Original Scientific paper
10.7251/AGREN2502041S
UDC 634.232:631.542

EFFECTS OF SUMMER PRUNING ON PHYSICAL PROPERTIES OF THE SWEET CHERRY TREE (*PRUNUS AVIUM L.*)

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ABSTRACT

Summer pruning is a recommended treatment for all fruit trees. It mainly involves operations on young trees and it is definitely recommended to do it, because with summer pruning we remove up to 50% of the branches, which would have been removed anyway with winter pruning. This research examined the effects of summer pruning on the sweet cherry tree, especially taking into account the monitoring and recording of the strength and intensity of fruit formation in comparison with unpruned individuals of the same plant culture. Two trees of two different varieties, 'Sunburst' and 'Sweet Heart', 22 years old, were taken for the research, which were planted on the 'Saint Lucie 64' rockstock. In both varieties, summer pruning was done on three tree, but not on the other three. Pruning was done at the end of April/beginning of May 2024 and consisted of removing excess shoots and shortening the growth. The aim of the research was to prove that the summer pruning treatment has a positive effect on the physical properties (weight and diameter) of the fruit. Trees on which summer pruning was performed had a smaller number of fruits, which were heavier and of better quality compared to fruits from trees on which summer pruning was not performed.

Key words: *sweet cherry, pruning, fruit, varieties.*

INTRODUCTION

Pruning is a necessary and efficient horticultural practice for tree growers, but at the same time represents a significant cost in production, both in terms of time and labor (Craig & Embree, 2006).

Summer pruning is an agrotechnical intervention that is carried out during the growing season and is often called summer pruning, and it refers exclusively to the young parts of the tree. Although it is as important as winter pruning, it is rarely carried out in plantations. The goal of summer pruning is to reduce vegetative growth and encourage fertility, and it is particularly useful for fruit trees with intensive vegetative growth. Summer pruning can also be carried out to correct mistakes made during winter tree pruning (Kulina et al., 2018).

Timely execution of summer pruning in many cases determines the next year's yield, because in the second half of the growing season the differentiation and development of the flower buds, which will bear fruit the following year, takes place. If summer pruning is not done, these buds remain in the shade and the differentiation of flower buds is reduced, which has a negative impact on the fruit.

Regular pruning involves pruning during the dormant season, but dormant pruning can increase the risk of bacterial canker damage, as branches pruned in winter do not fully heal until spring (Webster & Looney, 1996).

During the summer pruning, it is possible to influence the branching of young trees, which can be used for faster crown building or for "masking" the fruits and protection from sunburn. With summer pruning, we remove young trees from the middle of the crown, so that the crown is as well lit as possible. Too dense canopy favors the development of plant diseases and pests.

The requirements for pruning depend on the height of the tree, the method of cultivation, root system, the type of variety, the age of the tree and the time of pruning (Webster & Looney, 1996).

According to Wustenberghs et al. (1996), light pruning is better than severe pruning because of the way the cherry tree bears fruit.

Rovers et al. (2008) studied the effects of winter and summer pruning in fruit trees and concluded that yields were higher in fruit trees that were subjected to winter and summer pruning in addition to winter pruning, but further research was suggested due to variability in the production of varieties.

Specific summer pruning renews the tree and encourages the development of second- and third-order branches on which the main reproductive elements will form. Summer pruning also includes the removal of water shoots (young upright branches) that exhaust the tree and do not bear fruit (Aliman and Hasanbegović, 2017).

MATERIALS AND METHODS

The research was carried out on the experimental plantation of the Federal Institute of Agriculture in Sarajevo (43.8257012, 18.3158786) in Bosnia and Herzegovina. In the cherry orchard 'Sunburst'/'Saint Lucie 64' and 'Sweet Heart'/'Saint Lucie 64' were planted in the spring of 2002. The planting distance between the trees is 2.4 x 3 m. The growing form of the cherry tree is a pyramid, which is organized into 3 levels, and each level has 3 skeletal brancheswhich is mostly used in the production of cherries. The height of the trunk is 45 cm, and the total height of the tree is 3-3.5 meters. A drip irrigation system was installed in the orchard between the cherry trees. Six trees of two different varieties were selected for this research, three trees that will be pruned and three trees that will not be pruned, in order to later determine the effect of summer pruning on fruit trees. Pruning treatments (June, 2024) consisted of a hand pruned and it was conducted after flowering.

Trees of the variety 'Sweet Heart' that were pruned summer are marked with SH1, SH2 and SH3, and trees that were not pruned with SH1*, SH2* and SH3*. In the case of the 'Sunburst' variety, pruned trees are marked with S1, S2 and S3, and unpruned trees with S1*, S2* and S3*. Summer pruning was done at the end of

April/beginning of May 2024, about twenty days after full flowering, and the final results were obtained at the beginning of July of the same year.

For each tree used for this research, the mean weight and average diameter of the fruit were calculated for the 30 fruits taken. After calculating the average fruit weight and diameter of each tree, the average fruit weight and diameter were calculated for both varieties on pruned and unpruned trees.The weight of the fruit was measured with a precise digital scale, and the diameter with a digital caliper. The results are recorded in numbers with two decimal places.The significance of differences between mean values was determined by LSD and Tukey test multiple range test at P=0.05.

RESULTS AND DISCUSSION

Fruit weight

Trees SH1, SH2, SH3, S1, S2 and S3 were summer-pruned trees, it can be clearly concluded from the data (Chart 1) that there is a difference in the average fruit weight compared to unpruned trees (SH1*, SH2*, SH3*, S1*, S2* and S3*). To calculate the average fruit weight, 30 fruits were taken from each tree for both varieties, i.e. a total of 180 samples were taken from each variety, 90 samples from pruned trees and 90 from unpruned ones.

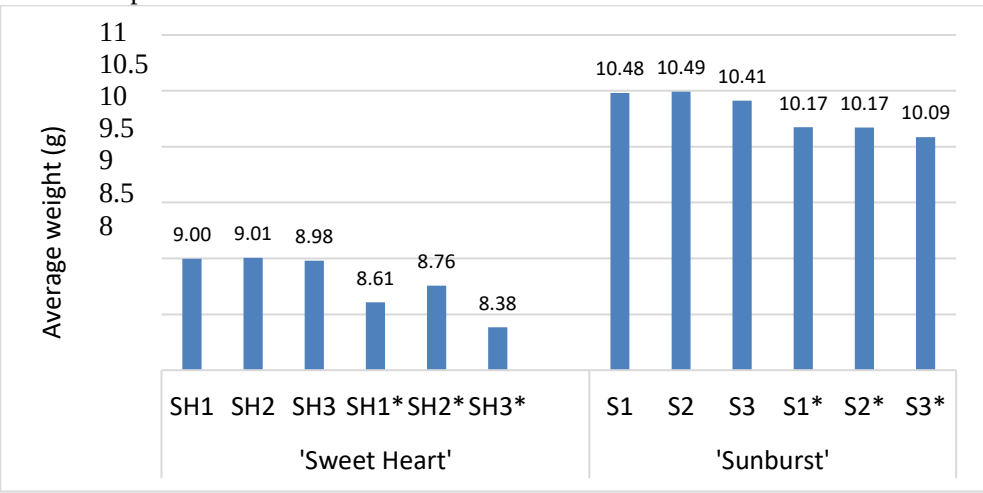

Chart 1. The average weight (g) of pruned and unpruned (marked with *) trees for both cherry varieties.

Average weight (Table 1) of pruned cherry trees 'Sweet Heart' (SH1, SH2, SH3) is 8.99 grams, and the average weight of fruits of unpruned trees (SH1*, SH3*, SH3*) is 8.58 grams. For the 'Sunburst' cherry average weight of pruned trees (S1, S2, S3) was 10.46 g, and the average weight of fruits of unpruned trees (S1*, S3*, S3*) is 10.14 g (Table 2).

Table 1. Average fruit weight of all samples for each tree with the average fruit weight of all trees of the 'Sweet Heart' variety.

	'Sweet Heart'	
	Prunned	**Unpruned**
SH1	9.00 ± 0.45	8.61± 0.49
SH2	9.01 ± 0.48	8.76 ± 0.71
SH3	8.98 ± 0.61	8.38 ± 0.69
Average weight (g)	8.99 ± 0.51	8.58 ± 0.63

Table 2. Average fruit weight of all samples for each tree with the average fruit weight of all trees of the 'Sunburst' variety.

	'Sunburst'	
	Prunned	**Unpruned**
S1	1048 ± 0.48	10.17 ± 0.14
S2	10.49 ± 0.39	10.17 ± 0.13
S3	10.41 ± 0.37	10.08 ± 0.18
Average weight (g)	10.46 ± 0.41	10.14 ± 0.15

Based on the data, it can be concluded that the fruits from the pruned trees of the 'Sweet Heart' variety were larger in weight by an average of 0.59 g compared to the unpruned trees (Table 1). Also with the variety ‘Sunburst’ there is a difference between the fruits from pruned and unpruned trees, which was on average 0.32 g (Table 2).

Aarifa et al. (2018) examined the physicochemical properties of several cherry varieties, including the 'Sweet Heart' variety, and the average weight of the tested samples for that variety was 8.15 g.

In terms of fruit weight, in average the ‘Sunburst’ variety had bigger weight for 1.47 g. The weight of the fruit may vary slightly depending on the year and the place of planting. This can be confirmed by the fact that in a scientific study conducted by Sarisu et al. (2016), it was determined that the ‘Sunburst’ variety in 2010 had an average fruit weight of 11.83 g, and the same variety in 2011 had an average fruit weight of 10.61 g on the same tree. They also monitored the 'Sweet Heart' variety, where it was determined that the average fruit weight in 2010 was 9.79 g, and in 2011 it was 8.50 g, which is similar to the fruit weight data of the ‘Sunburst’ cultivar obtained in this study.

Kappel (1998) reported that cherry cultivars can have different sizes in different regions, for example the variety ‘Sunburst’ had an average fruit weight of 11.4 g in Serbia (Milošević et al. 2015), 13.12 g in Canada (Lane and Schmidt 1984).

Fruit diameter

In this research, based on the obtained data from the cherry fruit, it can be noticed that there is also a difference in the diameter of the cherry fruit (Chart 2), both in varieties and in pruned and unpruned trees.

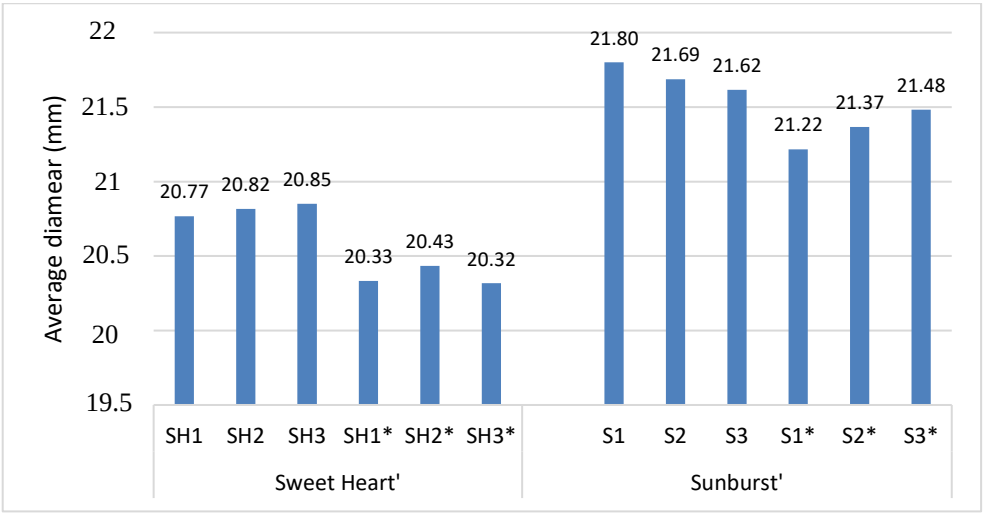

Chart 2. The average diametar (mm) of pruned and unpruned (marked with *) trees for both cherry varieties.

Average diameter (Table 3) of pruned cherry trees 'Sweet Heart' (SH1, SH2, SH3) is 20.80 mm, and the average diameter of fruits of unpruned trees (SH1*, SH3*, SH3*) is 20.35 mm. For the 'Sunburst' cherry average diameter of pruned trees (S1, S2, S3) was 10.46 mm, and the average diameter of fruits of unpruned trees (S1*, S3*, S3*) is 10.14 mm (Table 4).

Table 3. Average fruit diameter of all samples for each tree with the average fruit diameter of all trees of the 'Sweet Heart' variety.

	'Sweet Heart'	
	Prunned	**Unpruned**
SH1	20.76 ± 0.77	20.33± 0.45
SH2	20.81 ± 0.41	20.43 ± 0.47
SH3	20.85 ± 0.41	20.31± 0.45
Average diametar (mm)	20.80 ± 0.53	20.35 ± 0.45

Table 4. Average fruit diameter of all samples for each tree with the average fruit diameter of all trees of the 'Sunburst' variety.

	'Sunburst'	
	Prunned	**Unpruned**
S1	21,80 ± 0,40	21,21 ± 0,81
S2	21,68 ± 0,53	21,36 ± 0,64
S3	21,61 ± 0,47	21,48 ± 0,68
Average diametar (mm)	21,69 ± 0,46	21,35 ± 0,71

Based on the data, it can be concluded that the fruits from the pruned trees of the 'Sweet Heart' variety were larger in diameter by an average of 0,55 mm compared to the unpruned trees (Table 3). Also with the variety 'Sunburst' there is a difference between the fruits from pruned and unpruned trees, which was on average 0.34 mm (Table 4). Based on the data, it can be said that the effect of summer pruning had a positive influence on the physical characteristics of the diameter of the fruit in both varieties

Bouzari et al. (2015). compared the average fruit weight of seven cherry cultivars, including the cherry cultivar ‘Sunburst’. By comparing the average fruit weight in relation to the cultivars used, it was determined that 'Sunburst' has the largest fruit weight (7.21 g) and fruit diameter (22.23 mm).

Sarisu et al. (2016) monitored the physical characteristics of six sweet cherry varieties, including the 'Sweet Heart' variety. The average diameter of this variety in 2010 was 24.86 mm, and in 2011 it was 25.64 mm.

Usenik et al. (2008) studied the effects of summer pruning on fruit quality and yield performance of 'Kordia' and 'Regina' on 'Gisela 5' for three consecutive years. Their research showed that unpruned trees showed similar yield efficiency to pruned trees, but lower fruit weight and quality, which was confirmed by this research.

CONCLUSIONS

Summer pruning is an auxiliary technique that should not be neglected, its main purpose is to reduce vegetative growth, and direct nutrients and energy to flower buds, i.e. to fruits, in order to obtain the best possible yield on the fruit trees. Also, in addition to encouraging better fertility, it can also be used to correct mistakes made during the dormant period during winter pruning. Based on the data obtained in this research, it was determined that summer pruning performed on the trees of the 'Sweet Heart' and 'Sunburst' varieties had a positive effect on the weight and diameter of the fruit. The trees of both varieties, i.e. the control branches, on which the pruning was done, had a greater weight and diameter of the fruit, compared to the unpruned trees. So, in general, they were of better quality compared to the fruits of trees on which summer pruning was not carried out. There is also a difference in pruned trees between varieties. From the data shown in Charts 1., it can be seen that the variety 'Sunburst' had a higher weight of fruits compared to the fruits of the variety 'Sweet

Heart', which corresponds to the varietal characteristics. Also with regard to the diameter of the fruit, it was proven that the fruits from the branches on which summer pruning was performed were large in relation to the branches on which pruning was not performed Charts 2. After applying summer pruning, collecting and analyzing the obtained data, it can be concluded that the application of summer pruning it has a positive effect on increasing the weight and diameter of fruits, as well as on their quality, which was the goal of this research.

ACKNOWLEDGEMENT

The research was carried out as part of the INSTREAM project "Introduction of student research at the universities of Bosnia and Herzegovina", which financed this research. This scientific work was created as a result of the research mobility of students on the topic ". The topic of this scientific conference was "Effects of summer prunning on physical properties of the sweet cherry tree (P*runus avium* L.)“ which was carried out with the help of mentors Prof. Dr. Jamina Aliman and Prof. Dr. Mirko Kulin, at the plantation of the Federal Institute of Agriculture in Ilidža (Sarajevo).

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