

COMPARATIVE EFFICIENCY OF CROWN FORMATION SYSTEMS IN INTENSIVE APPLE PLANTATIONS

EFICIENȚA COMPARATIVĂ A SISTEMELOR DE FORMARE A COROANEI ÎN PLANTAȚIILE INTENSIVE DE MĂR

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Abstract. One of the directions of further improving of intensive culture the technology of apple trees, is to create and test new systems of crown formation. With this purpose in the Republic of Moldova were tested in a stationary experiment on six systems of formation of a crown on varieties of apple Generos and Florina, grafted on rootstock M9. Studies have shown that the rates of accumulation of vegetative mass during the formation of spindle-shaped crown are more emphasized, particularity at the free growing fusiform of apple trees. In conclusion, for the first 3 years of fruiting highest yield per unit area by the variety Generos obtained for the formation of its type Spindle bush, and at variety Florina – respectively is Solax.

Key words: apple, variety, types of crowns, growth, fruition, productivity

Rezumat. Una din direcțiile de îmbunătățire în continuare a tehnologiei de cultură intensivă a mărului o constituie crearea de noi sisteme de formare a coroanei. Cu acest scop, în Republica Moldova au fost studiate într-un experiment staționar 6 forme de coroană și 2 soiuri de mere, Generos și Florina, altoite pe portaltoi M9. Studiile au demonstrat că ratele de acumulare a masei vegetative în timpul formării coroanei sunt mai pronunțate la coroanele fusiforme și, îndeosebi, la pomii de coroană fus zvelt ameliorat. În concluzie, pentru primii 3 ani de fructificare, cel mai înalt randament pe o unitate de suprafață s-a obținut la soiul Generos cu forma de coroană fus zvelt ameliorat, iar la soiul Florina – respectiv Solax.

Cuvinte cheie: măr, soi, forme de coroane, creștere, fructificare, productivitate

INTRODUCTION

Using rootstocks with a low vigour of growth new systems of their formation and caring for apple trees, it was allowed to enter the new frontiers of productivity and economic efficiency of this culture. However, scientific development of a model of modern horticultural shows that even the most modern design of existing plantations do not ensure a sustainable use, especially those of economic resources such as light, air space, land area (Cimpoieș Gh., 2000; Cimpoieș Gh., 2002; Potel A. et al. 2005).

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In super intensive orchards of special importance has the system formation, trim, tilt, branches and other methods of regulating the growth of trees. At high density of plantation, each of them is given a limited space, which must be completely filled out with the required number of elements of phytomass in the optimal ratio between them. It must be complied strictly with the design features and geometric shape of the crown, and to maintain optimal balance between the processes of growth and fruiting throughout the period of operation of the orchard (Babuc V., 2000). Nowadays high-density plantations of apple trees are formed mainly by the type of spindle crown. This shaping has many differences and modifications depending on the regions and local contexts, where it is used.

In this connection there was a need for a comparative study of some of them in Moldova.

MATERIAL AND METHOD

Experimental orchard for the Study of spindle-shaped forms of the crown for intensive plantation of apple was founded in spring 2004 in the Experimental Station "Criuleni", Agricultural University of Moldova. The object of the research is forming the following:

1. Spindle bush (control variant). Recommended as the primary shaping for the apple on the rootstock M9 in the Republic of Moldova. The distance of plantation 4 x 1,5 m.

2. Slender spindle. Crohn's has a well-developed central conductor, surrounded by evenly placed 15 - 20 branches of fouling at the age of 1 - 4 years, which is constantly updated. The distance of plantation 4 x 1,5 m.

3. Solax. This form of the crown like a spindle-shaped bush, but the height of the tree it is not limited to cropping, and by tilting the center conductor at a height of 2,2 - 2,5 m up to a horizontal position. The distance of plantation 4 x 1,5 m.

4. Tesa. Trees have a trunk height of 1,2 m which is placed in a tier 5 - 7 main branches, tying them in a circle to a horizontal trellis. The distance of plantation 4 x 1,5 m.

5. Palspindel. Combines elements of palmettos and spindle bush. In the lower part of the crown has two skeletal branches, directed along the row, and the others lay on the type of spindle. The distance of plantation 4 x 2,5 m.

6. Solen. Trees shaped into a bilateral horizontal cordon and consist of a trunk height of 1,2 m and the two main branches, tied down the row to the horizontal trellis. The distance of plantation 4 x 2 m.

7. Bush form. The tree is formed as a bush, consisting of 4 - 5 main branches off at a height of 10 - 15 cm of soil. The distance of plantation 4 x 1 m.

The experiment studied two varieties of apple trees with genetic resistance to scab – Generos, Florina and was grafted on the rootstock M9. Repeated experience of 3-fold. The number of sample trees in version is 10 pcs.

RESULTS AND DISCUSSIONS

The intensity of growth processes of the tree as a whole is most clearly characterized by such indicators as: the total length of shoots and the diameter of the trunk. One-year increase in addition is also one of the indicators of potential productivity in the next year so is the base of forming fruit-bearing formations in the coming years (Cimpoieş Gh., 2000).

Analyzing the effect of crown shape on the total length of shoots, it should be noted that at 5 - 7 years after planting, the highest it has been in shaping Solax, surpassing the control by 22-25%. This is due to the fact that the height of the trees is not limited by pruning, but due to angling the upper part of the crown. The minimum values of this index were observed in the formation Solen 10,0-19,8 m/tree.

Table 1

**The main growth of apple trees depending on the shape of the crown.
Cultivar Generos**

Crown shape	The total length of shoots m / tree			Trunk diameter, mm		
	2008	2009	2010	2008	2009	2010
Spindle bush (control variant)	11,6	21,4	21,2	45,5	51,8	55,0
Slender spindle	10,2	23,0	22,3	46,1	52,0	55,4
Solax	14,8	28,2	26,4	46,0	53,3	57,4
Palspindel	13,9	25,8	25,3	45,2	57,9	64,1
Tesa	13,5	26,6	33,5	44,2	52,8	58,5
Solen	10,0	18,8	19,8	38,6	41,6	53,0
Bush form	16,9	22,5	20,2	44,9	50,8	54,7
DL 5%	0,82	0,92	0,89	0,35	0,38	9,41

It should be noted that the values of this indicator depends on many factors, including the load of wood harvesting. Thus, over the past 3 years for all studied forms of growth vegetative was the highest in 2009, when the variety Generos decreased the yield of fruits.

Increase the diameter of the trunk is an integral indicator of the intensity of growth processes of fruit tree. The highest values in the experiment was achieved by the formation of tree-type palspindel, amounting to 64.1 mm in 2010, surpassing the control by 15%. Features of this form of the crown allowed to increase in this scenario the largest volume of wood that has resulted in the largest diameter of the trunk.

The minimum value of this indicator over the years of research - 38.6 - 53.0 mm were observed in the forming Solen. In general, it should be noted that among the total length of shoots and the diameter of the trunk of apple trees there is a definite correlation.

The most important criterion of a collective evaluation of the formation of a yield and fruit quality. It should contribute to an early entry on fruit formation of trees and the annual holding it at a high level. Analysis of the results shows that the shape of the crown had a significant impact on the yield of apple (table 2).

In a cost-effective fruiting trees of all the studied variants come in 4 years after the plantation. The highest yield in the first two years of fructification registered the variety Generos being on plantations of bush canopy forms. In 2010, the highest yield in the experiment - 37,9 t/ha was obtained when the formation of tree-type low growth spindle-shaped bush. In this embodiment of the variety Generos at was recorded and the highest yield of fruit in the average over

3 years of fruiting, 72.9 t/ha. The lowest yield in all the years of research was reported in shaping Solen and was two times lower than in the control variants.

Table 2

**Yield of apple trees depending on the processing and varieties.
Experimental Station "Criuleni", SAUM**

Crown shape	Generos			Florina		
	2008	2009	2010	2008	2009	2010
Spindle bush (control variant)	18,9	16,1	37,9	17,8	22,9	29,6
Slender spindle	18,6	15,8	26,7	16,9	19,7	25,8
Solax	19,0	16,5	36,3	16,8	24,1	32,7
Palspindel	11,0	14,5	24,7	9,1	21,9	26,1
Tesa	18,6	15,9	20,8	14,9	17,8	23,2
Solen	11,3	12,6	13,4	10,1	15,2	15,7
Bush form	20,8	17,3	20,6	15,9	18,7	30,4

At varieties with strong-growth of growth like Florina indicators yields were higher in the formation of tree-type of Solax. In total, over 3 years of fruiting crops in this variant was 73.6 t / ha and exceeded the control with 5%.

The crown bushy formation for the variety Florina was less effective than for the variety Generos. The low temper of growth occurs during the formation of crop and tree-type Palspindel.

The lowest yield on the variety Florina was observed in the formation of Solen.

CONCLUSIONS

1. The intensity of growth processes during the formation of the above apple trees by Solax crown type, thanks to a minimal degree of pruning during its breeding and growth control by hazing an angle optimum branches. The lowest rates of capacity timber marked the formation of trees on the type of Solen.

2. The highest yield of fruit in the average in the first years of fructification was obtained during the formation of variety Generos type spindle bush. For strong-growing variety Florina most of crop was shaping Solax type crown.

3. Shape crown Solen due to the small amount of productive timber, it showed the lowest values of yield production.

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