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STUDIES REGARDING THE ECONOMICAL APPROACH OF PEAR FRUITS COMMERCIALIZATION ACCORDING TO THE QUALITATIVE ASPECTS

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Abstract

There are many situations where farmers exploit their fruit production just as it was harvested, without sorting the fruit by their quality or diameter. The present study that was carried out followed an economic approach of the pear fruit exploitation in terms of some quality aspects, namely it has highlighted the advantage of sorting the fruit into quality classes, as opposed to selling the fruit engross after being harvested from the orchard. The pear fruit belonging to the Conference, Beurre Bosc, Orizont and Cristal cultivars originated from a ten year old orchard located in the Bucharest area. The Orizont and Cristal cultivars in comparison with the Conference and Beurre Bosc cultivars display a genetic resistance to pear scab and fire blight diseases, which determined lower production costs, mainly due to less pre harvest intervention applied in the orchard. Both because of the above mentioned fact and the commercialization of the fruit after sorting, the obtained profit was between 1,150 RON/ha for the Conference cultivar and 13,900 RON/ha for the Cristal cultivar. This determined a higher value of profit, respectively between 5.5% and 25.1% in the case of the fruit sorted by quality criteria than for those exploited directly from the orchard, as soon as they have been harvested without any other postharvest intervention.

Key words**:** *cultivar, commercialization, pear scab, fire blight, sorting, quality criteria, quality indicators*

INTRODUCTION

Nowadays, the global changes of rapid population growth, urbanization and market liberalization generally have an impact on agricultural exploitations, making them more market – oriented and thus more competitive [4]. This trend is also valid in Romania.

Pear is the most mild climate fruit species after apple in the world. Pear fruit can be consumed both fresh and dry [6].

The fruit production obtained in an orchard may be exploited directly after harvesting, without being sorted into quality classes, when there is no storage capacity available or may be stored and exploited after being sorted on quality criteria, mostly taking into consideration the fruit diameter. In any of the above mentioned situations, the economic efficiency has to be analysed, because in order to obtain profit a number of factors are involved, of which the preharvest and postharvest ones are the biggest impact.

As long as the pears are asked for by the consumers, the culture of this species must enter into the attention of the fruit producers. The regress of the pear production must be halted, acting on the causes determining it, among which the most important are: the sensibility to the Psylla sp., bacterial fire (Erwinia amylovora) and not last - the lack of keeping spaces, equipped with refrigerating installations [1, 8].

Therefore growing pear cultivars that are genetically resistant to pear scab and fire blight allows the reduction of the production costs as a consequence of the drop in the number of phytosanitary treatments.

As far as the postharvest practices are concerned, sorting the fruit according to their diameter allows the classification on qualitative categories and their commercialization leads to a higher profit, despite the costs associated with the fruits sorting [2]. At times, due to the lack of work force or of reduced storage capacity, the farmer has to exploit the fruit production

directly after harvesting, through engross selling, which leads to a reduction in the obtained profit, especially if the fruits belong to the sensitive resistance to the main diseases category [3].

This study aimed to identify the economic aspects that resulted after the comparative exploitation of some pear cultivars that are genetically resistant to the main diseases and of others sensitive to these diseases, as well as the influence of the process of fruit sorting on the obtained profit.

MATERIALS AND METHODS

In order to carry out this study fruits from four pear cultivars were taken into consideration, grown in an orchard located in the Bucharest area and harvested in the autumn of the year 2019.

The four analyzed cultivars were: Conference, Beurre Bosc, Orizont and Cristal (Fig.1, 2, 3 and 4). The Conference variety, from the worldwide traditional range is of medium vigor, and the fruits are harvested in September and they reach maturity during the winter months. The medium weight of the fruits ranges between 150 and 300 grams. It is a variety that is sensitive to fire blight and moderately tolerant of scab.

The Beurre Bosc variety, from the worldwide traditional range is of medium vigor, and the fruits are harvested in September and they reach maturity during the winter months. The medium weight of the fruits ranges between 150 and 300 grams. It is a variety that is sensitive to fire blight and moderately tolerant of scab.

The Orizont variety, approved in the year 2003, is of Romanian origin and medium vigor. They are harvested in September and reach maturity in November and December. The fruits have the medium weight of 150-200 grams. It is a variety that is resistant to fire blight and scab.

The Cristal variety was approved in the year 2009, it is of Romanian origin and has a low to medium growth vigor. The fruits are harvested in September and reach consumption maturity in October. Their medium weight is 175-250 grams. It is a variety with a good tolerance to fire blight and scab [9, 10].

The economic analysis took into consideration the production costs, the sorting costs involved in selling according to qualitative categories, the revenue and the profit, both for cultivars genetically resistant to main diseases as well as for the sensitive ones. Moreover, some quality indicators were also determined, such as: Iq – the quality indicator and Kri – the medium quality indicator [5, 7].

Fig.1. Orizont cultivar
Source: Original.

Fig.2. Conference cultivar
Source: Original.

The formulas used for determining these indicators are:

$$I_q = \frac{Q_1}{Q_0}$$

where :
Q_1 = genetically resistant varieties medium production, influenced by quality categories;
Q_0 = standard varieties medium production, influenced by quality categories.
For determining the Kri indicator the following formula was used:

$$K_{ri} = \frac{\Sigma_{qi} \text{x} \text{R}_i}{\Sigma_{qi}} \text{ or } K_{ri} = \frac{\sum gi x \text{Ri}}{100}$$

where :
qi = product quantity by quality categories;
gi = production balance by quality categories;
Ri = the quality category coefficient [5, 7].

Fig.3. Cristal cultivar
Source: Original.

Fig.4. Beurre Bosc cultivar
Source: Original.

The Kri coefficient is representative for the situation in which the quality of a product or of a category of products is analyzed, when the fruit quantity is commercialized by quality categories.
In order to sort the fruits in quality categories, their equatorial diameter was taken into consideration, according to the specific quality standard, respectively: 60 mm – extra class category, 55 mm – first class category and 50 mm – second class category. The fruits that did not come under any of these categories or displayed qualitative flaws were classified as destined for industrial use.
The commercialization of the fruits on quality categories in 2019 in the Bucharest orchard area was carried out with the following prices: 5.5 lei/kg for extra class category; 4.5 lei/kg for first class category; 3.5 lei/kg for second class category and 0.8 lei/kg for the industrial destination. As the engross commercialization is concerned, the average price was around 3.5 lei/kg.

RESULTS AND DISCUSSIONS

As a consequence of the study carried out on the two harvesting categories and the economic analysis according to the type of commercialization (engross selling or quality categories selling) a series of data resulted that highlight the advantages of the genetically resistant cultivars growing as well as that of the commercialization after the pear fruits sorting, irrespective of the additional costs that come with this postharvest practice.
Thus, the data in Table 1 shows the medium quantity of fruits per hectare according to the different cultivars as well as the economic results according to the commercialization type.
The medium quantities of pear fruits obtained per hectare and their classification depending of the quality categories were significantly different for each cultivar, being influenced by the cultivar potential and the climatic characteristics of the year 2019. Therefore, the fruits quantities commercialization depending on the quality categories (fruits sorting included) determined an increased value influenced by the cultivars, varying from 4,760 lei/ha (Beurre Bosc) to 18,940 lei/ha (Cristal), which is equivalent to a higher

percentage rate, starting from 4.7% (Beurre Bosc) up to 17.7% (Cristal), in comparison with the engross selling.

After analysing the structure of the quality categories of the pear fruits for each cultivar it has been shown that the best were the first and second quality categories compared with the extra and industrial quality categories.

Regarding the production costs, the obtained data shows that in the case of Beurre Bosc and Conference cultivars, these were more important than in the case of Orizont and Cristal cultivars because of the increased number of phytosanitary treatments, the first two cultivars being more sensitive to the main pear fruits diseases (Table 2). It is also worth mentioning that in the situation of the fruit quality categories selling process, the production values costs were higher by 0.2 lei/kg because of the sorting practice.

The data shown in the Table 2 demonstrates the values of the profit obtained according to the type of commercialization, depending also on each cultivar category. Regarding the obtained profit values, the study carried out according to the two different selling approaches, highlighted some specific aspects, as follows:

-In the pear orchard it is more important to grow the cultivars which are genetically resistant to the main diseases, because of lower production costs;

-For the pear fruits it is more advantageous for farmers to sell the obtained production after the sorting process, according to the qualitative categories;

-The supplementary profits obtained per surface unit varied between 1,150 lei (Conference) to 13,900 lei (Cristal), when selling by quality categories, that means the increasing of the profit from 5.5% (Conference) until 25.1% (Cristal) in comparison with the en gross commercialisation;

-The supplementary profits obtained per surface unit were 3 – 5 times approximatively more important in the orchard with genetically resistant cultivars, in comparison with pear fruits orchard growing with sensitive cultivars to the main diseases.

Regarding the index of quality (Iq), the obtained values were: Iq extra quality = 1.21; Iq first quality = 1.21; Iq second quality = 0.68 and Iq industrial quality = 0.55.

The same index of quality, determined for the cultivar groups, has the result - Iq = 0.93.

The obtained results of the quality variation index demonstrate that for the both cultivar groups, the pear fruits from extra and first quality category were higher compared to the second and industrial quality categories.

Regarding the medium quality coefficient (Kri), by using the first formula, the obtained values were as follows: Kri Conference = 2.49; Kri Beurre Bosc =2.50; Kri Orizont = 2.30 and Kri Cristal = 2.13. These results were obtained according the following operations:

$$Kri = \frac{4.4\ x\ 1 + 10.2\ x\ 2 + 9.4\ x\ 3 + 4.5\ x\ 4}{28.5} = 2.49$$

(Conference)

$$Kri = \frac{5.2\ x\ 1 + 8.4\ x\ 2 + 8.6\ x\ 3 + 5.2\ x\ 4}{27.4} = 2.50$$

(Beurre Bosc)

$$Kri = \frac{5.6\ x\ 1 + 10.8\ x\ 2 + 6.7\ x\ 3 + 3.5\ x\ 4}{26.6} = 2.30$$

(Orizont)

$$Kri = \frac{6\ x\ 1 + 11.8\ x\ 2 + 5.6\ x\ 3 + 1.8\ x\ 4}{25.2} = 2.13$$

(Cristal)

The obtained results of the medium quality coefficient are in inverse proportion with the cultivars quality, so that ordered by quality the varieties would be: Cristal, Orizont, Conference and Beurre Bosc (the correspondence with the total and supplementary profits for the quality categories sales should be also consulted).

After calculating the Kri at the level of the variety group, the 2.21 value was obtained for the varieties with genetic resistance and 2.49 for the standard ones. This results highlights once again the fact that the cultivars having genetically resistance to the main diseases result in products whose medium quality is more important compared with the sensitive ones and the 2.49 – 2.21 = 0.28 deviation expresses the measure of this difference.

Table 1. The average production and economic results according to the commercialization type

Cultivar	Medium quantity t/ha	Fruits quantity for each quality category		Medium price	Commercialization value for the quality category selling		Commercializa-tion value for the engross selling lei/ha	Commercializa-tion value difference for the quality category selling	
		tons	%	lei/t	lei	%		lei	%
Conference	28.5	E 4.4	15.4	5,500	24,200	22.7	99,750	+6,850	+ 6.4
		I 10.2	35.8	4,500	45,900	43.1			
		II 9.4	33.0	3500	32,900	30.8			
		Ind 4.5	15.8	800	3,600	3.4			
	Total	**28.5**	**100.0**	**(3,740)**	**106,600**	**100.0**			
Beurre Bosc	27.4	E 5.2	19.0	5,500	28,600	28.4	95,900	+4,760	+4.7
		I 8.4	30.6	4,500	37,800	37.5			
		II 8.6	31.4	3500	30,100	29.9			
		Ind 5.2	19.0	800	4,160	4.2			
	Total	**27.4**	**100.0**	**(3,674)**	**100,660**	**100.0**			
Orizont	26.6	E 5.6	21.0	5,500	30,800	29.2	93,100	+12,550	+ 11.9
		I 10.8	40.6	4,500	48,600	46.0			
		II 6.7	25.2	3,500	23,450	22.2			
		Ind 3.5	13.2	800	2,800	2.6			
	Total	**26.6**	**100.0**	**(3,972)**	**105,650**	**100.0**			
Cristal	25.2	E 6.0	23.8	5,500	33,000	30.8	88,200	+18,940	+ 17.7
		I 11.8	46.8	4,500	53,100	49.6			
		II 5.6	22.2	3,500	19,600	18.3			
		Ind 1.8	7.2	800	1,440	1.3			
	Total	**25.2**	**100.0**	**(4,252)**	**107,140**	**100.0**			

Source: Own calculation.

Table 2. The profit value obtained according to the commercialization type

Cultivar	Engross commercialization			Quality categories commercialization			Profit value difference according the commercialization type	
	Value obtained lei/ha	Production cost lei/ha	Profit value lei/ha	Value obtained lei/ha	Production cost lei/ha	Profit value lei/ha	lei/ha	%
Conference	99,750	79,065	20,685	E 24,200	19,242	4,958	+1,150	+5.5
				I 45,900	36,534	9,366		
				II 32,900	26,107	6,793		
				Ind 3,600	2,882	718		
Total	**99,750**	**79,065**	**20,685**	**106,600**	**84,765**	**21,835**		
Beurre Bosc	95,900	80,090	15,810	E 28,600	24,302	4,298	+1,280	+8.1
				I 37,800	32,089	5,711		
				II 30,100	25,585	4,515		
				Ind 4,160	3,594	566		
Total	**95,900**	**80,090**	**15,810**	**100,660**	**85,570**	**17,090**		
Orizont	93,100	61,162	31,938	E 30,800	19,413	11,387	+7,230	+22.6
				I 48,600	30,582	18,018		
				II 23,450	14,759	8,691		
				Ind 2,800	1,728	1,072		
Total	**93,100**	**61,162**	**31,938**	**105,650**	**66,482**	**39,168**		
Cristal	88,200	62,139	26,070	E 33,000	20,688	12,312	+13,900	+25.1
				I 53,100	33,316	19,784		
				II 19,600	12,293	7,307		
				Ind 1,440	873	567		
Total	**88,200**	**62,130**	**26,070**	**107,140**	**67,170**	**39,970**		

Source: Own calculation.

CONCLUSIONS

It is better for the farmers to have in the pear orchard genetically resistant cultivars to the main diseases, because of the reduced number of phytosanitary treatments which determine lower production costs and less polluted fruits.

As far as the type of fruits commercialization is concerned, it is recommended to sell the

sorted production by qualitative categories, rather than engross selling, thus achieving a supplementary profit.

The supplementary profits obtained per hectare were significant, ranging between 1,150 lei (Conference cultivar) and 13,900 lei (Cristal cultivar), when the commercialization was performed by quality categories. That means obtaining a higher profit starting from 5.5% (Conference cultivar) to 25.1 % (Cristal cultivar), compared to the gross type of commercialization.

The supplementary profits obtained per hectare were 3 - 5 times bigger for the pear orchard cultivated with genetically resistant cultivars, compared with the standard pear orchard cultivated with the sensitive cultivars.

The values obtained for the index of quality (Iq) were as follows: Iq extra quality = 1.21; Iq first quality = 1.21; Iq second quality = 0.68 and Iq industrial quality = 0.55.

The results obtained regarding the medium quality coefficient (Kri) were: Conference = 2.49, Beurre Bosc = 2.50, Orizont = 2.30 and Cristal = 2.13. These values are inverse correlated with the cultivars quality, the most valuable being the Cristal cultivar.

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