THE RED OAK (QUERCUS RUBRA L.) FROM ROMANIA'S WEST PLAIN

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Abstract. *Red oak is a native North American species that was cultivated in Europe from the XVII century onward firstly in ornamental purposes and then in forest plantations. At present, the species occupies in our country a surface of 2.500 ha and is renowned for its rapid growth. The present paper has characterized red oak stands from the West Plain taking into account their environment and stand conditions. In order to achieve this, data from forest management plans were used from the period 1995-2008 from 13 forest districts located in this area. Red oak stands occupy a surface of 474 ha in this area (4%), especially in Tinca, Oradea, Radna and Săcuieni, and are situated at altitudes between 120-300 m. This species appears in field and slope areas, on preluvisol, luvisol and eutric cambisol soils and in Quercus mixtures, oak stands or Turkey oak stands. Tree pruning is low towards average, while the composition is mixed or in dense clusters. The structure is even-aged and the production class is average and average towards superior. The knowledge of these characteristics is very important for adapting the best practices in forestry and for the protection of best stands of the read oak, especially because this area (the West Plain) is one of the main area where the species is present in Romania.*

Keywords*: red oak, stands, site conditions, soil, pruning, current annual increment.*

INTRODUCTION

Fields and meadow occupy 36% of our country's surface. The West Plain is located in the country's west extremity, with the West limit represented by the Hungarian and Serbian borders. This field has the shape of a narrow band (15-75 km), while its relief is distributed on low areas and high areas from North to South. The climate is temperate-continental with oceanic influences and average annual precipitations between 500 – 650 mm/year (ARDELEAN, *ET AL*., 2008; COLESCA AND CIOCOIU, 2013; SERBAN, 2006).

The type of vegetation is determined by relief and climate conditions. From the entire surface occupied by forests in Romania, 10.9% are located in the field area (ANDRONACHE, *ET AL*., 2017; SCARLAT, *ET AL*., 2011). The vegetation from the West Plain is included in the silvosteppe which includes oak species.

Red oak is a native North American species and has started to be cultivated in Europe from the XVII century. The species was initially used in ornamental purposes (botanic gardens) and was later introduced in forest plantations. The species occupies a surface of 350.000 ha in Europe, with 2.500 ha in our country (NICOLESCU, *ET AL*., 2018; SOFLETEA AND CURTU, 2007). The species is characterised by a 60% faster growth when compared by holm (Quercus petraea Liebl.) and pedunculated oak (Quercus robur L.) (MAGNI, 2004). In addition, the species has a high ecologic adaptability; as such, it vegetates on both tropical climate areas as well as in those with Atlantic or continental climates. As it does not have increased soil property requests, red oaks vegetate on well drained soils that are rich in clay as well as on compact soils or those that are frequently flooded (FERRE AND COMOLLI, 2020; REDEI, *ET AL*., 2007). These forests offer also an important ecosystemic functions, such as non-wood forest products (TIWARY, *ET AL*., 2020; TUDOR AND DINCA, 2019), forest fruits (TUDOR, *ET AL*., 2019; VECHIU AND DINCA, 2019), animals (TIMIS-GÂNSAC, *ET AL*., 2018) and biodiversity.

The present paper characterizes red oak stands from the West Plain based on their environmental and stand conditions.

MATERIAL AND METHODS

The data from 13 forest district was used and extracted from forest management plans realized during 1995-2008 (FOREST MANAGEMENT PLANS, 1995-2008). These plans contain the description of all environmental and stand conditions so that the red oak stand elements were firstly extracted (438 elements) with the Excel program, followed by the data that belongs to each element. The following stand and environment characteristics were analysed: distribution, altitude, relief forms, soils, forest types, mixture, pruning, stand structure, current growth and production class.

RESULTS AND DISCUSSIONS

Distribution of red oak in the West Plain

Red oak is present in all 13 forest districts from the studied area and occupies a surface of 474 ha (figure 1). This represents approximately 4% of the total surface of stands from this area. The forest districts with an increased presence of red oaks are Tinca (110 ha), Oradea (60 ha), Radna (51 ha), Săcuieni (46 ha), Lugoj (38 ha), Lunca Timișului (36 ha), Săvârșin (34 ha) and Timișoara (34 ha). Red oak appears generally in reduced percentages in stand compositions, with the exception or pure red oak parcels (22 surfaces, namely 8% of the total number of surfaces in which the species appears).

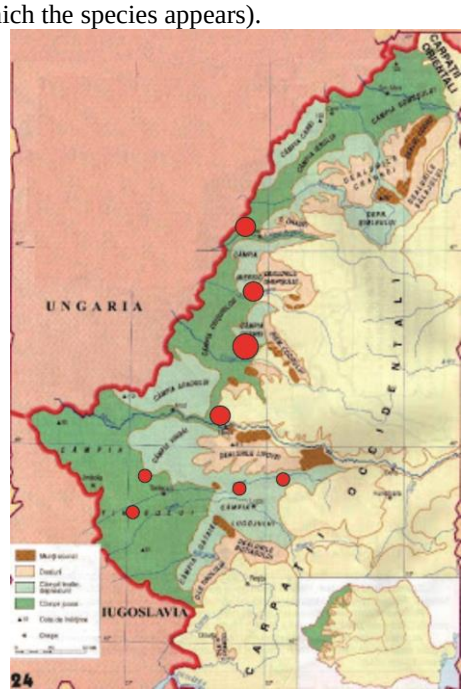

Figure 1. Distribution of red oak stands from Romania's West Plain (original map from http://geografiebranesti.blogspot.com)

The site characteristics of red oak stands from the West Plain

The altitude at which red oaks appear in this region is gathered between 90 m (Lunca Timisului) and 540 m (Radna). Generally speaking, the altitude characteristic for this species is of 120-300 m (figure 2).

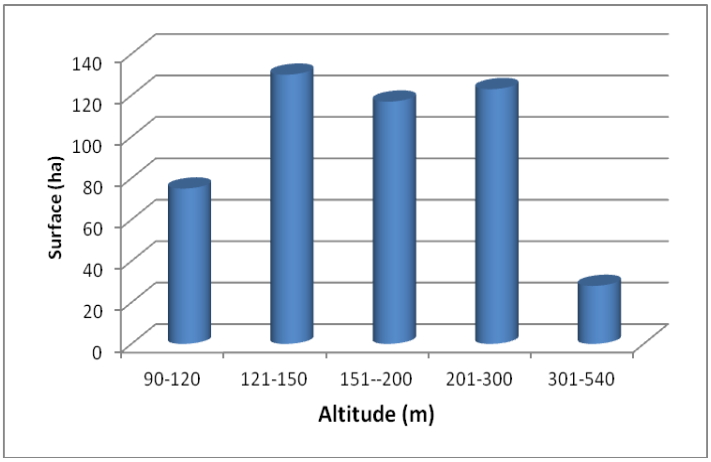

Figure 2. Altitude of red oak stands from Romania's West Plain

The relief forms specific for these stands are represented by plains (178 ha) and slopes (209 ha) (figure 3).

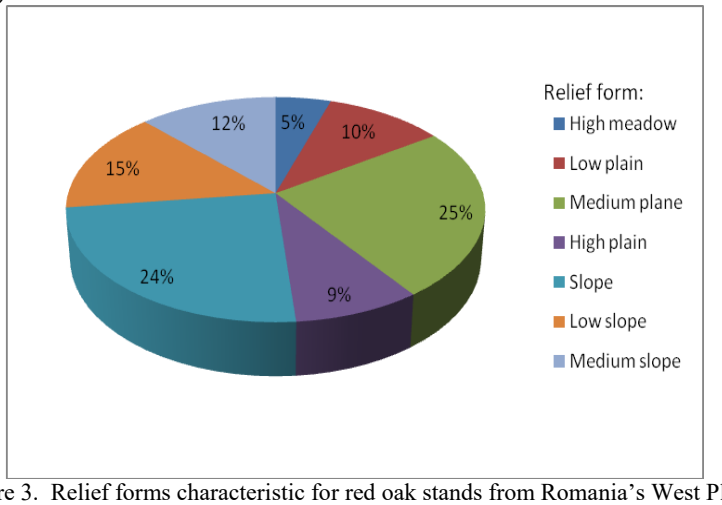

Figure 3. Relief forms characteristic for red oak stands from Romania's West Plain

The soils on which red oak vegetates in this area are represented by stagnic luvisol (205 ha), preluvisol (33 ha), eutric cambisol (30 ha), mollic-marnic preluvisol (28 ha), rodic preluvisol (22 ha) and luvisol (19 ha).

These soils are characterised by a rich microorganism's activity (DINCĂ, *ET AL.*, 2017; ONET, *ET AL.*, 2019A; ONET, *ET AL.*, 2019b), and by favourable chemical properties (CRISAN AND DINCA, 2017; DINCA, *ET AL.*, 2017) being advantageous for oak forests (CHISALITA, *ET AL.*, 2015).

Characteristics of red oak from the West plain

The forest types in which the red oak appears are: Normal mixture of holm, Hungarian oak and Turkey oak (72 ha), Normal field Turkey oak stand (47 ha), Oak stand on sandy fields from the forest area (28 ha), Normal plain oak stand of average productivity (24

ha), Depression Turkey oak stand (23 ha), Oak stand with Rhamnus frangula of average productivity (15 ha).

The mixture is composite, namely an intimate and grouped mixture (128 ha), in groups (38 ha), or large clusters (43 ha).

The pruning of red oak stands is low towards average (figure 4).

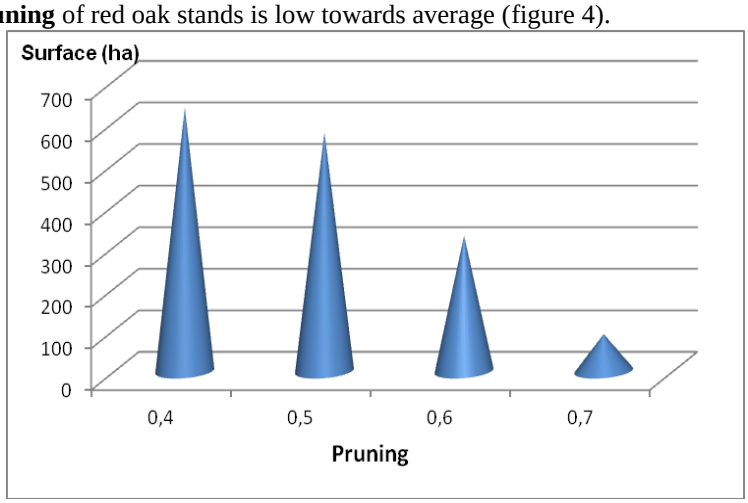

Figure 4. Pruning of red oak stands from Romania's West Plain

The structure of stands that contain red oaks is represented only by even-aged stands (298 ha) or relative even-aged stands (171 ha), unlike ash stands from the Southern Carpathians that also have a well-represented relatively uneven-aged stand structure (DINCA AND CONSTANTACHE, 2019).

The current growth of red oaks stands from this area ranges between 0.1 m^3/year/ha and 16.4 m^3/year/ha, with most mature stands recording growths higher than 1 m^3/year/ha (figure 5).

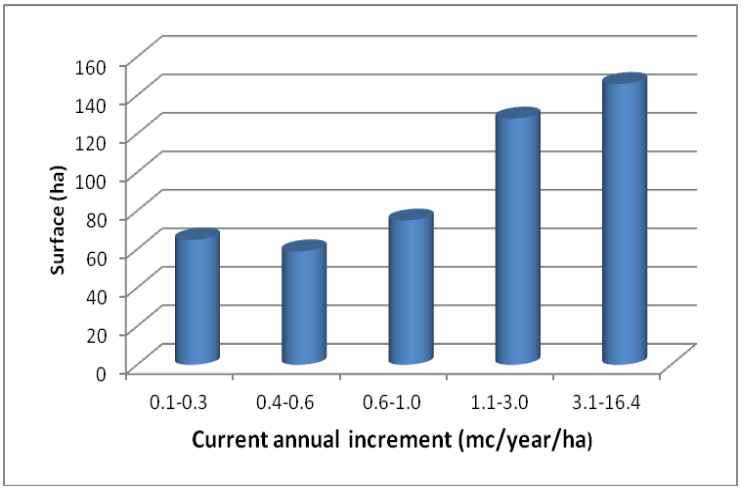

Figure 5. – Current annual increment of red oak stands from Romania's West Plain

Stand production classes (figure 6). The area is characterized by stands of an average production class (class 3=320 ha) and average towards superior (class 2=141 ha),

while superior and inferior production stands occupy narrow surfaces (class 1=7 ha and class 4=5 ha).

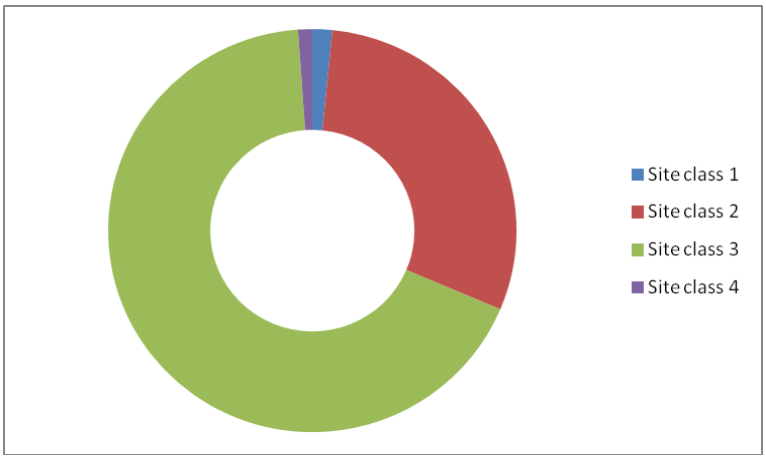

Figure 6. Site class of red oak stands from Romania's West Plain

CONCLUSIONS

Red oak is a species that was used initially only in ornamental contexts but was introduced in forest plantations. The species does not have high exigencies for environment or climatic conditions so that it can easily adapt to these conditions.

The red oak stands from the West Plain showcase characteristics that correspond to their ecological requests. They can be found at altitudes between 100-300 m, being situated in the field and low slopes areas. The most widespread soil type on which red oak vegetates in this area is represented by stagnic luvisol (205 ha). The majority of stands have an even-aged stand structure (298 ha) and average production classes (class 3=320 ha).

Red oak occupies a small surface in the West Plain (474 ha, 4%) compared to other areas where it is not represented at all or only on limited surfaces. As such, we can conclude that its presence in this area (especially due to climatic conditions and silvicultural traditions that are closely to the ones practiced in Central and West Europe) is quite significant. An increased presence was located in Bihor and Timis counties followed by Arad and Satu Mare, as well as in Tinca and Oradea forest districts

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