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**THE EFFECT OF THE CHERRY CROWN FORMATION TO  
STRENGTHEN THE HARVEST TREES, PRODUCTIVITY AND FRUITS  
QUALITY IN THE SUPER INTENSIVE SYSTEM**

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**ABSTRACT**

*The researches were made in the intensive cherry orchard, planted in 2010 with cv Ferrovia, cv Adriana and cv Skeena, grafted on Gisela 6, planted at a spacing of 4x2 m and led by a Natural crown improvement system with reduced volume, Slender Spindle and The vessel flattened. The trees formed the first crops in the fourth year after planting. The harvest in the second year of fruiting was damaged by the spring colds. The medium harvest in the third year of fruiting is about 12375-15583 kg/ha, depending on the sort and the crown forming. The Slender Spindle crown thin improved had the biggest productivity. The sorts were uniform over 80% fruits in the size category. Cv Adriana had 85.4% fruits with the diameter between 22-26 mm, cv Ferrovia - 82.5% fruits between 24-28 mm and Skeena - 80% fruits between 24-28 mm. The results are preliminary, but the crown formation with reduced volume, combined with the precocious vegetative mother/father can have the important productivity with excellent quality, in first 3 years of fruiting.*

**INTRODUCTION**

The leading system of the sweet cherry trees should observe the simplicity in the forming process and keeping the crown, the cutting system and to refresh the semi-skeleton branches, early important harvest. It doesn't matter the leading crown system, the forming cutting are very important for the sweet cherry trees, because they provide the forming air and balanced crown in the vertical and lateral sides and cutting final high of the trees according to the culture system (Claverie & Lauri 2005, Blažková & Drahošová 2012, Balan 2015). For cherry culture is important to apply a system of suitable culture for forming branches semi-skeleton predominantly vertical offering high quality fruit gathering of fruits from the ground with hand in order to obtain fruit with superior quality (Long et al. 2014, Asanica et al. 2013). Obviously solving these problems largely depend on sharp of crown (axis structured, Vogel, Slender Spindle, KGB, cup and others) associated with distance of small plants (4-5x2-3 m) and vegetative rootstock (Edabriz, Gisela 5, Gisela , Maxima 14 and others) own a decisive role in ensuring the efficient use of solar energy, level of fruit production, of productivity in high volume manual work

(harvest, cutting), the level mechanization of technological works (Long et al. 2014, Ampatzidis & Whiting 2013, Balan 2014, 2015).

The use small and medium force of rootstock, in cherry culture, changed the objectives of cutting and forming the trees. In the Republic of Moldova began intensive planting of orchards of cherry, using rootstock with small force and free form of crown with low volume, which allow maximizing manual work at cutting the trees and fruits harvest (Cimpoies 2001). Practical argumentation improving the use of crown forms with low volume with a view to obtain production of competitive fruits for the market, efficient using work force it becomes a problem with high value for modern orchards.

## **MATERIAL AND METHODS**

Field experiences were located in the “Prodcar” farming company in Negureni village, Telenesti district. By geographical and ecological point of view this location corresponds to cherry culture. It was studied in terms of training and developing trees, sort of new cherry in the Republic of Moldova culture, Ferrovia, Adriana and Skeena, widely spread in European Communities countries. Orchard was planted in 2010 with vegetative rootstocks of Gisela 6 (*Cerasus vulgaris* x *Prunus canescens*) grafted at the plant distance 4x2 m. The trees are formed after natural system Crown improved with low volume, thin Spindle improved and Craft delayed flattened. Crown form was oriented to improving the balance between growth vegetative and reproductive organs with the aim to accelerating the process.

The experiment includes repetition of every eighth trees. Measurements were carried out in the field and laboratory conditions according to the research methods approved in fruit tree science. Physical, chemical and technological characters of cherry fruit were studied in harvest time. Diameter and weight of fruit identified by the template provided with openings 26, 28, 30, 32, 34 and 36 mm which correspond to mass 8.5; 10; 11; 5; 13; 14.5; and 16 g suitable. Content of soluble dry substance determined in orchards through using a portable refractometer ATAGO N-20E, which express the facts in Brix %. The fruit solidity was measured helped by AGROSTA dendrometer measured index higher than 250 g/mm<sup>2</sup> favorable for cherry fruits (Long et al. 2014). The harvest establishment for every sort was made particularly through weighing the fruits on different 32 varieties. The middleweight of fruits was made through weighing and counting them from 1 kg of cherry.

## **RESULTS AND DISCUSSIONS**

To modernize cherry crop in the Republic of Moldova is being used vegetative rootstock and spindly crown implemented from the experience of other countries. Cherry varieties Ferrovia, Adriana and Skeena, grafted on Gisela 6 began to harvest in the 4<sup>th</sup> year at the time of sprouting. The harvest recorded averages of 708.3 kg/ha on the cv. Adriana, 1312.3 kg/ha for cv Ferrovia and 500 kg/ha for cv Skeena. In the second period of fruiting, the trees were partial attacked by the spring cold. When the air temperature during the burgeoning flowers was 6-7°C below and frozen the burgeons situated on the annual branches. It has to be mentioned that the harvest formed properly from the burgeons placed on the annual branches. The researched sorts had the medium results from 4208.3 kg/ha

from Skeena soil until 5000 kg/ha for cv. Ferrovia. In the view of the system effects of crown formation, on fruits harvest, the information from the 1<sup>st</sup> table place on the first way improved thin Spindle with 4500 kg/ha for cv. Adriana, 5125 kg/ha for cv Ferrovia, and 4375 kg/ha for cv Skeena, at insignificant differences from the other 2 systems forming the crown (table 1).

Table 1

Cherry fruit production according to the sort and the formation system of the crown, kg/ha\*

Formation system of the crown	Years			Media (2013-2015)
	2013	2014	2015	
cv. Adriana				
Natural crown improvement with reduced volume	625	4375	11875	5625
Slender Spindle	875	4500	13000	6125
The vessel flattened delayed	625	4000	12250	5625
Media	708.3	4291.6	12375	5791.7
cv. Ferrovia				
Natural crown improvement with reduced volume	1125	4875	13250	6416,7
Slender Spindle	1250	5125	15375	7250
The vessel flattened delayed	1562	5000	14125	6895.7
Media	1312.3	5000	14250	6854.1
cv. Skeena				
Natural crown improvement with reduced volume	625	4250	16000	6958.3
Slender Spindle	375	4375	16000	6916.7
The vessel flattened delayed	500	4000	14750	6416.7
Media	500	4208.3	15583.3	6763.7
DL 5%		435.2	971.8	

\*Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar", 2013-2015 period

In the third year of vegetation, the highest medium average of fruit production was recorded in Skeena cv (15583.3 kg/ha ) followed by Ferrovia cv ( 14250 kg/ha) and Adriana cv (12375 kg/ha). Small but significant differences are situated Ferrovia and cv Skeenas, both in the form of spindle improved crown and in the improved low volume natural crown system.

The lowest fruit production were recorded in the Craft system delayed level to all the sorts, namely to Skeena cv where the crop (14750 kg/ha) was significant lower in comparison to the tested varieties. The system effects of crown formation on the harvest is evident at spindle thin improved crown and natural improved crown with reduced volume in comparison with „Craft” delayed level with evident differences for all searching sorts. To remark that the difference between crown formation system is important. That is why it is a question about the effects of crown formation for creating the qualified fruits.

The size and the shape are the most important element if the cherry are sold for consumption in fresh condition (Ivanov et al. 2015). The crown forming system and the particular biologic facts influenced the middle diameter of the researched fruits. The fruits of Adriana, Ferrovia and Skeena had the medium value -24, 9 – 28.1 mm the diameter, the differences are important, Ferrovia cv and Skeena cv had the highest forms (tab.2).

The crown formation system at the Craft crown with delayed level were found the best size values ( 25.7-28.1 mm) and the Slender Spindle (24.8-26.4 mm). The searching cherry sorts had the uniformity about 80% of the size category. Adriana cv formed 85.4% fruits with 22-26 mm diameter; Ferrovia cv - 82.5 % fruits between 24-28 mm and Skeena sort 80% fruits between 24-28 mm.

Table 2

The fruit cherry quality depending on the sort and crown formation\*

Formation system of the crown	Fruits diameter, mm	Cherry mass, g	Dry, soluble substance, Brix %	Acidity of fruits, g malic acid/ 100g fresh fruit	Fruits firmness, kg/cm <sup>2</sup>
Cv Adriana					
Natural crown improvement with reduced volume	24.9	8.14	16.7	0.67	2.57
Slender Spindle	24.8	8.11	6.5	0.67	2.55
The vessel flattened delayed	25.7	8.40	16.9	0.67	2.56
Media	25.1	8.21	16.7	0.67	2.56
Cv Ferrovia					
Natural crown improvement with reduced volume	26.2	8.57	17.5	0.79	2.51
Slender Spindle	26.4	8.63	17.1	0.75	2.50
The vessel flattened delayed	27.3	8.93	17.8	0.75	2.55
Media	26.6	8.70	17.5	0.76	2.52
Cv Skeena					
Natural crown improvement with reduced volume	26.0	8.59	18.0	0.89	2.98
Slender Spindle	26.3	8.60	18.0	0.85	2.87
The vessel flattened delayed	28.1	9.18	18.6	0.88	2.90
Media	26.8	8.76	18.2	0.87	2.92
DL 5%	1.13	0.42	0.85		

\*Rootstock Gisela 6, planting distance 4x2, SRL "Prodcar", 2015

The fruit weight is an element influenced by the crown forming system and biological particularities of the sort. Skeena cv showed the middle average-8.76 g, followed by Ferrovia cv -8.70 g, having important differences among them. The dry

soluble material in the fruit had different values at the researched sorts, having the average between 16.7 Brix% (Adriana cv) and 18.2 Brix% (Skeena cv). The forming system of the vessel flattened delayed distinguishes from rising dry soluble material in the fruits, but is not distinctly important - 5%.

As average value of titratable acidity level, Adriana cv recorded the lowest results, of 0.67 g malic acid/100 g fresh fruit and the Skeena cv recorded the highest results, with 0.87 g malic acid/100 g fresh fruit. The rate of soluble solid content and treatable acidity recoded values between 24.9 for Adriana cv, 23.0 for Ferrovio cv and 20.9 for Skeena cv, which is a parameter that determines the taste of the fruit and it is not strongly influenced by the formation system of the crown.

Another important parameter that determines the quality of the cherry fruit is resistance from deformation showing the degree of elasticity of the tissues. When comparing the sorts between them, it was noticed that Adriana and Ferrovio sorts are the most resistant to deformation, having remarkable differences compared to Skeena sort.

### CONCLUSIONS

Trees formed the first harvest in year 4 after the flowering. In the second year of flowering, the harvest was affected by the spring cold and recorded averages from 4208.3 kg/ha for the Skeena cv up to 5000 kg/ha for the Ferrovio cv. The average yield in the 3<sup>rd</sup> year of fructification is about 12375-15583 kg/ha, depending on the sort and the forming system of the crown. The improved thin spindle crown had the biggest production per hectare, on the craft crown with delayed level had the lowest yield but also had the highest values of the fruit size (25.7-28.1 mm) and the dry, soluble substance in fruits (16.9-18.6 Brix%).

The diameter, firmness, average, weight and dry soluble substance of the fruits, depend on biological characteristics of soil and are barely influenced by the formation system of the crown. The sorts distinguish over 80% of fruits with the same size. Adriana cv formed 85.4% fruits with the diameter between 22-26 mm, Ferrovio cv -82,5% fruits with the diameter between 24-28 mm and Skeena cv - 80% fruits with the diameter between 24-28 mm.

Although the results are preliminary, it seems that the formation system of the crown with reduced volume, combined with precocious vegetative mother/father plant may show large yields of fruits of an excellent quality, in the first 3 years of fructification.

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