

Biological and Pomological Characteristics of some Pear Varieties in Republic of Macedonia

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Summary

Five years research of the biological and pomological characteristics of some pear varieties are presented in this paper. 18 pear varieties with different ripening time were included in the research. Some of investigated varieties are new bred (Turandot, Norma, Karmen, Monica), some of them are famous as resistant to Fire Blight ('Harrow Delight', 'Harvest Queen', 'Harrow Sweet', 'Honey Sweet') and some of them belong to group of old varieties that have been less investigated in our conditions ('Starking Delicious', 'Abbe Fetel', 'Packams Triumph', 'Conference', 'Magness Highland', 'Guyot'). All varieties were compared with standard varieties ('Williams', 'Precoce Moretini', 'Bosc's'). Demonstrative orchard was established in 1997 at the Faculty farm-Trubarevo near Skopje. The trees were grafted on BA 29 quince rootstock and for those varieties that had not affinity with quince, we used inter stock pear variety Cure. Research was conducted during the period of 2003-2007. The following parameters were investigated: blossom, ripening of the fruits, growth of the trees (TCSA, volume of the crowns), yield, pomological characteristics of the fruits and content of the soluble dry matters and acids. The results showed that some of the pear varieties are characterized with a good production attributes, resistant to Fire Blight, pear sucker and to some a biotical factors, with good quality of the fruits. In the first group, the best characteristics gave variety Norma, from resistant variety group good results gave variety Harrow Sweet, and from old variety assortment for our conditions, good results gave 'Packams Triumph'. These varieties can be recommended for cultivation in our climatically conditions.

Key words

pear, variety, research, behavior, yield

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Introduction

The pear is a fine fruit which is appreciated and requested by the consumers. Before the 90's, the pear production in Republic of Macedonia has reached over 20,000 tones. Later though, the pear orchards as well as their production rapidly decreased. Today, the pear production orchards are almost gone. The markets are full with imported high priced pear fruits nearly unaffordable for the consumers. The reasons for this situation lay mostly in the appearance of epiphytotic rate of the pear sucker and erwinia, about which the producers have no knowledge (Ristevski et al., 2004).

The adaptation to the surrounding conditions including the pest and disease resistance, is the main goal of selection of new pear varieties (Bellini et al., 2002).

The existing pear assortment worldwide is becoming too conservative and therefore, the market conditions and the sensibility of certain varieties towards some pests and diseases, request not only complementing of the existing assortments but also a replacement of varieties with more quality and less sensitive to the unfavorable biotic and abiotic factors (Gliha, 1997).

During the classification of the varieties by their resistance towards certain pests and diseases Bellini et al. (1997) put the varieties 'Harrow Delight', 'Harvest Queen', 'Harrow Sweet', 'Honey Sweet' and 'Magness' in the group of Fire Bright resistant varieties. The pear production is facing a line of problems mainly concerning the sensitivity of the varieties towards diseases that largely endangers the pear productivity. One of the manners for advancement of the production is improvement of the variety structure and increase of the participation of quality and productive varieties (Nenadović-Mratinič et al., 2007). Rivalta et al. (2002) describes the new realized and perspective pear varieties 'Turandot', 'Norma' and 'Carmen'.

Material and methods

The research on the pear varieties was conducted in the area of the Faculty farm - Trubarevo in Skopje. The research orchard with the varieties 'Harrow Delight', 'Harvest Queen', 'Harrow Sweet', 'Honey Sweet', 'Starking Delicious', 'Abbe Fetel', 'Packams Triumph', 'Conference', 'Magness', 'Bosc's', 'Highland', 'Monica', 'Guyot, Williams', 'Precoce Moretini' has been established in 1997, whereas the 'Turandot', 'Norma' and 'Karmen' varieties have been grafted on older trees of the variety Cure in 2003. Quince BA 29 has been used as a rootstock for the researched varieties. Planting distance was 4 x 1.5 m (1,666 trees/ha). The paper presents the results from the research from 2003-2007. The orchard has been established on a fertile loam soil. The area has been maintained with a clean cultivation until the seventh vegetation, and after that with natural grassing. In the orchard drip irrigation system was installed. For fertilization was used only cattle manure. The trees crowns have been formed by the free spindle bush system.

Time of blooming and ripening of the fruits have been observed. The vegetative development of the trees has been followed through measurement of the trunk diameter which determined the Trunk Cross Sectional Area (TCSA). The crown volume and cumulative yield per tree and per hectare were recorded. The pomological characteristics were determined by measuring dimension of the fruits and their mass and the chemical characteristics were determined by the content of soluble dry matters and total acids. The statistical analyses was done by an analysis of the variance, and the testing by a T-test.

Results and discussion

Blossoming and ripening of the pear varieties - The blossoming time is an important characteristic of the pear due to two reasons: combining of pollinating varieties on one side and the danger of damage due to late spring frosts on the other. The pear varieties which blossom earlier are in bigger risk of damage from the late spring frosts (Kiprijanovski, 2002).

The Turandot variety blossoms early, whereas the Bosc's variety blossoms the latest. The research group included varieties with different ripening time. The Turandot variety ripens early, and the 'Harrow Sweet', 'Bosc's' and 'Packams Triumph' varieties ripe the latest (Table 1).

The dimensions of the trunk presented through TCSA are an integral indicator of the trees growth (Simovski et al., 1986). From the researched varieties, the 'Bosc's' and 'Magness' have the largest TCSA (105.7 and 103.3 cm²), whereas the Guyot variety has the smallest TCSA (30.5 cm²) (Table 2). The crown is the fruit's bearer and therefore the trees with a bigger crown have a higher productivity potential. This is only valid up to a certain point because a large part of the inside of the voluminous crowns is being shadowed and the leafs become inefficient. The dimensions of the crown were in co-relation with the dimensions of the trunk. The vari-

Table 1. Blossom and harvest time of the pear varieties (2003-2007)

Variety	Blossom			Fruit maturity
	Beginning	Full	End	
Turandot	03.04	05.04	10.04	16.07
Precoce Moretini	05.04	09.04	17.04	26.07
Harrow Delight	09.04	14.04	20.04	30.07
Norma	06.04	09.04	12.04	30.07
Karmen	06.04	09.04	12.04	05.08
Harvest Queen	09.04	12.04	19.04	10.08
Guyot	10.04	14.04	20.04	12.08
Monica	09.04	13.04	19.04	14.08
Williams	09.04	13.04	21.04	24.08
Honey Sweet	11.04	15.04	21.04	26.08
Starking Delicious	09.04	13.04	20.04	01.09
Highland	10.04	14.04	20.04	12.09
Magness	09.04	13.04	18.04	12.09
Conference	08.04	12.04	18.04	15.09
Abbe Fetel	06.04	12.04	18.04	16.09
Harrow Sweet	09.04	12.04	19.04	22.09
Bosc's	13.04	16.04	19.04	22.09
Packams Triumph	08.04	12.04	19.04	25.09

Table 2. Tree size at the end of 10th year

Variety	TCSA (cm ²)	Dimension of the trees		
		Height (cm)	Width (cm)	Crown volume (m ³)
Precece Morettini	89.4	285	160	2.36
Harrow Delight	75.1	245	170	2.08
Harvest Queen	90.2	355	150	2.87
Guyot	30.5	177	110	0.92
Monica	46.1	233	140	1.75
Williams	59.0	223	160	1.85
Honey Sweet	66.9	300	140	2.19
Starking Delicious	90.4	273	160	2.24
Highland	92.1	250	165	2.07
Magness	103.3	315	210	3.45
Conference	72.5	263	200	2.67
Abbe Fetel	55.9	240	155	1.84
Harrow Sweet	73.3	287	175	2.60
Bosc's	105.7	295	220	3.38
Packams Triumph	54.1	260	160	2.36
LSD _{0.05}	17.6			0.35
0.01	23.7			0.47

Table 3. Cumulative yield per tree and per hectare (2003-2007)

Variety	Cumulative yield per tree (kg)	Cumulative yield per hectare (t)
Precece Morettini	79.2	131.9
Harrow Delight	61.2	101.9
Harvest Queen	56.6	94.3
Guyot	23.4	38.9
Monica	61.7	102.8
Williams	71.0	118.3
Honey Sweet	38.3	63.8
Starking Delicious	57.7	96.1
Highland	61.7	102.8
Magness	124.7	207.7
Conference	89.2	148.6
Abbe Fetel	74.4	123.9
Harrow Sweet	76.7	127.8
Bosc's	97.3	162.1
Packams Triumph	77.4	128.9
LSD _{0.05}	19.3	3.21
0.01	25.9	4.31

eties 'Magness' and 'Bosc's' had the largest crown volume (3.45 and 3.38 m³). The Guyot variety had the smallest one. This variety is poorly vigorous and shouldn't be grafted on a quince rootstock.

Castro et al. (2002) established that the 'Abbe Fetel' and 'Conference' varieties had a diameter of the trunk of 25.9 cm and 25.7 cm respectively in the ninth year on a BA 29 rootstock, which is close to our results.

The growth of the pear trees depends on the depth of planting and the way of cultivation of the orchards (Kolečevski et al., 1995)

Yield - The fruits and their quality are the main motive for cultivation of the orchards. From the researched 15 varieties, the Magness variety gave the highest cumulative yield per tree and per area unit for five years (124.7 kg/tree and

Table 4. Pomological and quality characteristics of the fruits (2003-2007)

Cultivar	Weight of the fruits (g)	Dimension of the fruits (mm)		Soluble solid matters (%)	Total acids (%)
		Height	Width		
Turandot	140	89.8	62.7	11.2	0.20
Precece Morettini	185	83.3	66.2	11.8	0.14
Harrow Delight	70	57.0	55.2	12.4	0.25
Norma	190	116.2	71.5	12.2	0.32
Karmen	195	95.0	74.5	11.0	0.52
Harvest Queen	120	65.2	62.5	11.6	0.27
Guyot	220	89.7	74.5	16.2	0.12
Monica	215	104.0	64.7	14.6	0.13
Williams	230	75.9	63.9	14.3	0.31
Honey Sweet	145	43.4	36.7	14.6	0.23
Starking Delicious	195	56.9	58.6	13.9	0.26
Magness	210	75.9	62.4	13.3	0.19
Conference	170	63.6	55.0	18.0	0.23
Abbe Fetel	185	75.5	56.7	13.2	0.12
Highland	265	127.4	76.3	13.9	0.25
Harrow Sweet	165	66.9	52.2	17.4	0.29
Bosc's	210	88.7	66.2	15.6	0.24
Packams Triumph	235	83.4	79.3	16.4	0.24

207.7 t/ha). The 'Bosc's', 'Harrow Sweet', 'Precoce Morettini' and 'Conference' varieties are amongst the more productive varieties. The 'Guyot', 'Honey Sweet', 'Harvest Queen' and other varieties have lower yields (Table 3).

Etkins (2002) points out that the system of growing and the rootstock play an important role in the productivity and the fruit quality of the variety Bosc's. Similar results have been presented by Vercammen (2002) who researched the Conference variety.

Fruit quality - Analyzing the data on the fruit quality, it can be pointed out that the average mass, the content of soluble dry matters and total acids in the fruits are different at certain varieties (Table 4).

The 'Guyot', 'Monica', 'Highland', 'Williams', 'Abbe Fetel' and 'Packams Triumph' varieties characterize with large fruits. 'Precoce Morettini', 'Norma', 'Karmen', 'Starking Delicious', 'Conference' and 'Harrow Sweet' varieties had mid-large fruits. The 'Harrow Delight', 'Harvest Queen', 'Honey Sweet' and 'Magness' varieties had smaller fruits.

The fruits from the 'Harrow Sweet', 'Conference', 'Bosc's' and 'Honey Sweet' varieties highlight for their high content of soluble dry matters.

Conclusion

Based upon the several years of research of the pear varieties in the Skopje region, a few conclusions can be made:

1. From the newly created varieties, we emphasize the 'Norma' with its characteristics (time of blossoming and ripening, productivity and fruit quality).
2. From the varieties resistant to Fire Blight, the Harrow Sweet variety had the best characteristics (productivity, fruit quality and resistance).

3. From the older group of varieties in the given conditions, the 'Pakhams Triumph', 'Abbe Fetel' and the standard Williams variety, gave the best results. The Conference variety is very sensitive to sun burn, the Bosc's variety is very sensitive to Fire Blight and therefore require specific growing conditions.

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