70 years, since the small number of tree and larger crowns, it had a direct impact on the volume increase. In the culture of 50 years, the growth was higher than in the culture of 30

years, and less than that of the culture of 70 years. But that does not mean that it will steadily gain the increase while aging. A lot of the older culture growth declines due to the fall of the overall physiological potential of trees.

Conclusion

Black pine, based on the results obtained, showed a certain dependency and correlation between the length of the crown and the increment of black pine in the research area, with the decrease of the length of crown, dropping altitude curves, falling growth as in the fifth experimental field. Black pine is a species which has the thick and long increment of the crown with outstanding beauty only when applying the appropriate measures in the future. Proceeding thinning, the black pine will indirectly develop the increase in the length of the crown.

References

1. Jovanović S (1988) Forest growing, Classbook, Science book, Belgrade p:200-230.
2. Arbez M, Millier C (1971) Contribution a etude de la variabilite,geographique de Pinus Nigra Arn. Annales des Sciences Forestieres. 28:23-49.
3. Tomanić L (1968) Black pine on Goč, structure, growth productivity and the management, Master work Belgrade p: 55-60
4. National forest inventory (2012).
5. Forest Managerial Basis (2010).
6. Durkaya A, Durkaya B, Unsal A (2009) Predicting the above-ground biomass of calabrian pine (Pinus Nigra) stands in Turkey-journal of biotechnology Bartin Turkey 8: 2483-248.
7. Cedro A (2006) Comparative Dendroclimatological Studies of the Impact of Temperature and Rainfall on Pinus nigra Arnold and Pinus sylvestris in Northwestern Poland. Baltic Forestry 12: 110-116.
8. Assmann E (1961) Waldertragskunde, Munchen-Bonn-Wien 20: 58-66.