BEHAVIOR OF DISEASE RESISTANT APPLE TREE CULTIVARS IN SUPER-INTENSIVE ORCHARDS IN ORADEA

COMPORTAREA SOIURILOR DE MĂR REZISTENTE LA BOLI ÎN CULTURĂ SUPERINTENSIVĂ ÎN CONDIŢIILE DE LA ORADEA

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Abstract. *The studied cultivars and hybrids can be planted at 3/1 m using spindle bush type crown formations. This can lead, over a period of eight years of production, to average yields of 48.8 t/ha for Florina, 46.2 t/ha for Auriu de Bistriţa, 45.2 t/ha for Baujade, 44.8 t/ha for T195 and 42.3 t/ha for Liberty. The indices of size and weight of the fruit are not significantly influenced in a negative way by the high density of trees per ha.*

Key words: hybrids, phenophases, super-intensive

Rezumat*. Soiurile şi hibrizii studiaţi se pot cultiva la 3/1m utilizându-se forme de coroană fus-tufă. Se pot obţine producţii medii pentru opt ani de rod de 48,8 t/ha la Florina,46,2 t/ha la Auriu de Bistriţa,45,2 t/ha la Baujade,44,8 t/ha la T195 şi 42,3 t/ha la Liberty. Indicii de mărime şi greutate ai fructelor, datorită densităţii ridicate de pomi la ha, sunt influenţaţi negativ nesemnificativ.*

Cuvinte cheie: hibrizi,,fenofaze, superintensivă

INTRODUCTION

Cultivars that are resistant to disease and pests have revolutionized apple production in the last two-three decades, both worldwide and in our country.

Generally, the introduction and study of their behavior in Romania has been conducted in intensive orchards (N. Branişte, N. Ghena 2003; I. Botu, M. Botu 2003; Şcheau and colab. 2006; Valeria Petre 2009).

MATERIAL AND METHOD

In 1997, some branches were taken from I.C.D.P. Piteşti – Mărăcineni that came from the following apple cultivars and hybrids resistant to apple scab and powdery mildew: Florina, Generos, H8/12/87 – Piteşti, T 195, H6/80/87 – Piteşti, Liberty, Priam, Romus 3, Braeburn, Baujade and Auriu de Bistriţa.

In the nursery of the S.C.D.P. Oradea, these cultivars and hybrids were grafted on the M 106 rootstock and planted in the spring of 1999 at a distance of

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three meters between rows and one meter within row (3333 trees per ha), linearly, having 12 trees per variant (4 repetitions of 3 trees).

Amounts of 150 kg N, 100 kg P2O5 and 200 kg K2O were administered annually.

Grass was planted between rows, while within the rows only manual labor was performed during the first three years since plantation; during the following years the herbicide Roundup 3l/ha was used.

The evaluations and determinations referred to:

-the main phenophases of fruit-bearing;

-the surface of the trunk section;

-the production of fruit per ha;

-the physico-chemical indices of the fruit (the index of size, the index of weight and dry substance determined by refractometry).

All the data was statistically processed through the variance analysis method.

RESULTS AND DISCUSSIONS

Table 1 presents the main phenophases of fruit-bearing of the studied apple cultivars and hybrids.

The start of the flowering phase occurs on the 7th of April for the Priam cultivar and ends on the 16th of April with the Elstar cultivar.

The ending of flowering begins with the Priam and Auriu de Bistriţa cultivars, on the 22nd of April and ends on the 30th of April with the Baujade cultivar.

As to number of days, the flowering period ranges between 11 days for Liberty and Auriu de Bistriţa and 17 days for Florina, Baujade and the H8/12/87 – Piteşti hybrid.

Regarding ripening age, Romus 3 is harvested between the 1st and 10th of July, being a summer cultivar, H8/12/87-Piteşti and H6/80/87-Piteşti during the first twenty days of August, being autumn cultivars, and the others after the 20th of September.

Table 2 presents the surface of the trunk section in the 11th year since plantation.

Compared to the average of the 12 studied cultivars and hybrids, there are some very vigorous cultivars: Liberty, Auriu de Bistriţa, Baujade and Braeburn are statistically ensured as positive, very significant; cultivars and hybrids of average vigor: H8/12/87-Piteşti, H6/80/87-Piteşti, Florina and hybrids of average vigor: H8/12/87-Piteşti, H6/80/87-Piteşti, Florina and Elstar and cultivars of little vigor like Generos, Romus 3, Priam and T195, negative statistically very significant.

Table 1

The main fruit-bearing phenophases of apple cultivars and hybrids (average values 2003-2010)

Nr. Crt.	Cultivar or hybrid	Flowering phase			Readiness for harvesting	
		Beginnig	Middle	End	Beginning	End
1	Florina	10 - IV	20 - IV	26 - IV	01 – X	10 – X
2	Generos	15 - IV	22 – IV	28 - IV	20 – IX	30 – IX
3	$H_{8/12/87}$-Piteşti	08 - IV	19 – IV	24 – IV	10 – VIII	20 – VIII
4	T 195	13 - IV	19 – IV	26 – IV	20 - IX	30 – IX
5	$H_{6/80/87}$-Piteşti	09 - IV	18 – IV	23 – IV	20 – VIII	30 – VIII
6	Liberty	08 - IV	18 – IV	28 – IV	01 – X	10 – X
7	Priam	07 - IV	18 – IV	22 – IV	20 – IX	30 – IX
8	Romus 3	09 - IV	16 – IV	23 – IV	01 – VII	10 – VII
9	Braeburn	15 - IV	18 – IV	27 – IV	20 – IX	30 – IX
10	Elstar	16 - IV	20 – IV	29 – IV	15 – X	30 – X
11	Baujade	14 - IV	20 – IV	30 – IV	10 – X	25 – X
12	Auriu de Bistriţa	12 - IV	17 - IV	22 - IV	20 – IX	30 – IX

Table 2

The surface of the trunk section in the 11th year since plantation of apple cultivars and hybrids

Nr. crt	Cultivar or hybrid	Surface of the trunk section – 2010		±d (cm^2)	Significance
		Absolute (cm^2)	Relative (%)		
1	Liberty	80.2	153.1	+27.8	xxx
2	Auriu de Bistriţa	77.8	148.5	+25.4	xxx
3	Baujade	67.0	127.9	+14.6	xxx
4	Braeburn	64.1	122.3	+11.7	xxx
5	$H_{8/12/87}$-Piteşti	59.1	112.9	+6.7	x
6	$H_{6/80/87}$-Piteşti	53.3	101.7	+0.9	-
7	Florina	52.4	100.0	-	-
8	Media(Mt)	52.4	100.0	-	-
9	Elstar	51.1	97.5	-1.3	-
10	Generos	40.1	76.5	-12.3	ooo
11	Romus 3	33.4	63.7	-19.0	ooo
12	Priam	30.1	57.4	-22.3	ooo
13	T 195	20.6	39.3	-31.8	ooo

LSD5% = 6.3
LSD1% = 8.5
LSD0.1% = 11.4

Table 3

Fruit production of apple cultivars

Nr. crt.	Cultivar or hybrid	Production (t/ha)								Average production		±d (t/ha)	Significance
		2003	2004	2005	2006	2007	2008	2009	2010	Absolute (t/ha)	Relative (%)		
1	Florina	30.1	36.5	40.8	48.4	50.7	55.3	61.7	66.8	48.4	140.6	+ 14.1	xxx
2	Auriu de Bistriţa	28.2	34.7	38.2	44.7	48.4	53.5	58.7	63.1	46.2	133.1	+ 11.5	xxx
3	Baujade	27.5	34.9	38.4	43.1	49.3	51.8	55.2	61.2	45.2	130.3	+ 10.5	xxx
4	T 195	28.1	33.3	39.5	42.1	47.1	50.9	56.2	60.9	44.8	129.1	+ 10.1	xxx
5	Liberty	25.6	27.2	31.3	42.6	48.5	52.2	50.6	60.5	42.3	121.9	+ 7.6	xxx
6	$H_{8/12/87}$-Piteşti	19.7	21.8	24.7	32.4	39.8	46.4	47.2	51.2	35.4	102.0	+ 0.7	-
7	Media(Mt)	19.3	22.6	26.2	32.3	37.7	42.4	46.3	50.7	34.7	100.0	-	-
8	Elstar	18.5	20.6	24.3	30.7	36.1	40.2	44.9	49.8	33.1	95.4	- 1.6	-
9	Generos	17.2	19.1	22.6	27.3	32.5	37.3	42.6	45.7	30.5	87.9	- 4.2	o
10	Braeburn	15.1	16.3	19.9	25.9	31.7	36.2	39.7	43.4	28.5	82.1	- 6.2	oo
11	$H_{6/80/87}$-Piteşti	8.4	9.6	12.7	17.3	24.2	31.1	40.5	38.5	22.8	65.7	- 11.9	ooo
12	Romus 3	7.3	9.4	11.6	17.4	23.9	28.7	30.9	35.3	20.6	59.4	- 14.1	ooo
13	Priam	6.2	7.7	9.9	15.1	20.2	25.6	27.2	31.1	17.9	51.6	-16.8	ooo

LSD5% = 4.2
LSD1% = 5.6
LSD0.1% = 7.6

Table 3 presents the production of fruit from the third year since plantation and up to the 11th year. For the eight years of fruit-bearing, average yields range between 17.9 t/ha for Priam and 48.8 t/ha for Florina.

The following cultivars and hybrids: Florina with 48.8 t/ha, Auriu de Bistriţa with 46.2 t/ha, Baujade with 45.2 t/ha, T195 with 44.8 t/ha and Liberty with 42.3 t/ha are positive statistically very significant.

Priam, Romus 3 and H6/80/87 are negative statistically very significant, Braeburn is negative distinctly significant and Generos is significantly negative.

Table 4 presents the average physico-chemical characteristics of fruit coming from the studied apple cultivars and hybrids.

The weight index varies from 90.6 g for H6/80/87-Piteşti and 180.6 g for Generos.

Except for the Romus 3 and Priam cultivars and the H6/80/87-Piteşti, H8/12/87-Piteşti nad T195 hybrids, all the others classify as having large and very large fruit. Values of above 12% dry substance occur in the case of Florina, Generos, Liberty and Romus 3, and of above 13% in the case of Elstar and Braeburn.

Table 4

Physico-chemical characteristics of the fruit (average values 2003-2010)

Nr. crt.	Cultivar or hybrid	Size index (mm)	Weight index (mm)	Dry substance (%)
1	Florina	74.2	165.3	12.3
2	Generos	79.6	180.6	12.6
3	$H_{8/12/87}$-Piteşti	59.3	103.9	10.0
4	T 195	62.2	110.5	11.0
5	$H_{6/80/87}$-Piteşti	56.1	90.6	9.0
6	Liberty	63.6	120.2	12.3
7	Priam	60.0	105.1	10.0
8	Romus 3	61.1	110.2	12.0
9	Braeburn	61.8	129.2	13.8
10	Elstar	64.3	125.7	13.6
11	Baujade	64.1	110.7	11.2
12	Auriu de Bistriţa	69.2	135.0	11.7
13	Media(Mt)	64.6	123.9	11.6

Fruit quality is insignificantly influenced by the small distances between planted trees by the reduction of their size.

CONCLUSIONS

The production of apple can be made super-intensive by planting the trees at 3/1 m and training the trees in a tall spindle bush system. The Florina, Auriu de Bistriţa, Baujade, T195 and Liberty cultivars obtain average productions of 48.8 t/ha, 46.2 t/ha, 45.2 t/ha, 44.8 t/ha and 42.3 t/ha for eight years of study

REFERENCES

1. **Botu I.,Botu M., 2003** -*Pomicultură modernă şi durabilă*. Editura Comphys, Rîmnicu Vîlcea, p. 337-347.
2. **Ghena N.,Branişte N., 2003** - *Cultura specială a pomilor*. Editura Matrix Rom., Bucureşti, p. 118.
3. **Şcheau V. et. al., 2006** - *Disease and pest resistant apple varieties*. The International Symposium – Natural resources and sustainable development, Oradea – Debrecen, p. 371-374.
4. **Petre Valeria, 2009** - *Tehnica obţinerii soiurilor de măr cu rezistenţă genetică la boli prin mutageneză*. Editura Moroşan, p. 18.