PRODUCTIVITY OF LONG-TERM CULTIVARS IN THE APPLE TREE SUPERINTENSIVE CULTURE SYSTEM

PRODUCTIVITATEA SOIURILOR DE PERSPECTIVĂ ÎN SISTEMUL SUPERINTENSIV DE CULTURĂ A MĂRULUI

PEŞTEANU A.[1], BABUC V.[1], GUDUMAC E.[1]
e-mail: a.pesteanu@mail.uasm.md

Abstract. *The investigations were made in a commercial orchard "Codru-ST" Ltd. founded in the spring of 2000 year with bench grafting. Apple trees of the varieties Idared, Golden Reinders, Sir Prise, Florina, Mutsu, Gala Must, Jonagored, Jonagold and Ionica growth on dwarfing M 9 rootstock, the distance of plantation between rows is 4.0 m, and between trees in the row is 1.0 m. The trees were trained by the slender spindle crown formation. From 2003 to 2010 was studied the productivity of the apple orchard and fruit quality. It was established, that the first fruits, was registered in the 2003 year, when the yield of the studied cultivars constituted 13.3-33.8 t/ha. In 2010 year, the yield significantly increased to 26.7-40.6 t/ha. During the study period, the highest averages yield of fruits was obtained at the varieties Ionica – 32.07 t/ha, Gala Must – 32.38 t/ha, Golden Reinders – 32.92 t/ha şi Jonagored – 35.06 t/ha. The lowest averages yield was registered at the varieties Jonagold, Florina and Mutsu.*

Key words: variety, apple plantation, slender spindle, productivity.

Rezumat. *Studiul s-a efectuat într-o plantaţie pomicolă comercială a întreprinderii "Codru - ST" SRL fondată în primăvara anului 2000 cu altoiri la masă. Pomii de măr din soiurile Idared, Golden Reinders, Sir Prise, Florina, Mutsu, Gala Must, Jonagored, Jonagold şi Ionica cresc pe portaltoiul cu talie scundă M 9, distanţa de plantare dintre rânduri 4,0 m, iar dintre pomi pe rând 1,0 m. Pomii au fost conduşi după forma de coroană fus zvelt ameliorat. Între anii 2003-2010 s-a studiat productivitatea plantaţiei de măr şi calitatea fructelor pe diverse soiuri. S-a stabilit că primele fructe s-au înregistrat în anul 2003, unde producţia la soiurile studiate a constituit 13,3-33,8 t/ha. În anul 2010 producţia de fructe s-a majorat semnificativ, până la 26,7-40,6 t/ha. Pe parcursul cercetărilor, cea mai mare productivitate medie s-a înregistrat la soiurile Ionica – 32,07 t/ha, Gala Must – 32,38 t/ha, Golden Reinders – 32,92 t/ha şi Jonagored – 35,06 t/ha. Soiurile Jonagold, Florina şi Mutsu formează cea mai scăzută producţie medie.*

Cuvinte cheie: soi, plantaţie de măr, fus zvelt ameliorat, productivitate.

INTRODUCTION

Variety is a biological unit with printed characters and qualities of the species that formed the basis of its training and shaping human action. So, not all varieties have created regions, areas or countries, but for certain specific conditions of certain climatic zones of some pedoclimatic zones and have all possible qualities as fresh consumption and various forms of industrialization (Balan V. et al., 2000; Cepoiu N., 2002; Cimpoieş Gh. et al., 2001).

[1] State Agrarian University of Moldova, Republic of Moldova

Replacing the old varieties, that have less relevant requirements, with new ones, that are being more efficient and more productive, is an ongoing process and compulsory. This replacement is done according to the introduction of new varieties from other countries on the creation of new local varieties and selection of the most valuable clones (Cimpoieş Gh. et al., 2001).

In Poland, an attempt is made in variety of commercial plantations during the first four crops and can then be decided to be studied that the variety to be introduced in the State Register (Sadowski A. et al., 2005).

In the Republic of Moldova it was currently registered in 70 varieties and 32 temporarily ones for testing under production conditions and more than 50% of global production is apple varieties Golden Delicious and Idared. Share of world production of apples ripening varieties of winter period is 81.0%, 12.0% winter and summer 7.0% (Peşteanu A., 2008; Rapcea M. et al., 2002).

For the foundation of apple orchards is recommended super quality varieties, to have the higher freight, earlier fructification, stable production, tolerant to diseases and a higher economic returns (Peşteanu A., 1998; Sadowski A. et al., 2005).

Introduced varieties must have a good climatic and edaphic adaptability, modern cultivation technologies.

MATERIAL AND METHOD

The study was conducted during the years 2003-2010 in apple superintensive orchard „Codru–ST", planted around the village Rassvet, district Straseni. Planting was conducted in spring 2000 with perfected copulation. As bench grafting in biological material were used varieties Idared trees (variant control), Golden Reinders, Sir Prise, Florida, Mutsu, Gala Must, Jonagored, Jonagold and grafted onto rootstock Ionica M9. Planting distance is 4.0x1.0m.

The trees are driven by thin-time system. Training work and cutting trees were carried out as up-to-date recommendations.

Each version includes four repetitions of eight trees that you located on the ground randomized. Number of trees in rehearsal is 8.

Research has been conducted in laboratory and field conditions as the accepted method of achieving the experiments with fruit crops.

RESULTS AND DISCUSSIONS

Quantity fruit bearing formations in the crown of apple trees demonstrates how did was the process of differentiation of shoots and allows to determine the degree of intervention to cutting and prior calculation of the crop for next year

The study shows that the total quantity of fruit-bearing formations in the varieties studied is 228-309 pcs/tree (fig. 1). The amount of fruit it is best formations to achieve yields of 35-40 t/ha of fruit quality.

The largest amount of fruit-bearing formations during the research has formed Gala Must variety - 309 pcs/tree. Sir Prise, Florina, and Jonagold Jonagored varieties formed the smallest amount of 228-260 pieces of fruit formation/tree. Mutsu, Idared, Golden Reinders varieties and quantity of training

Ionica was respectively 274, 280, 290 and 292 pcs/tree

To obtain in the crown of apple trees in the superintensive plantations the respective quantity of fruit it is necessary to make cuttings to optimize the cargo of the tree, in the period when the fruits reach the diameter between 10-12 mm for thinning and to exclude the future interchange of fructification. In addition to have a more rational feathering with fruit-bearing formations it is necessary to make all the agro-technical measures (soil maintenance, fertilization, irrigation, harvesting) in optimal time.

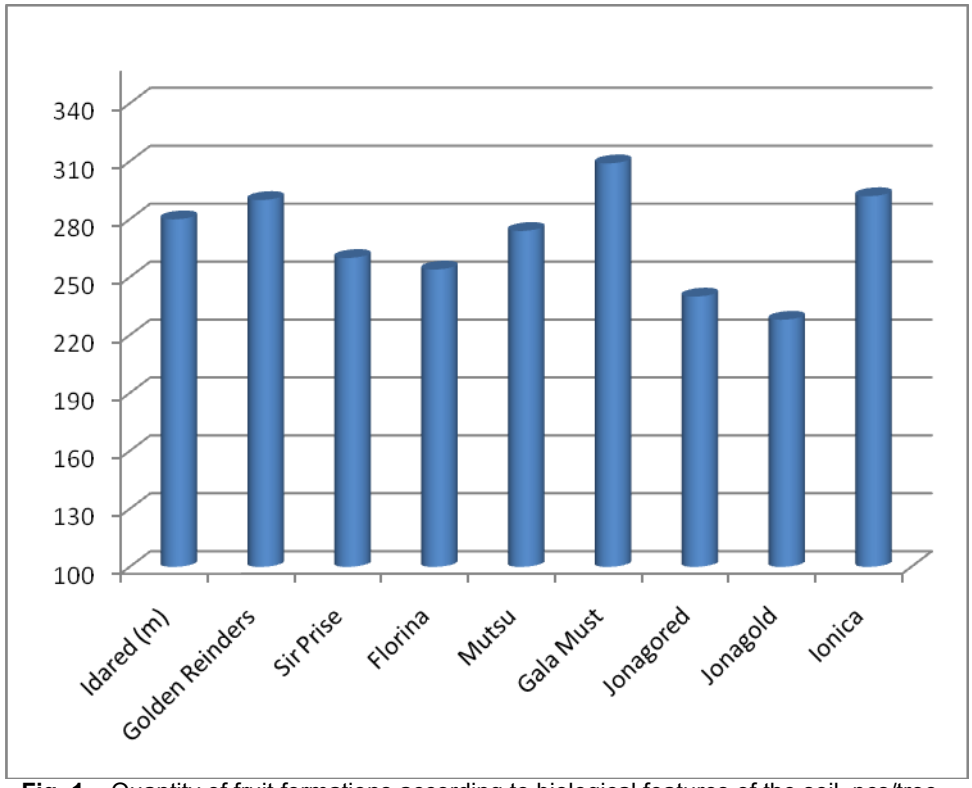

Fig. 1 – Quantity of fruit formations according to biological features of the soil, pcs/tree

Placing the fruit on the branches of different age groups is particularly important to determine the cutting of trees and canopy structure. It improves the lighting and ventilation system of the crown to give a quality production and competitive domestic and foreign.

The study shows that the location of fruit on the branches of different age influences the biological features of the variety (table 1).

The largest number of fruit varieties in the study is placed on the branches of 1-3 years of age from 80.2 to 94.6%, while the older branches are formed from 5.4 to 19.8% fruit. Among the investigated varieties also recorded some difference. If you study the varieties increased fruit weight on younger branches, while their quantity diminishes the older branches. Sir Prise, Idared, Florina and

Golden Reinders varieties on the branches forming the corresponding annual 43.1, 44.4, 44.4, 46.2%. Gala Must and Mutsu varieties the fruit weight is less than the annual branches and constituted 25.8 to 25.9%. Other varieties formed by branches from 36.3 to 38.2% of the total annual fruit. The branches in only two years old Gala Must variety of fruit weight increased and the variety Ionica diminished in comparison to other varieties. If the annual branches Gala Must variety formed 25.8%, then those two years 44.7%, and vice versa variety Ionica a law, the industry 36.3% and 28.8% on the annual age two years.

Table 1

Arrangement of fruit on branches of different size, according to the biological features of the soil, %,

Varieties	Shoots age				
	1 year	2 years	3 years	4 years	5 years
Idared (m)	44,4	40,6	7,0	6,7	1,3
Golden Reinders	46,2	34,4	12,6	5,9	0,9
Sir Prise	43,1	37,1	13,9	5,6	0,1
Florina	44,4	41,3	8,9	4,6	0,8
Mutsu	25,9	38,2	17,1	15,3	3,5
Gala Must	25,8	45,1	14,5	12,1	2,5
Jonagord	38,2	36,1	13,7	8,9	3,1
Jonagold	37,7	36,9	16,4	5,0	4,0
Ionica	36,3	28,8	15,1	16,6	3,2

The branches in only three years old Florina and Idared variety forms a small quantity of fruit from 7.0 to 8.9% as compared to other varieties whose weight was from 12.6 to 17.1%.

The small amount of fruit varieties in the trial branches are formed on 5 years of age where their share was 0.1 to 4.0%. Our results show that the variety branches Idared and rejuvenate Florina made from wood garnish of three years of age, Gala Must and Mutsu varieties from wood aged 4-5 years, and for other wood varieties to age 3-4 years depending on the load of fruit buds

The study demonstrates that biological features of fruit varieties have influenced the location of the branches of different age. These data can be used to recommend the level of cutting trees during fructification.

To obtain consistent production of fruit, it is necessary to use varieties with early fruit setting and a high potential for fruition, allowing restricted in terms of changing the range in accordance with the requirements of wood. To solve these problems is necessary to use new structure planting, cutting progressive types and methods according to ecological features of the area

where these varieties are grown.

The first production of fruit varieties studied was recorded in 2003 (table 2). The largest fruit crop has been the variety Golden Reinders - 33.8 t/ha and lower values for varieties Jonagold - 16.4 t/ha and Ionica - 18.8 t/ha. The productivity of the other varieties ranged from 20.4 t/ha to 29.0 t/ha.

Higher productivity in 2003 was a negative impact on yield reduction in 2004 accounted for the variety Golden Reinders - 8.4 t/ha, the variety Sir prize - 3.0 t/ha, the variety Idared - 2.0 t/ha and the variety Jonagored - 1.8 t/ha. In other varieties of fruit production increased by 1.2 to 4.2 t/ha compared with the previous year.

In the years 2005 - 2006 the varieties with a fruit production in the study showed an increase from 1.5 to 2.3 times compare with the previous year. Jonagored varieties, Ionica and Sir Prize were recorded higher values of 50.0 t/ha.

Table 2

Apple tree productivity according to the biological features of the soils, t/ha

Verieties	2003	2004	2005	2006	2007	2008	2009	2010	average on 8 years
Idared (m)	26,6	24,6	33,1	40,8	30,8	24,6	31,7	33,1	*31,2*
Golden Reinders	33,8	25,4	40,8	40,9	30,8	22,7	30,6	38,4	*34,3*
Sir Prise	29,0	26,0	55,3	36,2	29,7	18,4	31,6	26,7	*35,2*
Florina	13,3	17,7	38,6	39,8	36,4	18,7	34,1	33,2	*29,2*
Mutsu	20,4	24,0	46,2	35,0	28,3	15,8	27,4	35,7	*30,8*
Gala Must	26,3	27,7	38,2	40,7	35,4	22,5	33,8	34,5	*33,7*
Jonagored	23,0	21,2	50,7	47,8	31,3	28,5	37,4	40,6	*35,8*
Jonagold	16,4	17,6	44,1	36,4	24,0	19,9	29,7	31,2	*27,7*
Ionica	18,8	23,0	51,5	39,1	33,4	26,0	31,6	33,2	*33,2*
Media	*23,1*	*23,0*	*44,3*	*39,6*	*31,1*	*21,9*	*32,0*	*34,0*	-

High temperatures during the growing season of 2007 and insufficient rainfall have a negative impact on production fruit varieties in the study. Crop varieties in the study decreased by 24.2 to 34.0% compared to the production of fruit harvested in 2006.

In 2008 fruit production in 2004 was reduced due to the formation of fruit with floral buds. Since 2009, production of fruit is set, the values obtained are characteristic super apple plantations, and in 2010 recorded an increase in the index study.

Productions during the research have been enhanced varieties Ionica - 32.07 t/ha, Gala Must - 32.38 t/ha, Golden Reinders - 32.92 t/ha and Jonagored - 35.06 t/ha. Values bellow 30.0 t/ha of fruit varieties have been Jonagold, Mutsu and Florida.

The results obtained during eight years of study we demonstrated that the

varieties introduced in the country, the varieties Golden Reinders, Jonagored, Ionica and Gala Must be suitable for establishing high-density apple orchard to a unit area.

CONCLUSIONS

1. When cutting trees it must be taken into account the biological features of fruit variety and location of the branches of different age. To rejuvenate Florina and Idared variety of industries to be made from wood garnish with 3 years of age, Gala Must and Mutsu varieties from wood aged 4-5 years, and the varieties Golden Reinders, Sir Prise, Jonagored, Jonagold and the Ionica wood aged 3-4 years depending on the load of fruit buds

2. The studied trees varieties started to build since March of crown formation. During the research productivity was the highest recorded for varieties Ionica - 32.07 t/ha, Gala Must - 32.38 t/ha, Golden Reinders - 32.92 t/ha and Jonagored - 35.06 t/ha.

3. The establishment of plantations besides super apple varieties listed in the register of plant varieties planted orchards with varieties Golden Reinders, Jonagored, Ionica and Gala Must temporarily plant varieties for testing under production conditions for a potential higher productivity and higher quality.

REFERENCES

1. **Balan, V., Gh. Cimpoieş, M. Barbăroşie, 2001** - *Pomicultura.* Chişinău
2. **Cepoiu N., 2002** - *Pomicultura aplicată.* Bucureşti, Ştiinţe agricole, 252 p.
3. **Cimpoieş Gh., V. Bucarciuc, I. Caimacan, 2001** - *Soiuri de măr.* Chişinău. Ştiinţa
4. **Peşteanu A., 1998** - *Dezvoltarea livezilor superintensive de măr cu ciclul scurt de exploatare.* 50 ani de la înfiinţarea Facultăţii de Horticultură. Bucureşti, pg. 60-61.
5. **Peşteanu A., 2008** - *Pretabilitatea soiurilor de perspectivă pentru sistemul superintensiv de cultivare a mărului.* Lucrări ştiinţifice UASM Chişinău, vol.16, pg. 77-80.
6. **Rapcea M., V. Mladinoi, V. Babuc, C. Dadu, I. Donica, V. Bucarciuc, I. Ţurcanu, 2002** - *Concepţia dezvoltării pomiculturii în Republica Moldova pe anii 2000-2020.* Cercetări în Pomicultură. Chişinău, Vol. 1, pg. 4-17.
7. **Sadowski A., Bernacki A., Zoltowski T., 2005** - *Effectiveness of use of different types of trees for establishment of apple orchards.* International Conference „Environmentally Friendly Fruit Growing. Tartu, pg. 36-44.