THE EFECT OF CUTTING AT THE APPLE TREE CULTIVATED IN SUPER INTENSIVE SYSTEM REGARDING COPSE CULTIVATION AND FRUIT PRODUCTION IN ORADEA GROWING CONDITIONS

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Abstract

Fruit-bearing cutting at the apple-tree is a very important activity which the current and next year' crops depend on, fruit-bearing cutting trying to establish a favorable balance for the growth and fructification of the trees.

Even if the fruit-bearing cutting at the apple-tree has been known, as it has been studied by a lot of researches and experts in the field of apple –tree growing, the present conditions and the more demanding market for a high-quality fruit production justifies the fulfilling of studies related to the best variants of cutting , so that a good crop should develop the best quality parameters for the fruit.

In order to fulfill this requirement, it was considered necessary to perform an experiment of fruit-bearing cutting at the apple-tree, for the Starkrimson variety, in order to find out the best variants depending on the year's conditions and the physiological situation of the trees.

The area where this study was carried out is placed inside a fruit-bearing perimeter(Oradea region) characterized as being favorable for the tree-growing.

Starkrimson is a variety obtained in the U.S.A., the tree presents a medium vigor, of a type bearing the fruit on short fructiferous formations, it can be cultivated at high densities of 3000-5000 trees/hectare. It gives a good, constant production, but it is very sensitive at the scab.

The fruit has a medium to big shape of 150-180 grams, in the shape of an elongated truncated cone, with a red and tinted skin. The pulp is white to yellow, greenish shadowed, having a medium, sweet and flavored consistency. Ripening and consumption stage lasts from the end of September until March.

Key words:apple tree, species, cutting, copse, growth, production, fruitsquality, blossom inflorescence

INTRODUCTION

The apple-tree growing is extremely important for the valuable, fine and rich in nutritious substance, insistently asked for fresh consumption and for obtaining industrial preparation.

Apples are placed the first among the fruits of the trees grown in the areas characterized by temperate climate, regarding the crop quantity and the demand on the commodity market.

As part of the world fruits production, the apple-tree has a special place, because, together with the banana-tree and orange-tree, provides 2/3

of the world production, each of the variety possessing almost an equal share.

The important share which the apple-tree growing has at the world economy of the fruit production is due, in the first place, to the role that fruit have for the rational nourishment of people and for the prevention and control of some diseases, for increasing of national income, as well as in improving the microclimate conditions of the growing areas.

Apples have an extremely complex chemical structure. They contain sugars, organic acids, tannic and pectin substances, proteins, cellulose, phenolic substances, alcohol, esters, carbons, acetates, lignin. Apples contain 77,8-88,5 % water, 7,6-16,4 % sugars, 0,06-0,31 % tannic substances, 0,23-1,14 % pectin substances, 0,18-0,72% proteins. There were identified 169 substances in the apple flavor composition. Apples also contain a lot of vitamins and mineral salts.

Among the vitamins, the most important are: vitamin C (0,5-40 mg for 100 grams of fresh substance), vitamin PP (0,1-0,7 mg for 100 g), provitamin A (0,02-0,09 mg for 100g) and vitamins B1, B2 and B6. Regarding the mineral salts, there have been identified 45 elements in the apples till now, the content of these elements being different.

The nourishing content, the taste harmony, the subtle aroma and the pleasant texture of the apples, place them in the category of the food demanded throughout the world.

Apples are eaten when fresh, dried, prepared as cooked food, pickled, as non-alcoholic drinks (juice and nectar) or alcoholic drinks. They prepare jam, compote, jelly, paste, juice, cider, vinegar and brandy. Apple-juice production is the largest, 21 %.

The contents of the apples prove that, besides the nutritious value, this fruit has some therapeutic characteristics. As a well-known deconstipating, especially if it is eaten at breakfast, the apple holds an important part in preventing cancer at the large intestine level. It also represents one of the best treatments for infantile, acute or chronic diarrhoea.

When we refer to the use of apple as food-medicine, it should be pointed out the fact that, because of the numerous number of varieties with spaced out period of ripening (from June-July till winter) and because of the capacity of preserving the fruit during winter, this species is present all the year long.

There should be added some agro biological characteristics at the increasing of the apple importance as a fructiferous species. The variety is rustic, well-adapted to the temperate climate. The apple-tree can be grown at very different pedo-climatic conditions and it can be used any of the culture

systems with it. Its fruit can be transported easier than other varieties and they are very valuable raw material in the food industry.

MATERIALS AND METHOD

The cutting experiment was placed in a super-intensive orchard, with the Starkrimson variety grafted on M106.

The plantation was founded in 1998, the trees being planted at the distance of 4x1m, resulting 2500 trees on a hectare. The soil in the orchard was initially kept in good condition as a ploughed field but, during recent years, and especially in 2007, the maintenance of the soil has been neglected and, this way, the field was filled with weeds for a while during the vegetation period.

The phytosanitary treatments were performed at warning and, in 2007, because there was a very good fruit production, the trees suffered because of lack of water, too.

The experiment belongs to the monofactorial type, each variant having 16 trees, and so, 4 trees to a repetition.

The following variants have been taken into account:

V_1- trees which were not cut

V_2- tees cut with farm conditions

V_3- cut trees having eliminated 25 % fertile branches

V4- cut trees having eliminated 50 % fertile branches

The natural conditions of researching: yearly average temperature was 10,5 °C, yearly average rainfall - 634 mm, atmosphere humidity – 70 %-80 % during tree rest period, 55 % - 60 %during blossom time, 65 % - 70 % during the rest of vegetation time.

The soil is brown, characterized by 31,5 % clay for the Ap horizon and 40,0 % for the Bte, this way being favorable to the growth of apple-tree. The soil pH is between 5,5-6,6.

RESULTS AND DISCUSSIONS

Variants were applied on the field by cutting in accordance with the variants that different quantities of wood (biomass) were taken, depending on the variants. This way, we present below the biomass which was cut depending on the variants taken into account.

Table 1

The wooden biomass taken away when cutting in 2008

Variant	kg overall	kg/trees	The relative value %
V1	-	-	-
V2	11,5	0,76	100
V3	15,3	1,02	134

V4	18,1	1,20	157

Looking at this table we can notice that, unlike V2, where cutting was performed in farm conditions, V3 presents a 34% bigger quantity, while at V4, where it was performed an action upon the fertile branches of 50 %, the quantity of wood fallen during cutting outran 57 % compared to the variants applied at the production farm.

Regarding the thickness growth of the trunk under the influence of the cutting, the results which were obtained are presented in Table no.2. The table proves that the thickness of the trunk expressed in centimeters ranges between 34,5 cm and 39,3 cm, the surface of the trunk's cross-section given the situation of the applied variants.

The differences are slightly different and they do not follow a line which could say that they because of a more reduced or not so reduced cutting. It can be noticed that witness V1 is 37,7 cm² thick in trunk, very close to that of V2 with 36,3 cm².

Table 2

Thickness growth of the trunk under the influence of the cutting

Variant	Thinckness of trunk		Diffe rence	Height of the tree		Diffe rence	Thickness of crown		Diffe rence	Signi ficanc e
	cm	%		cm	%		cm	%		
V1	37,3	100	0	245,0	100	0	149,0	100	0	-
V2	36,3	97,3	-2,7	220,0	90,6	-9,4	113,0	75,8	-24,2	000
V3	39,3	105,3	+5,3	239,0	97,5	-2,5	126,0	84,5	-15,5	00
V4	34,5	92,5	- 7,5	233,0	95,1	-4,9	128,0	85,9	-14,1	00
DL 5%			4,5			0,19			0,18	
1%			8,2			0,34			0,33	
0,1%			18,2			0,76			0,73	

A negative influence upon the trunk thickness is still noticed at V4, as the quantity of fallen wood when cutting is bigger and where the thickness of the trunk is 7,5 cm² smaller compared to the witness.

The height of the trees is also an element which more or less reflects the influence of the cutting upon this element, and it can be noticed in table no.2 that, compared to the trees which were no cut, the cut ones reduce their height.

The thickness of the fructiferous crown is more influenced by the studied variants. All the cut variants registered a smaller thickness of the crown compared to the witness which was not cut, showing negatively assured differences from the statistical point of view.

As concerns the growth of the copse under the influence of the studied variants, the results are presented in table no.3, and it proves that all

the variants where cutting was applied, show longer copse than those which were not cut, having relative values between 14 – 19 %, with statistically assured differences.

Table 3

Height and thickness growth of the fructiferous crown

Variant	Year		Average (cm)	Difference (cm)	%	Significance
	2007	2008				
V1	12,6	10,5	11,5	-	100,0	-
V2	13,2	13,0	13,1	+1,6	114,0	X
V3	14,0	13,2	13,6	+2,1	118,2	X
V4	13,8	13,5	13,7	+2,2	119,1	X
DL 5%				1,4		
1%				2,6		
0,1%				5,7		

The elements which work out in order to obtain the production of fruit are the number of flowers being in the inflorescence state, the percentage of bound fruit out of the whole number of flowers, and the number of fruit remained after the falling down.

Table no. 4 shows that tree- flourishing in 2008 was very weak as a result of a poor differentiation during 2007. So that the number of of inflorescence on the trees was an average of 25 compared to 923 in 2007.

The number of flowers being in the state of inflorescence was higher in 2008 compared to 2007, but this higher level didn`t have any influence upon the production because the number of inflorescences was small.

Table 4.

The influence of the fructification upon the fruit- bearing elements(inflorescences, flowers) and the percentage of bound fruit

Variant	Number of inflorescences on the tree		Number of flowers in inflorescence		Number of flowers on the tree		Bound fruit out of the total number of flowers (%)		Number of fruit remained after the faling down	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
V1	976	35	4,3	5,2	4197	180	8,6	45	364	25
V2	1019	26	4,1	5,1	4178	135	6,1	48	258	26
V3	1011	24	4,0	5,2	4044	125	11,0	47	448	28
V4	686	15	4,0	5,0	2748	75	13,1	48	360	27
Average	923	25	4,1	5,1	3791	128	9,7	47	357	26,5

As concerns the number of fruit remained after the falling down, the difference between the 2 years is very big even if the physiological falling in 2008 is still developing.

W hen refering to the production of fruit in table no. 5, it can be noticed that, in 2007, trees had a very good boad, fulfilling a crop of about 18-30,3 kilo/ tree, the best variants being V3, V4, which surffered an intervention upon the fructiferous formations.

The average production for 2007-2008, even if it was smaller because of the assessed crop of 2008, it is still higher for V3 and V4.

The production expressed in tons/ hectare, showed the same line as the one expressed in kilo/ tree, higher for V3, V4, with relative differences, statistically assured differences, significantly distinct.

Table 5

Production of the fruit at apple- tree (Starkrimson variety) depending on the fruit- bearing cutting

Variant	Production kilo/tree		Average tons/ hectare	Diference tons/ hectare	Relative production (%)	Significance
	2007	2008	2007-2008			
V1	18,0	2,5	25,7	0	100	-
V2	19,0	2,6	27,7	2,0	107	-
V3	30,3	2,8	41,2	15,5	160	xx
V4	28,0	2,7	38,5	12,8	149	xx

DL 5% = 2,9
1% = 10,3
0,1% = 12,8

As concerns the quality of the fruit obtained as a result of the fruit-bearing differentiated cutting, it can be seen that the average weight of one fruit is the least for the trees were not cut (V1), having a fruit of 92,5, compared to the trees which supported a cutting of 50 % from fruit- bearing branches, and which had the average weight for a fruit of 114 g, outrunning with 23,2 % the fruit of V1. The number of fruit at 1 kilogram is decreasing from the variant which was not cut to the cut ones. This fact is appreciated, harder cutting influencing the obtaining of bigger more appreciated fruit.

The content of dried substance was situated at close levels for all the studied variants, yet obtaining a smaller percentage of 13,8% for the fruit of the trees which were not cut, compared to the 14,8 % for the cut trees, table no. 6.

Table 6

The quality of the fruit at Starkrimson depending on the fruit- bearing cutting 2007-2008

Varian t	Average weight of one fruit (grams)	Number of fruit piece/ kilo	Content of dried substance (%)	Difference
V1	92,5	11,5	13,8	0
V2	101,5	11,0	14,4	0,6
V3	106,5	10,0	14,8	1,0
V4	114,0	9,5	14,1	0,6

CONCLUSIONS

When speaking about tree growing, it can be noticed that the variants which supported cutting, registered lower values compared to the witness which was not cut, both as concerns the growth trunk thickness and regarding the height of the trees and the thickness of the crown.

When referring to the length of copse growth of framework and under framework extension, it can be noticed a positive situation, in the way the cut variants show up to 19 % longer copse compared to the trees which were not cut, the copse being taller at the variants of trees which were cut up to 50 % of fructiferous formations.

So, it can be stated that the cutting at Starkrimson variety, which belongs to the group showing a reduced growth, is a compulsory and profitable measure, meant to assure the copse growth so that it could be the best balance of growing and fruit bearing.

The production of fruit is on fluenced by the studied variants first of all, for the trees which were not cut, having a higher production, and the next year the production of the cut variants significantly growing, so that the variants with reduced fruit- bearing branches are situated at the highest level, with a production of 28-30 kilo/ hectare in 2007, compared to 18,0 for the witness which was not cut.

When we refer to the yearly production of 2008 it can be seen, from the assessment taken, that this is very small, because in 2007 the differentiation had not occurred in suitable, conditions as a result of a prolonged drought, of the increasing production for the trees, but because of technological shortcomings related to the weeds control in time, too.

As a result of not making any difference between the fruit- bearing buds in 2007, the production assessed in 2008 shows no difference depending on the studied variants.

On the average, during 2007- 2008, there are obtained productions which show the superiority of the cut variants and which, suported a reduction of 25 % and 50 % of the fruit- bearing branches, so that, compared to the witness variant (V2) cut at farm, it is obtained a production increaase of 2,5-5,5 tons/hectare.

When referring to the variant which was not cut, it can be noticed that this registers a high production, owing to the first year when the production increased, but after that it decreases to half of it , so proving onee again the necessity of fruit- bearing cutting every year.

Referr to the production again, it is important that the quality of the crop should be noticed, as the average weight of a fruit is heavier up to 23 %

at the trees cut by reducing to 50 % the fruit- bearing branches, a fact that represents another reason taken in to account, which comes to the necessity of yearly cutting in the apple- tree orchards.

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