

RESEARCH REGARDING THE INFLUENCE OF PRUNING AND PLANTING DISTANCE ON THE GROWTH AND FRUCTIFICATION OF SOME APPLE TREE VARIETIES WITH BIOLOGICAL RESISTANCE

CERCETĂRI PRIVIND INFLUENȚA TĂIERII ȘI A DESIMII DE PLANTARE ASUPRA CREȘTERII ȘI FRUCTIFICĂRII UNOR SOIURI DE MĂR CU REZISTENȚĂ BIOLOGICĂ

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Abstract. *The research was conducted in a high density plantation, 2777 trees/ha, with four varieties resistant to diseases: Pionier, Prima, Generos and Florina and four pruning variants (shortening the semiscaffold with 1/2-1/3 of length with and without shortening of annual branches). The reaction of the trees to the pruning of different intensity was particular per variety regarding the trunk growth, fruit bud differentiation and obtained production. Only the growth of the shoots was directly influenced by the intensity of the pruning. Generally, the shortening of the semiscaffold with 1/2 with and without shortening the annual branches led to better results on average for the varieties Prima, Pionier and Generos, and for the Florina the shortening of the semiscaffold with 1/3 of length.*

Key words: apple culture, pruning, resistance varieties

Rezumat. *Cercetările au fost efectuate într-o plantație de desime mare 2777 pomi/ha, cu 4 soiuri rezistente la boli: Pionier, Prima, Generos și Florina și 4 variante de tăiere (scurtarea semischeletului cu 1/2-1/3 din lungime cu și fără scurtarea ramurilor anuale). Reacția pomilor la tăierea de intensitate diferită a fost particularizată la nivel de soi în ceea ce privește creșterea trunchiului, diferențierea mugurilor de rod și producția obținută. Numai creșterea lăstarilor a fost direct influențată de intensitatea tăierii. În general scurtarea semischeletului cu 1/2, cu și fără scurtarea ramurilor anuale, a dat pe medie rezultate mai bune la soiurile Prima, Pionier și Generos, iar la soiul Florina scurtarea semischeletului cu 1/3 din lungime.*

Cuvinte cheie: cultura marului, taiere, soiuri rezistente

INTRODUCTION

Apple culture has been and remains one of the basic species by which fields more or less proper to other agricultural cultures can be capitalized. Choosing the assortment that is to be cultivated is correlated with the conditions that the area offers, with the requirements of the consumers but

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also with the ecological plasticity and tolerance to biotic and abiotic stress factors. The introduction of varieties with biological resistance made it possible to reduce the costs of phytosanitary protection and to reduce the negative impact of chemisation on the environment.

The plant management and pruning systems are important to capitalize better the light and to ensure quality fruit production constant in over time. By using less vigorous rootstocks, it was gradually passed from higher and higher culture density in order to reduce the size of the trees and to increase the yield for manual works, especially for pruning and harvesting. Also, the small trees ensure, apart from large productions and a very good quality, for most of the varieties, more than 90% of the fruit of extra quality.

In order to establish how trees react to different pruning interventions on the semiscaffold, it was organized the present experiment, the results of which will be presented below.

MATERIAL AND METHOD

The experiment was conducted at ICPP Pitești Mărăcineni, in 2004-2006, in an apple tree plantation founded in 1995, with four resistant apple tree varieties: Pionier, Prima, Generos and Florina, grafted on M9 and planted at a distance of 3,6/1m resulting 2777 trees/ha.

The following pruning variants were used:

V1 – shortening the semiscaffold $\frac{1}{2}$ of length;

V2 - shortening the semiscaffold $\frac{1}{2}$ of length + shortening the annual branch with $\frac{1}{2}$ of length;

V3 – shortening the semiscaffold $\frac{2}{3}$ of length;

V4 - shortening the semiscaffold $\frac{2}{3}$ of length + shortening the annual branch with $\frac{2}{3}$ of length.

The plant management was made as vertical ax, supported on trellis with horizontal wires, the soil was maintained grassed between rows and worked on the rows, the applied technology was the one specific for the fruit plantations.

Observations and determinations were made regarding the growth in thickness of the trunk, shoot growth, fruit bud differentiation and obtained production.

RESULTS AND DISCUSSIONS

The growth of the trees was influenced both by the variety and by the pruning variants used.

Thus, for the Pionier variety, the transversal section area of the trunk (TSA) was higher for the variants V2 and V3 and lower for V1 and V4 during the entire study period (table 1).

For the Prima variety, the rate of increase of TSA was higher for the V3 variant, 3,71 cm², the variants V2 and V4 were relatively equal and V1 had the lowest value (table 2).

Table 1

The influence of pruning on the increase of transversal section area of the trunk for Pionier variety (cm²)

Variant	2004	2005		2006		Average rate
	TSA	TSA	rate	TSA	rate	
V1	7,90	9,09	1,19	9,87	0,78	0,99
V2	11,94	13,20	1,26	13,98	0,78	1,02
V3	10,31	11,47	1,16	12,63	1,35	1,26
V4	7,31	7,95	0,46	8,50	0,55	0,51

Table 2

The influence of pruning on the increase of transversal section area of the trunk for Prima variety (cm²)

Variant	2004	2005		2006		Average rate
	TSA	TSA	rate	TSA	rate	
V1	9,90	11,40	1,50	15,27	3,87	2,69
V2	14,02	16,81	2,79	20,17	3,36	3,08
V3	16,26	19,29	3,03	23,68	4,39	3,71
V4	11,59	14,14	2,55	17,68	3,54	3,05

For the Generos variety, the rate of increase of TSA was higher for the variant V4, followed by V1 and lower for V2 and V3 (table 3).

Table 3

The influence of pruning on the increase of transversal section area of the trunk for Generos variety (cm²)

Variant	2004	2005		2006		Average rate
	TSA	TSA	rate	TSA	rate	
V1	8,52	9,70	1,18	11,49	1,79	1,49
V2	8,92	9,90	0,98	11,86	1,96	1,47
V3	9,59	11,37	1,78	12,22	0,85	1,32
V4	10,68	12,81	2,13	15,06	2,25	2,19

For the Florina variety, the best increase was recorded for the variant V1, followed by V4, and the lowest for V3 (table 4).

Table 4

The influence of pruning on the increase of transversal section area of the trunk for Florina variety (cm²)

Variant	2004	2005		2006		Average rate
	TSA	TSA	rate	TSA	rate	
V1	19,10	22,25	3,15	27,44	5,19	4,17
V2	13,14	15,98	2,84	20,44	4,46	3,65
V3	11,73	13,93	2,20	17,63	3,70	2,95
V4	12,990	14,73	1,83	20,59	5,86	3,85

The sum of shoot growths was influenced by the variety, climatic year and pruning variant used. Thus, the average data per variant showed that the intensity of the growth was directly influenced by the growth intensity, as seen in table 5.

Table 5

The sum of shoot growths depending on the pruning variant (cm)

Variant	2004	2005	2006	Average
V1	510,7	486,9	513,2	503,60
V2	597,6	607,3	567,0	590,63
V3	636,3	606,5	606,7	616,50
V4	754,8	678,3	921,7	784,93

The average number of fruit buds differentiated per variety was higher for the variety Prima, followed by Pionier, and lower for Generos (table 6). The differentiation was rather influenced by the climatic year, the values being different per variety, at times the amplitude exceeding 100% from one year to another.

Table 6

**Capacity to differentiate fruit buds
(average data per variety)**

Variety	2004	2005	2006	Average
Pionier	201,3	117,6	289,3	202,7
Prima	163,7	182,4	285,5	210,5
Generos	173,1	179,9	129,5	160,8
Florina	183,7	217,5	109,4	170,2

The obtained fruit production was very different both between the varieties and between the used variants. Also, the climatic year highly influenced the production for the same variant. As seen in table 7, the values obtained per three years of research show very wide limits of the production: over 40 t/ha for Prima in 2006, variants V2 and V3 and Florina in 2005 for V2 and values under 20 t/ha for Florina in 2006, variants V1, V2, and V3, and Generos in 2006 varinat V4 and Pionier in 2005, varinats V3 and V4. From this data it can be observed the particular way in which the variety reacts to pruning depending on the climatic conditions of the area. High variability of the data, without a direct connection with the pruning variant or with the variety, showed that the experiment was not statistically ensured, the differences compared to the average being insignificant.

Table 7

Apple production depending on the variety and pruning variant

Variety	Var.	2004	2005	2006	Average	Difference	Significance
Pionier	V1	26,32	23,02	34,32	27,89	111,39	N
	V2	24,52	22,41	33,12	26,68	106,58	N
	V3	26,88	17,35	25,63	23,28	93,01	N
	V4	25,57	16,85	22,74	21,72	86,77	N
Prima	V1	26,74	28,49	42,12	32,45	129,61	N
	V2	28,54	31,40	40,15	33,37	133,27	N
	V3	23,88	28,10	27,93	26,64	106,40	N
	V4	24,24	26,74	26,29	25,76	102,88	N
Generos	V1	24,07	32,99	32,21	29,76	118,85	N
	V2	27,32	31,18	20,49	26,33	105,18	N
	V3	26,32	26,88	21,18	24,79	99,04	N
	V4	28,35	23,90	13,96	22,07	88,17	N
Florina	V1	25,77	34,62	17,46	25,95	103,66	N
	V2	22,29	40,59	16,46	26,45	105,66	N
	V3	26,27	38,26	17,74	27,42	109,54	N
	V4	22,29	23,90	15,19	20,46	111,39	N
Average		25,59	27,92	25,44	26,31	100	Mt

DL 5% - 42,12

DL 1% - 56,83

DL 0,1% - 75,43

CONCLUSIONS

1. The behavior of the resistant varieties in density plantations was generally good, but with a particular reaction of the variety to the thinning interventions.

2. Shortening the semiscaffold influenced differently the growth in thickness of the trees, only for the Prima variety the growth was directly influenced by the growth intensity;

3. The sum of shoot growths was directly influenced by the pruning variants, the highest growths were for the variant V4;

4. The fruit production was influenced by the pruning, variety, climatic year and the interaction between these factors, without establishing a direct connection with any of them.

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