

Prospects for Olive Growing in Bulgaria

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Abstract: Reformation of global tobacco market and changes in the CAP of EU gives strongly influence of tobacco farm in Bulgaria. With sharpness is the question of non-uncultivated lands, which raises the question "whether the soil and climatic conditions of the Eastern Rhodopes to allow success to be cultivated olives?". Research in recent years has revealed that the olive is not only delicious food but also represents an important source of good health, and especially olive oil. Scientists say that because of these properties, olives and olive oil should be an essential component of every meal in one's daily nutrition program. The benefits of olive plants led us to thinking about adaptation and growing them in Bulgaria, as an alternative culture of the Eastern Rhodopes. To solve the target in study included Spanish olive varieties "Castellana", "Arroniz" and "Cornicabra", characterized by their high resistance to cold -16; -18°C. Based on the study conclusions are drawn regarding the adaptability of the varieties used on the territory of the Rhodopes in Bulgaria. It was found that the interception of olive trees is a medium to full rooting. Plants overcame adverse weather conditions with the least defeats are varieties of "Castellana" and "Arroniz". For a more comprehensive justification of the status and growing olives in Bulgaria continue to conduct periodic surveys of experimental fields, on their adaptability and reproduction.

Key words: Olive, adaptability, alternative crops, Rhodope Massif, Cultivation and Reproduction of olives in Bulgaria.

1. Introduction

The olive tree is the only one of its group with edible fruits, and it originates from tropical and central parts of Asia. It is polymorphic with an average size and furrowed bark. Like a tree from the Mediterranean area, dry tropical climate, it better adapts to extreme weather conditions, but requires highly intense light and oxygen-rich soil (Tsolov, 1991)

Olive trees are resistant to drought and disease. Their root system is resilient and is able to recover tree trunk, even when bole is frozen, burned or cut down. Have a clear preference for calcareous soils - limestone slopes and rocks. They prefer a light soils, poorer in nutrients and warm weather. To withstand -16 °C, disposable cold.

Based on morphological traits such as speckles on leaves, color of adaxial leaf surface, shape of leaf blade, leaf apex, shape of fruit, fruit length, fruit diameter and seed size were used to distinguish between closely related Russian olive varieties (Asadiar et al., 2012). The olive genotypes were also evaluated for the morphological traits namely leaf, fruit and endocarp characters (Zaher et al., 2011). Milotic et al. (2005) performed morphologic characterization of 64 olive trees using 23 characters of leaves, inflorescence, fruits and seeds.

The olive tree is unlike any fruit trees on their chemical composition, namely: sugar content is very low (2.5 - 6%); high fat content 17-30%, most especially oleic acid, which is monounsaturated and the presence of a bitter substance contained only in olives (Espasa, 1981; Serafimov, 1983; Dirk, 2000; Brezovski, 2003; Belaj, 2007).

Scientists say (Burr, 1999; Caragnaro, 2001; Drinkwater, 2006; PFTA, 2007) that due to their properties, olives and olive oil should be an essential component of every meal in one daily nutrition program.

The benefits of olive plants and peculiarities of their growing, challenge us to test and verify adaptability and keeping them in Bulgaria, as an alternative crop for the geographic areas of eastern Rhodopes Mountain.

The reasons for this study are fragmented and less fertile land and low yields of major crops due irregular rotation. This leads to the need of using poor soils and steep eroded terrain, and orientation of agriculture in Rhodopa mountain to eco-production and the requirements of the European market.

2. Material and Methods

2.1. Materials used in this study

The experimental study was conducted during the period 2013-2015 year and includes three varieties of olives planted a total area of three acres in the conditions of the Eastern Rhodopa region of southern Bulgaria, in the area of the municipality of Ivaylovgrad - 7 km. northwest of the city. To solve the tasks in the study are included the Spanish olive varieties - "Arroniz", "Castellana", "Cornicabra", characterized by its quantitative and qualitative indicators.



Variety "Arroniz" - This variety has a medium fruity aroma with hints of fresh vegetables, originating in Spain. Very original, bitter and spicy taste. A great feature of the hybrid is, that olive oil is distinguished

from other commercial oils and gives dishes specific spicy flavor.

Variety "Castellana" - oil produced from this variety is oily and very balanced and healthy. The predominant color of the oil is green, more or less intense, depending on the time of harvesting fruits and the degree of ripeness of the olive oil. The oils of this variety are fruity and aromatic, with aromas of grass, banana, hazelnut or mixed, sometimes left in the mouth spicy taste.



Variety "Cornicabra" - Cornicabra variety or Cornezuelo originates from Spain. It got its name because of the shape of the fruit -strong elongated and asymmetric like a horn, which continues to handle. The variety gives high oil yield, but is unsustainable fungal infections and diseases.



Attempts are displayed on a single methodology of the Polish experience, respecting all requirements established in practice as ways of betting; plotting, seeding and planting and care during vegetation. Used varieties are set on an abandoned uncultivated area, as required by the

standard scheme for cultivation, having met the requirement for the direction of planting from north to south. An exception is made only in hilly areas where it follows the slope of the hill in order to facilitate harvesting. Before planting, deep plowing and regolvane of 60-80 cm is carried out, and there are planting holes with dimensions 60x60x60sm created. Planting is a circuit diagram 6x6 m.; 24 pieces / acre to three acres - 72 pieces.

The trees are planted in May. During the planting was tabled 6-8 ml/1 tree Bio-stimulator of root growth "Tekamin Rice", i.e. 1 l in 1000 liters of water and fertilizing with "Uidstar" applied is, with a dose of 200-400 g / 100 liters of water as required after planting are plenty poured with water. Care during the reporting period of vegetation are to established guidelines and requirements.

2.2. Methods used in the study

The study used biometric and statistical analysis. During the vegetation are done morphological observations, reported to the commonly agreed methodology for field trials conducting. Early interception was reported at 10% and mass at 75% by of young trees interception. It is going to analyze the data for identifying the nature and degree of dependence between signs.

3. Soil and Climatic Characteristics

In terms of climate Rhodope mountain range entirely belongs to Continental-Mediterranean climatic region of Bulgaria and precise in its South-Bulgarian climatic sub-region. Ivaylovgrad municipality is located in the southeast part of the Rhodopes. The climate of the region is transitional Mediterranean. The municipality falls entirely within the Eastern - Rhodope physical - geographical area with an altitude moving from 70 to 700 m. The landscape of the region has well expressed low and valley nature. Ivaylovgrad is located in the extreme parts of the Eastern Rhodopes in the middle reaches of the Arda River and its tributaries White and Mad River.

The average annual rainfall for the period is from 725 to 925 mm/m², and average annual temperatures are 21-23° C. The temperature sum of the growing season is 4000 °C. Notably is warm climate and atmospheric largest range of variation in May, where the average daily temperature is with largest amplitude of variation of the average

day and night temperatures ranging from 2 to 26 °C. Winds are weak, mainly southern and south. The summer was hot and dry, and winter - wet and mild with relatively rare snowfalls, which does not require spraying the trees with plant antifreeze against pollution.

Total productive capacity of the lands are characterized by a medium (agronomic) bonity score 57 for the Ivaylovgrad region, which is attributed to bonity group "Medium land".

4. Results and Discussion

Seven kilometers northwest of the city of Ivaylovgrad is situated experimental plantation adaptability and cultivation of olives as an alternative crop for this region. It was created in the second half of May 2013. and includes varieties "Arroniz", "Castellana", "Cornicabra".

Olive plantation for the period studied (2013-2015) is located in apparently good biological condition. The highest percentage of intercepting are distinguished "Arroniz" (100.0%), "Castellana" (90%), "Cornicabra" (85%). The percentage of intercepting to calculate the required number of pledged and anticipated successfully propagated plants. On this basis in practice it can be calculated planned production of cultivated trees.

It was found partially frost 9-10% of substantiating in frost, yellowing and defoliation and frost young unripe shoots, formed after the acquisition, shortly before abrupt climate change for the period. Of 5% was found frost on trees, conditioned dry overall foliage and 1/3 of the trunk of olives. In the established situation in the experimental plantation is done cleaning pruning of frozen and dried leaves, shoots and stems (Figure 1).

The trees are left with 3-5 main branches around the central branch of 20-30 cm from each other with a length of 30 to 45 cm, in order to better shape the crown. The aim is to open the inside of the tree, so sunlight can reach all parts. This leads to uniform ripening of fruit during the growing season. All abbreviations are made in the vicinity of the node/papule/ eye. Long branches are redundant, as they are left 4-5 pairs of leaves. Usually shaping the crown is completed within the 3-4 steps while currently converting to cup type pruning. Rejuvenating pruning is done twice a year is recommended to be more friendly.

Over the past three years, annual growth of followers of skeletal branches ranges between 10 and 30 cm per year, which determines the different location of fruit on the branches (Table 1).

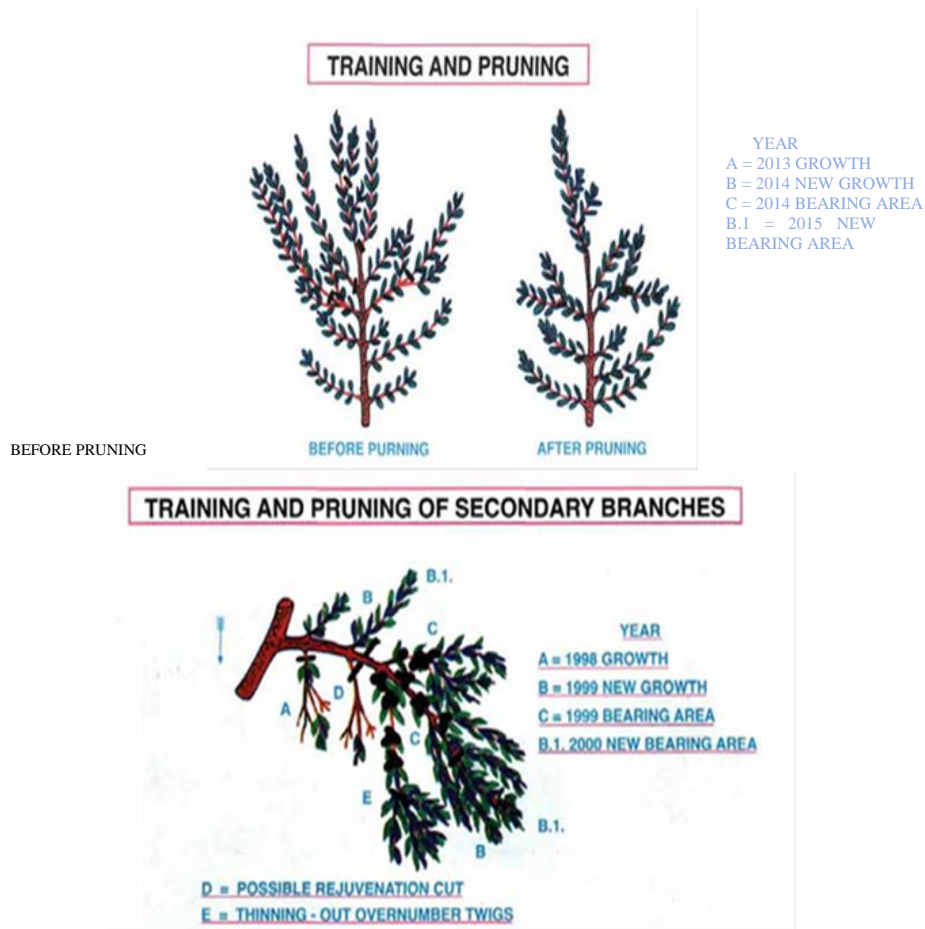


Figure1. Pruning of olive trees

The results presented in Table 1 show that on average for the period variety Arroniz enters the phenophase dissolving the buds of 10.04. Of the remaining studied varieties before starting vegetation Cornicabra.

Full blossoming and maturation period of the studied varieties is also presented in Table 1. The results obtained show that the largest number of flowers and fruits are numbered in variety Arroniz, followed by Castellana and Cornicabra. Late flowering varieties in Castellana and Cornicabra allows their cultivation in places with a high probability of spring frosts.

The strength of growth of the trees is determined according vegetative growth leader and duration of the skeletal branches and twigs. As a result of which varieties are grouped in weak growth, with growth 5-10 cm; moderate growth, with growth 10-20 cm and strong growth, with growth of more than 20 cm.

To a group of strong growing varieties belong Castellana and Cornicabra, which have annual growth leader and duration of the skeletal branches and twig over 15-20 cm. The variety Arroniz is with weak growth, with growth continuer 5-10 cm.

Table 1. Average morphological data of olive varieties for 2013 -2015 years.

Variety	Force of growth of the variety	Dissolving apices buds	Flowering			Period of maturing
			start	full blossoming	end	
Arroniz	weak growth	10.04	19.05	25.05	03.06	20.11
Castellana	strong growth	25.04	26.05	28.05	01.06	10.12
Cornicabra	moderate growth	17.04	22.05	26.05	30.05	15.11

Table2. Morphological characters of three cultivars of Olives (All measurements are in mm scale except the ratios).

Characters	Arroniz	Castellana	Cornicabra	LSD
Leaf-length	35.4 ± 5.2 ^b	42.0 ± 4.4 ^a	42.5 ± 2.1 ^a	5.4
Leaf-width	10.8 ± 1.0 ^b	9.3 ± 0.6 ^a	7.4 ± 1.3 ^a	1.4
Length/width ratio	4.97 ± 0.01 ^d	4.56 ± 0.02 ^c	5.00 ± 0.03 ^d	0.19
Fruit-length	12.3 ± 1.3 ^a	17.9 ± 1.1 ^b	17.1 ± 1.3 ^b	1.7
Fruit-diameter	10.9 ± 1.3 ^a	12.5 ± 1.2 ^a	12.9 ± 1.3 ^a	1.9
Length/width ratio	1.20 ± 0.03 ^a	1.43 ± 0.07 ^c	1.55 ± 0.04 ^d	0.09
Fruit-pulp thickness	3.1 ± 0.2 ^b	3.2 ± 0.1 ^b	2.6 ± 0.1 ^a	0.3
Weight on 1 a fruit (g)	3.86 ± 0.03 ^a	7.6 ± 0.4 ^b	5.74 ± 0.04 ^e	0.8

Means followed by the same letter superscript are not significantly different at 0.05.

The results obtained show that the tested varieties ripen in the range from November 15 to December 10th.

Were conducted morphological and biometric analysis. For the analysis were used leaves and single fruit of fruit twigs. Biometric measurements of the fruit is made directly after harvesting.

The indicators are presented in accordance with the methodology for the study of plant resources in fruit plants (Nedev et al., 1979).

Sixty leaves and fruits were randomly selected from each cultivar lot. Maximum length and width of leaves were measured using mm scale and maximum length and diameter of the fruits were measured using a screw gauge. Length–width ratio of leaves and fruits were calculated. All measurements were tabulated and LSD among the values of each cultivar corresponding to each character was found out. Data was further analyzed using the software called STATISTICA, version 7.0 и BIostat (ANOVA).

Analysis of the morphological data pertaining to the three cultivars showed insignificant variations in many parameters (Table 2). Largest leaf-length was recorded by Cornicabra followed by Castellana but maximum leaf-width was seen in Arroniz. Leaf length–width ratio was nearly identical in all three varieties, indicating a low level of variance in the leaf shape. One cultivar had a higher fruit-length, measuring nearly 18 mm with Castellana showing the largest fruit-length.

Arroniz and Cornicabra have comparatively smaller fruits of size ranging from 12.0 to 17.0 mm long. Length–diameter ratios of different fruit varieties also showed significant variations ranging from 1.20 to 1.55. There were insignificant variations in the thickness of fruit pulp ranging from 2.6 to 3.2 mm.

The highest average weight of fruit is variety Castellana -7,6 g (Table. 2). After him with an average weight of fruits are Cornicabra (5,74 g) and the variety Arroniz, respectively with at least fetal weight 3,86 g.

The above data characterizing varieties show that they fall within the group of varieties with medium to large fruits - weighing from 4,0 to 8,0 g.

For a more comprehensive justification of the status and growing olives in Bulgaria continue to carry out periodic monitoring of experimental plantations on their adaptability and reproduction.

5. Conclusion

Based on the study are drawn conclusions on the value of the varieties and their adaptability within the Rhodopes in Bulgaria.

It was found that the interception of olive trees is medium to full rooting.

The studied Spanish varieties are suitable for growing in Bulgaria

In soil and climatic conditions of southern Bulgaria varieties showed significant variations in morphology. Morphologic analysis revealed that dimensions of leaves and fruits are reliable morphologic characters to distinguish between varieties provided a large number of replicates are measured per sample. However, biometric values alone were not able to detect differences among some morphologically similar varieties characterized by different agronomical traits.

Variety Cornicabra can be used as table olives for edible purpose than for oil production, and varieties and Arroniz Castellana are suitable for oil production.

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