



VEGETATIVE TRAITS OF STRAWBERRY CULTIVARS CULTIVATED IN LOW TUNNELS

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Abstract

Main objective of this research is the test of some strawberry cultivars (*Fragaria ananassa* Duch.) cultivated to the low tunnels for some vegetative and physiological indicators. In searching was included two cultivars of strawberries introduced by Netherlands; *Elsanta* and *Sonata*, planted to the location of Skenderaj. Experiment is placed with random method with four repetitions. For every repetition are researched 25 plants x and 4 repetitions = 100 plants for each parameter.

The size of surface in which the experiment was putted 0.25 ha. All cultivars were grown on banks covered with silver polietilen foil in the form two – rows were putted in place. Planting distances of strawberries cultivars were 40 x 30 cm. Surface between tunnels was covered with stubble which constrains weeds activity. It is researched the number of crowns in cluster and cultivar which has realized a higher value for this parameter, it is emphasized *Elsanta* with the average value of 5.88. A lower height of cluster has *Sonata* cultivar (34.03 cm), but with higher value of the wildness of cluster (42.60 cm). A bigger general surface of leaves has *Sonata* cultivar (193.68 cm²). *Elsanta* cultivar has a smaller leaf surface (157.74 cm²), but with the average value higher than yield (18.26 t/ha). Distinguishes between the cultivars being researched for the parameters where significant distinguishes for both levels 0.05 and 0.01. These cultivars are preferred to be cultivated for commercial purposes in low tunnels according to the Skenderaj conditions.

Key words: Cultivar, low tunnels, vegetative traits, yields

INTRODUCTION

Strawberry is one of the most important soft fruits because it produces its fruits very early (in year one after planting), it is easily proliferated, its fruits are of high quality and it is cultivated all over the world. Despite favourable conditions for the

cultivation of strawberries in Kosova its production remains at a relatively low level since it does not fulfil the requirements of the domestic market. In the recent years efforts have been made to intensify the strawberry production by raising new orchards and applying modern cultivation technologies such as the planting in lines covered with polyethylene folio and installation of the ferrty-irrigation.

Demands in the domestic market for fresh strawberry fruits are continuously increasing especially in spring when there is a lack of fresh fruits. Commercial producers are interested to intensify and apply advanced technologies in order to extend the production season. Authors (Duralija et al. 2006) present data on strawberries, for the increase of producers' interest to find successful systems of indoor strawberry cultivation, which, when combined with new cultivars in high producing conditions provide optimal success. According to (Lieten 2002) there are various ways of strawberry cultivation and production increase outs of season. Strawberry mulching presents one of the most important agro-technique measures which increases the production and quality of strawberry fruits. The use of black folio is standard for all strawberry producers in the world, but the application of various tunnels on the black folio enables the strawberry fruits to be ripened and marketed earlier. The increase of the demand for fresh strawberries and the extension of the consumption period shows that farmers are interested to intensify the production of this culture. (Sylanaj 2004, Sylanaj et al. 2008). The purpose of the paper was to make a research of vegetative properties and of the productivity of introduced strawberry cultivars in agro-ecologic conditions, in low tunnels (Elsanta and Sonata) which are becoming popular to a great extent in order for us to provide instructions for the intensification of production.

MATERIAL AND METHODS

Researchers have included two introduced strawberry cultivars (Elsanata and Sonata) planted in the commercial orchard in Llausha – Skenderaj in an area of 0.25 ha. The planting of good quality virus free A⁺ is done at the beginning of august 2008. Before planting the land was prepared well and dressed with manure 40 t/ha and 800 kg/ha NPK (10:20:30). The strawberry orchard was established in two rows covered with silver polyethylene folio with planting densities 40 x 30 cm. The ferrty-irrigation system was placed under the silver folio and it has enabled the continuous supply of the plant with water from dripping irrigation and with water-degradable mineral fertilizers (crystal). On 1 April the whole row was placed under the low tunnel covered with PVC light releasers. Space between tunnels is covered with straw which reduces the potential weeds and enables better production conditions. All regular agro-technique measures are applied in the orchard. The research used the following parameters: number of crown in the cluster, width and height of the cluster, the number of leaves in the cluster, size of the leaf, the whole assimilative size, the length of the petiole (leaf) stem and the yield per plant-cluster. The research has been conducted four times per each cultivar with 25 plants. The abovementioned parameters are determined with standard morphometric methods with measurements and counting. The achieved results are analysed with statistical methods.

RESULTS AND DISCUSSION

Morphological properties of shrubs of strawberry cultivars that were researched are presented in Table 1.

Tab 1. Traits of clusters of strawberry's cultivars.

Cultivar	No. of crown in the cluster	Height of the cluster, cm	Width of the cluster, cm.	Length of the petiole (leave) , cm.
Elsanta	5,36	36,37	37,93	28,48
Sonata	5.88	34.03	42.60	27.37
LSD 0.05	0.0638	0.1674	0.0574	0.0287
0.01	0.1171	0.3072	0.1054	0.0527

The highest average number of crown of strawberries in the cluster is found at the cultivar Sonata (5.88), while the lower number has the cultivar Elsanta (5.36). meanwhile the length of the crown is higher to the strawberry cultivar Elsanta with (36.37cm), to compare with the cultivar Sonata (34.03cm). The Average wideness of the crown Sonata is (42.60 cm) , while the average wideness is smaller to the cultivar with (27.37 cm). Based on the vegetative parameters in our research the results are significant and are partly commensurable to the results of the Jankovic et al. (2006) research.

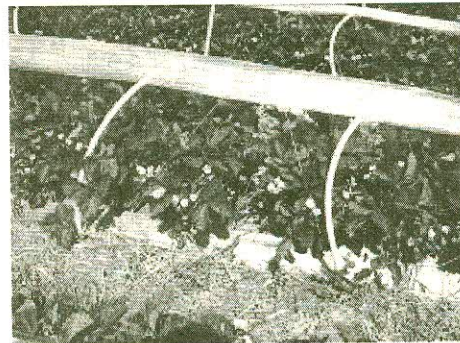
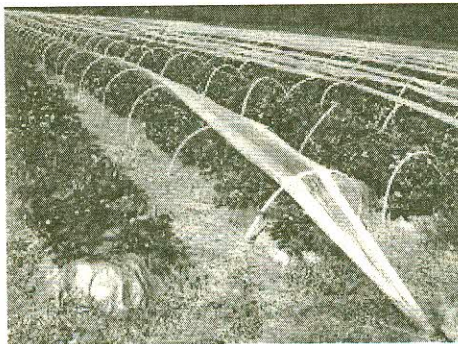


Photo 1. Low tunnels

Tab.2. Assimilating surface of strawberry cluster

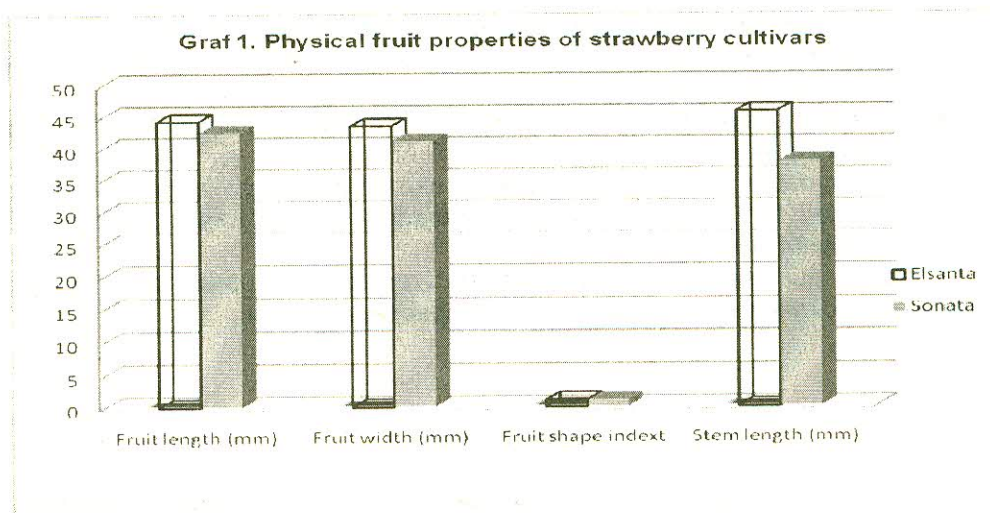
Cultivar	Nr. of leaves in a cluster	Surface of leaves in cm ²	Average surface of the leaves in the cluster cm ²
Elsanta	43.04	157.74	6788.26
Sonata	40.44	193.68	7832.01
LSD 0.05	0.0994	1.38	
0.01	0.1825	2.58	

The average number of the leaflets was highest to the cultivar Elsanta with (43.04) compare to the cultivar Sonata with (40.44). The greater leaflets surface has cultivar Sonata (193,68cm²), while smaller leaflets surface has the cultivar Elsanta (157,74 cm²). The average surface of a cluster has the cultivar Sonata (7832.01cm²), while the average is smaller to the cultivar Elsanta (6788.26 cm²). The assimilative plant surface is depend on the number of leaflets, the average wideness surface which might have direct impact on the quality of fruit as well. The difference between to the cultivars, number and the surface of the leaflets in our cultivars are significant. Furthermore our findings are partly commensurable to the Jankovic et al (2006) findings due to the fact that he speaks for different cultivars and way of cultivation. The results of physic parameters of the fruit and the yield per strawberry cultivars are presented in the table 3 and Graph. 1.

Table. 3. Number, mass, weight yield and of strawberry fruit

cultivar	Nr. of fruits per cluster	Mass of fruit in g.	Yield per cluster g.	Yield per ha/t
Elsanta	20.12	18.13	365.27	18.263
Sonata	23.10	14.51	335.01	16.750
LSD 0,05	1.6599	0.5297	34.559	
0,01	3.0471	0.9723	63.438	

The average mass of the fruit is bigger to the cultivar Elsanta with (18,13g), compare to the cultivar Sonata which is smaller (14,51g). If we compare the mass of fruits between the cultivars our findings results to be significant. Furthermore Nikolic et al.(2008) find out the figures of the overall yield and weight of fruit to the cultivar of Elsanta which is smaller than in our findings and which is depend on a vertical position and way of cultivation. However, our findings per fruit in the shrub are a bit smaller than Sponberger et al. (2006) findings, while are commensurable to Voca et al. (2006) findings to the strawberry cultivar Elsanta, cultivated in the low tunnels. To achieve the higher yield of strawberry fruit is needed to have a proper leaflets and flowers in strawberry shrub, as well as the number of strawberry fruits is depend on the way of cultivation other characteristics of cultivar (Sylanaj et al.2008). If we analyze our findings, we will see that the Sonata cultivar has huge number of fruit (23,1), while the cultivar of Elsanta has small number of fruit with (20,12). In addition the difference between the cultivars were significant. Results are presented in graph. 1.



Parameters for fruits length and width for investigate cultivars are in harmony for weight fruit. The cultivar Elsanta in our investigation was with average value for length (44.3 mm) and for width (43.5 mm), which was characterized with higher value compared to cultivar Sonata. The fruit shape index at cultivars Elsanta and Sonata were 1.05 respectively 1.04, which showing conusoid shape. If compared our results to Sponberget et al.(2006), results showing minimal differences. The fruit stem length are important parameters for determination of cultivars and harvest fruits. In our investigation the cultivar Eslanta had realized maximal average value for stem length (45.7 mm), while with minimum average value was determined cultivar Sonata on value 37.5 mm.

To know the quantity of yield in our condition is of high importance due to the way of cultivation and the biological attribute and the ecological condition. Based on the data presented above the higher yield per cluster is achieved to the cultivar Elsanta (365.27g) compare to the cultivar Sonata (335.01g) as well as the overall yield per surface unite is achieved to the Elsanta (18.263 t/ha) in comparison with Sonata with (16.750 t/ha).

CONCLUSION

Based on all vegetative and reproductive parameters tested in our research to the strawberry cultivars cultivated in low tunnels we can conclude:

- All the vegetative parameters of the strawberry cluster except wideness of leaf surface are higher the Elsanta in comparison to the cultivar of Sonata.
- The number of leafs in the strawberry cluster was greater to the Elsanta (43,03), however, the overall leafs surface and the cluster greater is to the cultivar of Sonata (193,68 cm²).

- The physical fruit property at cultivar Elsanta was with length average value 44.3 mm and width was 43.5 mm, which showing higher value compared with cultivar Sonata.
- The fruit shape index at two cultivars were higher to value 1, which had conusoid shape.
- The number of fruit per strawberry cluster is greater to the cultivar of Sonata (23,10), while the weight and the total yield is greater to the cultivar of Elsanta (18,13 g).

According to our results for vegetative and reproductive parameters the two cultivars recommended in low tunnels as perspectives cultivars.

REFERENCES

- Duralija, B., Čmelik, Z., Družić-Orlić, J., Milosević, T. (2006). The effect of planting sistem on the yield of strawberry grown out-of-season. *Acta Hort.* 708:89-92.
- Janković, Z., Zec, G., Čolić, S., Đurović, S. (2006). Vegetativni pokazatelji novointrodotovanih sorti pagoda u intenzivnoj proizvodnji. *Zbornik naučnih radova*, Vol.12. 3. 64-70.
- Lieten, P. (2002). The use of cooled stored material in Central Europe. *Acta Hort.* 567 : 553-560.
- Nikolić, M., Milojević, Jasminka. (2008). Pomoloske osobine noveintrodukovanih sorti jagoda gajenih u plasteniku. *Zbornik referatov 2. Slovenskog sadjarskeg Kongresa z mednarodnom udeležbo*, 541-54.
- Spornberger, A., Steffek, R., Altenburger, J. (2006). Testing of early ripering strawberry varieties tolerant to soil-borne pathogens as alternative to Elsanta. *COST 863 JMWG 283 Abstract Book*: 25.
- Sylanaj, S. (2004). Dredheza. *Gjakove*.
- Sylanaj, S., Shala, A. (2008). Pomoloske osobine novointroduciranih sorti jagoda. *Pomologia Croatica*. Vol.14. br.3.:195-200.
- Voća, S., Duralija, B., Družić, J., Skenderović-Babojelić, M., Dobričević, N., Čmelik, Z. (2006). Influence of cultivation systems on physical and chemical composition of strawberry fruits cv. Elsanta. *Agric. Conspectus Scientificus*, Vol.71. No.4 : 171-17