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THE DIMENSIONS OF THE STRAWBERRY SHRUBS IN HIGH TUNNELS FOR THREE CULTIVARS AND TWO DIFFERENT PLASTIC MULCHES

Kujtim Lepaja[1], Sylë Sylanaj[2], Lavdim Lepaja[1], Agim Zajmi[2], Vahid Avdiu[1], Naim Krasnqi[3]

[1]Department of Horticulture and Lanscape Architeture. Agriculture University of Tirana.

Kodër – Kamëz, Tirana, Albania

[2]Faculty of Agriculture and Veterinary, pn. 10000, Prishtina, Kosovo.

[3] New Opportunity for Agriculture. USAID. Str. Radovan Zogoviq No.1, 10000 Prishtina, Kosovo.

Abstract

This field experiment was designed to determine the dimensions of shrub, crown height, width in terms of order and the width between rows of crops of strawberries in high tunnels for three cultivars Elsanta, Sonata and Dora plastic mulch cultivated in black and white. The experiment was conducted in Kosovo in experimental greenhouse of 2.5 ar during 2010, respectively in the second year of production. The experiment is set by the block of four repetitions method, where for each cultivar and type of plastic mulch were taken 20 plants. In the end are presented the results obtained which are statistically processed where differences were observed between variants of cultivation. Between cultivars had no significant differences between plastic mulch while significant differences were found. Sonata is shown on breaking cultivar. Higher values for the parameters investigated were reaching black plastic mulch.

Key words: *shrub, Elsanta, Sonata, Dora, plastic mulch*

1. INTRODUCTION

Strawberry started to grown in Kosovo, on the commercial production, during the second part of the last century in 1974 in Kosovo there were growned 32 ha with a total production of 239 tons (Zajmi & Efendija 1984, Avdiu 2004), while in 1980 this surface was increased for 70 ha more, in a total production of 434 tons (Zajmi & Efendija 1997, Zajmi *et al.* 2007); whereas in 2012 there were cultivated 163 ha all round the country, with total yields of 1630 tons (MAFRED 2013), a production which still remain small based on the potencial and opportunities that Kosovo has.

A few decades ago in the different European countries; whereas in Kosovo only last years; has been started the strawberries cultivation in the low and high tunnels, where the ripening of the fruits occurs for 25 days in earlier, in comparison to the cultication on the open field (Sylanaj 2004).

Taking into consideration that the increasingly demand for the fresh fruits in spring, summer and autumn, the farmers are interested to extend as much as they can this production period and to have strawberries for fresh market at off-season. The greenhouses are designed to keep the temperatures at optimal for the growing of strawberries. However, the greenhouses are more expensive to construct them and to maintain, the high tunnels are relatively cheap to be constructed (Rowley *et al.* 2010), are easier to maintain and the strawberries come to the production very early in the spring, while the cultivation in the open field come to the production later. High tunnels have increased effectively the strawberry production.

The high tunnel is designed for intensively managing a small area. Therefore, site selection is critical. The tunnel should be located in well-drained soils that are fertile and free of serious pathogens, weeds and other problems. (Black *et al.* 2008). High tunnels can significantly extend the growing season for strawberry production (Rowley *et al.* 2010).

The strawberry production in high tunnels is the best solution on the protected environment. There are different structure forms of a high tunnel, which allows operations without disturbing inside the tunnel as well as the harvesting can be done while raining. This cultivation form also showed to be one of the best ways of this production form that is used actually in the whole world (Lepaja 2011).

High tunnels provide protection from unfavorable weather conditions, including wind, hail, frost, and excessive rainfall. This can translate into a better survival rate of strawberry plants, as well as earlier berries. Insect and disease problems are usually less severe in a high tunnel, thus improving the organic production potential.

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Advantages of high tunnels include season extension, crop protection, higher yields, quality improvement, and better control of the growing environment. With the interest in high tunnels growing, and the desire to maximize the profit in this high-value space, extending the season of strawberries is a viable option. (Wszelaki *et al.* 2013)

The disadvantages of the strawberry cultivation in the high tunnels is that they need additional heat, in cases of strong frost there is need also to cover the plants with the fabric called Agril. The limited space inside the protected environment, decreses the production and sometimes also the quality of the fruit is lower (Nikolić & Milivojević 2010).

High tunnels capture and retain heat. The first goal when using high tunnels is to protect the fruit and flowers from frost injury in the early and late parts of the year. This means keeping the temperature above 28°F, especially when there are fruit and or flowers on the plant. The second goal is to keep the temperatures in the tunnel warm enough for the plants to continue growing. The minimum temperature at which strawberry plants continue to grow (baseline) is about 40°F. The third goal is to maintain optimal temperatures for as much of the day as possible. The optimal temperature for strawberry growth is between 70 and 80 degrees. (Rowley *et al*. 2010).

The need for the market where the strawberry production is low and the demand is high, where the majority of the producers do not have strawberries for the market, offer is low, has pushed the farmers to further intensify this production. .

2. RESEARCH FACILITY, MATERIAL AND METHOD OF WORK

2.1 Research Facility

The research was carried out in the high tunnels of plasmas (PVC) on dimensions 4.5 width and 2.2m height, where planted 0.025 ha in the demonstration plot at Faculty of Agriculture and Veterinary of University of Prishtina, during the 2010 season. The demonstration plot has performed on the altitude 573m, and is located 21° 09’ of the geographic length and 42° 39’ of the geographic width. The main objective of this study was to see the differences of the shrub height, width between the rows and within the rows by using of three different cultivars and two different colors of mulching types.



Figure 1. The demonstration plot where the research was carried out

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2.2 Material

In the research were included three strawberry cultivars two of them brought from Holland called Elsanta and Sonata, while Dora cultivar was brought from Italy. The planting material was in frigo conditions A++ and A+. The seedlings were planted by the end of August 2009. The planting was carried out narrow strip forms on two rows on width of 80 cm, with drip irrigation system installed on place. There were black and white mulching types, while the planting distances of the seedlings were 40 x 30 cm with density of 6 plants/meter square.



Figure 2. The white and black mulching types

2.3 Method of work

The experiment was set on the randomized block design, with four repetitions including 20 plants for each cultivar and cultivation form as well, in general on the research were included 120 plants.

The working methodologies for the investigated parameters are showed as below:

The height of the crown was measured from the mulching surface until on the highest peak of the shrub;

The measurements for the longest points of the shrub, in the rows and between the rows.

The measurements have been done with a ruler and the values were expressed on cm.

2. RESULTS

The results of the research included the collection of the all data for the investigated parameters of the shrub dimensions, respectively the height of the crown, the width in the row and between the rows. Although, there are different forms of strawberry cultivation, the object of the study was the cultivation of the strawberries in high tunnels, while the results of this research are shown on the Table 1.

Table 1. The dimensions of the strawberry shrub cultivated on high tunnels

		The shrub dimensions (cm)		
Variety	Mulching type	Height of the crown	The width between the rows	The width within the rows
Elsanta	Black	30.75	43.75	43.18
	White	28.68	43.62	38.18
∑Xi		29.71	43.68	40.68
Sonata	Black	33.30	45.40	46.00
	White	31.00	45.75	38.70
∑Xi		32.15	45.57	42.35
Dora	Black	29.60	43.45	41.75
	White	27.20	39.58	34.79
∑Xi		28.40	41.51	38.27
LSD 0.05		3.3300	3.9975	3.5093
0.01		5.0447	6.0558	5.3163

The results showed on the Table 1, the LSD test by ANOVA showed that, there are noticed significant differences between the mulching types. On average the highest values for three cultivars was reached on the black mulching type (except that that the highest values has showed the Sonata cultivar with white plastic mulch, on the width between the rows).

Whereas talking for the height values of the shrub, three cultivars Elsanta, Sonata and Dora in white and black mulching, showed on Table 1, clearly noticed that Sonata cultivar has performed the highest average height (33.30 cm in black mulching), where is also in accordance with the data research carried out by Sylanaj 2010, while the lowest height showed Dora cultivar (27.20 cm on white mulching).

Based on the ANOVA, there are not significant differences between cultivars, whereas there are highly significant differences between the black and white mulching.

Regarding the width between the rows, to the three cultivars, grown on the black and white mulching the results are highly different. The highest width showed Sonata cultivar (45.75 cm on white mulching) comparing to the Elsanta (43.75 on black mulching) and Dora (39.58 cm on white mulching).

Based on the analyses of variance test, there were not found any significant differenced either to the cultivars as well as to the different colors of the mulching types.

The values of the width within the rows to the three cultivars, grown on two mulching types, from Table 1, is noticed that Sonata has the highest width with 46.00 cm on black mulching, while the lowest width showed Elsanta cultivar on white mulching 31.18 cm, where is in accordance with the data research carried out by (Mišić & Nikolić 2003), and (Nikolić & Milivojević 2010), which emphasized that Elsanta cultivar is on average vigorous.

Based on the analysis of variance there are not significant differences between cultivars, but there are high significances between mulching types.

3. CONCLUSIONS

The research of the strawberry cultivation on the high tunnels, with use of different mulching types black and white mulching, the main aim has to gain highly new experiences on these cultivation systems taking into consideration always cultivars and the mulching color of cultivation on the agro –climatic conditions of Kosovo.

Based on the one year research carried out concerning the strawberry cultivation on the high tunnels, the three strawberry cultivars, grown on the black and white mulching on the agro ecologic conditions of the experimental field of the Faculty of Agriculture and Veterinary of Prishtina, we came to these conclusions:

- Regarding the mulching type to the all cultivars included in the experiment; Elsanta, Sonata and Dora, the black plastic mulch to the all cultivars showed to be more vigorous than white plastic mulch.
- The cultivar that showed to be more vigorous is Sonata a Dutch cultivar, in comparison to the Elsanta cultivar, which was found with average vigorous; while the Italian cultivar Dora showed not to be vigorous.

From these data we can conclude that Pristina region possesses optimal agro ecologic conditions for successfully cultivating strawberries on the black and white plastic mulch.

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