GREYISH OAK AND PUBESCENT OAK FORESTS OF THE TELEORMAN PLAIN IN THE CONTEXT OF CLIMATE CHANGES AUXOLOGICAL RESEARCH

Matei Florin*

**University ,, Ştefan cel Mare" of Suceava, Universităţii Street, nr.13, 720229 Suceava, Romania*
Forest Research and Management Institute (ICAS), 128 Eroilor Bvd, 077190 Voluntari- Ilfov, Romania

Abstract

Greyish oak and downy oak forests are located in the east and southeast of Teleorman Plain. Greyish oak stands occupies an area of 346.9 ha and those of downy oak a total area of 20.1 ha. The purpose of this research work was was to know the auxological greyish oak and pubescent oak stands in Teleorman Plain, as a result of their current status in the context of sustainable forest management and climate change impacts in the south and south-east of our country. The main objectives of this research were: development and statistical analysis of tree-ring series for the greyish oak and downy oak of Teleorman Plain and the identification and evidence of that climatic factors which are exhaustive for the biosynthesis process of the two studied species.

The research has revealed that the climatic factor with the character most strongly limiting for the biosynthesis of trees in Vlăsia Plain is the rainfall , having a positive influence (direct correlation) as compared auxological both greyish oak and for downy oak too. Temperatures have a negative influence (inverse correlation).

Keywords: *greyish oak*, *downy oak*, auxolugical, climatic factors**.**

INTRODUCTION

Knowing the response of trees under the growth processes for the variation of climatic factors is a prerequisite substantiation and development for management strategies and development for sustainable forestry.

The subject of this paper is part of the tendency to acquire new knowledge concerning the relationship between radial growth processes and climatic factors, the variability of response dendroclimatic *greyish oak* and *pubescent oak* trees of Teleorman Plain. Presently, the forest area of Teleorman Plain has 27688 ha, which 21392 ha of state forest and 6296 ha of private forest. The forests of *greyish oak* and *downy oak* are located mostly in the east and southeast of Teleorman Plain. According to forest management, the first occupies area of 346.9 ha, while downy oak stands totaling 20.1 ha area.

The purpose of this research work was reveal the auxological *greyish oak* and *downy oak* stands in Teleorman Plain, as a result of their current status in the context of sustainable forest management and climate change impacts in the south and south-east of our country.

The main objectives of this work were:

- development and statistical analysis of tree-ring series for the *greyish oak* and *downy oak* of Teleorman Plain;
- identification and evidence of climatic factors which are exhaustive for the biosynthesis process of the two studied species.

MATERIALS AND METHODS

The research has been conducted in *greyish oak* and *downy oak* stands in Alexandria Forest Range, III-rd management unit, parcel 14, precisely in Dandara forest.

To achieve the proposed objectives was placed in this paper a sample surface of 1 ha area, of a permanent character.

In Teleorman Plain climate has a transitional character, representing an area of interference between oceanic western influences specific of Oltenia Plain, with the sub-Mediterranean in the south and eastern continental aridity specific of Baragan Plain. The non-periodic climate variations were recorded particularly in rainy years, when the fall-out were almost double, the annual amount of precipitation compared to average annual 947 mm that in 2005, to 525 mm annual average. Also in dry years, the quantities taken were sometimes less than half of the annual average, respectively 247 mm in 2000.

In order to determine the climate influence on increases, were used the climate data from the period 1945-2008, from Alexandria weather station, located about 25 kilometers from the study area, characterized by a temperate, transitional, with some nuances continental excessive in Bărăgan Eastern Plain. The annual average temperature at the meteorological station is 11.1°C, and the average amount of annual precipitation is 536.6 mm. The analysis of climatic conditions, where the two species of oaks grow, is shown in the diagram Walter-Lieth (Fig. 1). The correlation between temperature and fall-out at this meteorological station, highlights only dry phenomena.

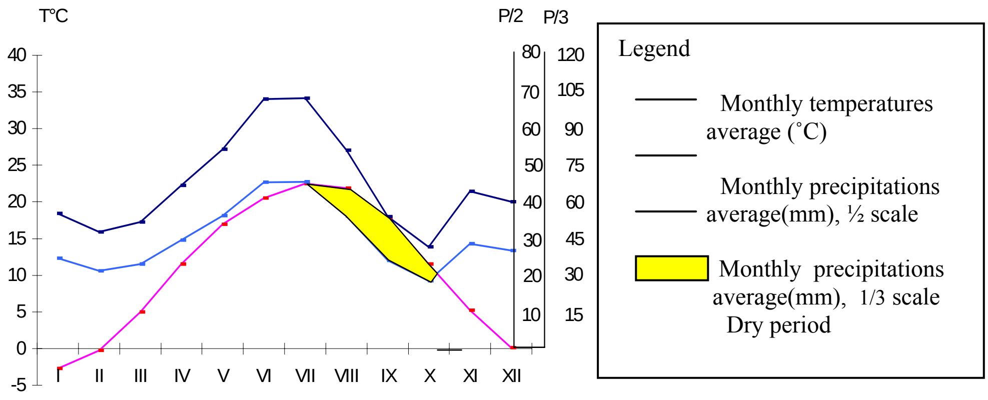

Fig. 1. Walter-Liteh climate diagram, at the weather station Alexandria, during 1961-2008

The global climate changes manifested by increasing average air temperatures and changing ranifall regime and leaded in recent decades to an increase in drought affected areas both in our country and worldwide (Sandu et al, 2010).

The annual ring width varies from year to year in a more or less regularly manner, a big part of this variability being attributed to climatic conditions (Frits, 1976). Description of time series represented by the temporal variation of annual ring width was achieved through a set of specific indicators for time series (Popa, 2004).

For dendrochronological research were chosen trees of the upper positional classes and around the diameter of the upper and central base area. The cores were extracted from a height of 1.30 m, with a Pressler drill 40 cm long and 5 mm inner diameter.

Tree-ring series were prepared according to dendrochronological procedures known (Frits, 1976, Cook, Kairiukstis, 1990, Popa, 2004).

The measurement of annual rings was performed with digital Lintab, of a 0,001 mm precision of (Rinntech, 2005).

The growth series were using the TSAPwin software interdatat and reliability verification was done with COPOCHA software (Holmes, 1983, Cook et al., 1995). The standardized index series was obtained through the biobalanced average ,using thus ASTRANwin software (Cook, Krusic, 2006). In the analysis we used standard dendrcronologaly series (Fig. 2 and 3).

RESULTS AND DISCUSSION

The *greyish oak* and *downy oak* tree-ring series developed for the study (Teleorman Plain), covers the period from 1947 to 2008 for *grayish oak*, 1945 to 2008 for *pubescent oak*, both species are in Dandara forest.

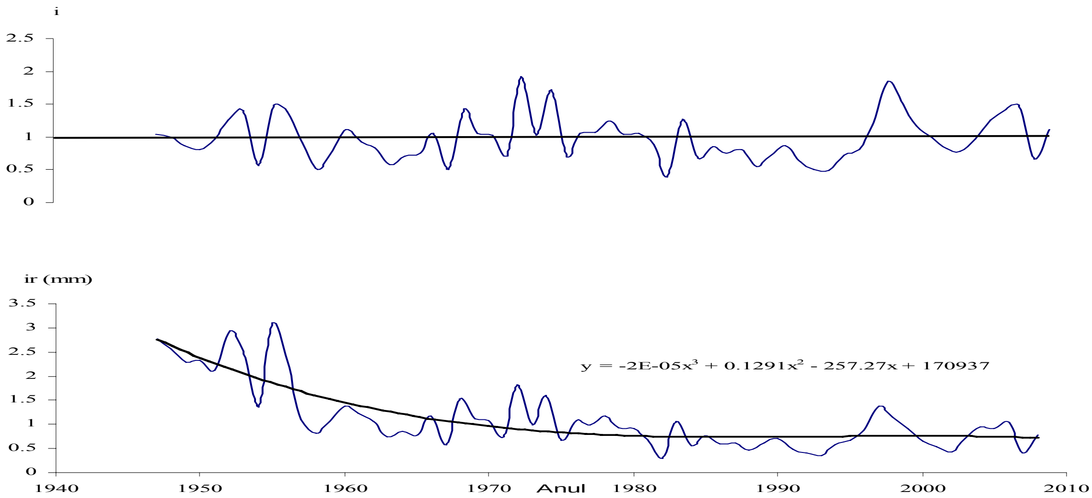

Fig.2. Radial growth dynamics and the dendrochronology series for *greyish oak* , the sample surface Dandara, Range Forest Alexandria

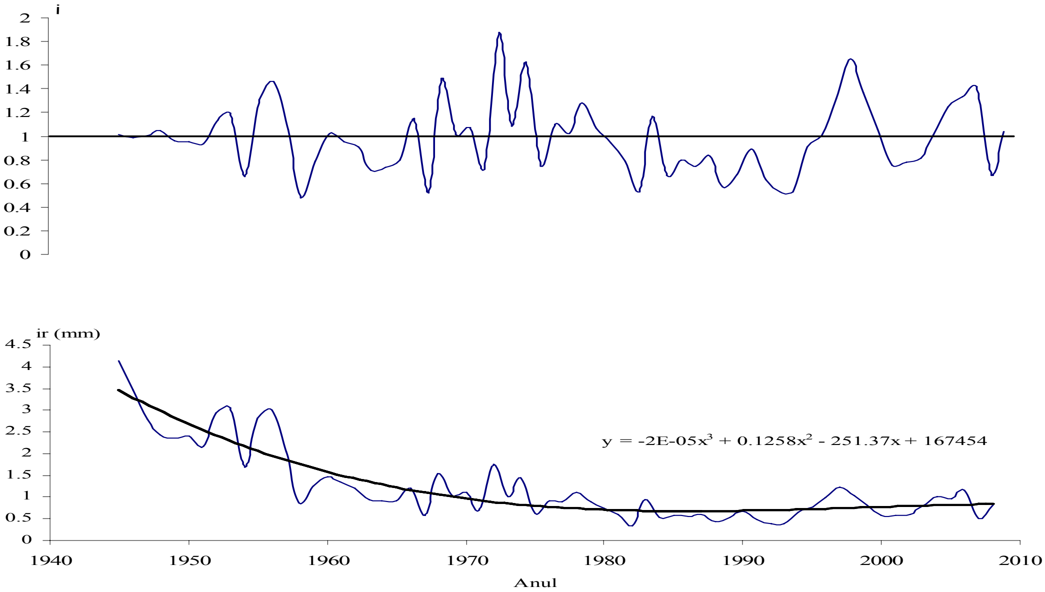

Fig.3. Radial growth dynamics and the dendrochronology series for *pubescent oak* , the sample surface Dandara, Range Forest Alexandria

Analyzing the tree-ring series (figures 2 and 3), we note that excessive droughts in the periods 1988-19994, 2000-2004, 2007 had negative influence over the trees increases. For instance, the sample surface of *downy oak* in Dandara forest, the growth indices for the period 1988-1994 between 9.4 and 47.1% decrease, and if signs of growth of the *greyish oak* decline in 19.7% and 50.8%.

It also notes that between rainy years and radial increases there is a synchronicity, effects of rainfall were recorded by trees in the same year and the next year. In 2005, when was recorded the highest amount of rainfall at the meteorological station Alexandria, respectively 1067,2 mm, the growth index increased with 33,3% in 2005 and 41,6 % in 2006 at *downy oak* and for *grayish oak* with 41,9 % in 2005 and 48,2 % in 2006.

As it is known, the cyclical variation of radial increases should be considered to track the effect of silvicultural interventions in the stands (thinning treatments, pruning) or influence of some disturbing factors such as insect outbreaks, grazing, industrial gases, etc.. (Giurgiu, 1967).

The main climatic parameters used in the analysis were monthly and annual average temperature, monthly average and annual precipitation, aridity index *de Martonne.*

In this paper, the influence of climatic factors on radial growth of *grayish oak* and *downy oak* trees, reflected in the structure of the most important and easily determined auxological indicator, respectively ring, a correlation analysis was proved as especially helpful (Giurgiu, 1979). It provides useful information about type, intensity and direction of association with the growth indices of climatic parameters, examining the influence of a particular parameter on growth, as shown in Table 1.

Table1

The correlation coefficients of indices of tree growth and climatic factors for the gray oak and pubescent oak, Dandara sample surface, Range Forest Alexandria.

Climate factor	Species	
	STB	STP
Average annual temperature	-0,046	-0,087
Previous year's annual average temperatures	-0,142	-0,160
March temperature	-0,044	-0,174
Annual average rainfall	0,306*	0,325**
Average rainfall the previous year	0,227	0,216
Precipitation from March to October	0,293*	0,313*
Precipitation from April to October	0,305*	0,326**
Precipitation from October to December last year	0,082	0,044
Precipitation in September last year	0,276*	0,260*
Precipitation from December to May	0,063	0,072
Precipitation from January to June	0,146	0,133
Annual aridity index *deMartonne*	0,257*	0,323**
Aridity index *de Martonne* of the months March to October	0,298*	0,315**

STB - *greyish oak*;
STP - *downy oak*;

* - significant correlation, the probability of transgression 0,05;

** - distinct correlation significant transgression probability 0,01.

The analysis result of correlation coefficients presented above permit the following identification of regularities concerning the relationship of climate-growth stands of trees studied, listed below.

- For both the *greyish oak* and the *downy oak*, the rainfall is the limiting climatic factor with the strongest character for the biosynthesis of trees (growth).
- For both species are found closer correlations between precipitation and increases only between air temperature increases, hence influence so prevalent on the climaticfactor to increases is rainfall;
- There is positive influence of precipitation fallen in September last year, the correlations are strong in this case. In this month, when the increase in diameter is over, it is possible to form, for the most part, the substances used by trees back next year. It confirms, if so, that the previous year's climatic conditions have a decisive influence on the formation of the next annual ring.
- The correlation coefficients, significant for *greyish oak* and distinctly significant for *downy oak*, emphasize the determining influence on the deposition of biomass per tree trunk, the rainfall during the year increases were formed.
- The precipitation during the growing season (March, April-October) affect increases, both *greyish oak*, but especially for *downy oak*.
- The semnficative correlations for greyish oak and distinctly semnificative for *downy oak* between dynamics of change increases and annual aridity indices *de Martonne,* also in March and October, shows that the latter are synthetic climatic indicators that can be used effectively to characterize the biosynthetic processes of the two species of oak.

CONCLUSIONS

As for the *greyish oak* and *downy oak* it was no evidence that rainfall is the lawfulness of nature climatic factor most strongly limiting for the biosynthesis of trees, having a positive influence (direct correlation) as compared auxological. Of a particular importance to the variation of biomass deposition on tree trunk are fallen-out during the growing season. Also the rainfall in September last year have positive influence on growth.

The temperatures have a negative influence in auxological relation.Thus, the average annual temperatures are statistically significant.

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