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PRODUCTION COSTS FOR THE CULTIVATION AND HARVESTING OF TABLE GRAPES UNDER CONDITIONS OF SOUTH-CENTRAL BULGARIA

Boyan STALEV[1], Lyudmil ANGELOV[1], Anelia POPOVA[1], Nevena SHULEVA[2]

[1]Agricultural University-Plovdiv, 12 Mendeleev Blvd, Plovdiv, Bulgaria
[2]University of Forestry, 10 Sveti Kliment Ohridski Blvd, Sofia, Bulgaria

Corresponding author email: stalev26@abv.bg

Abstract

The production and supply of table grapes is becoming an increasing challenge for grape growers and processors. The reasons are complex - from increased competitive pressure and requirements of retail market in terms of environmental production and certification of products according GLOBAL GAP criteria, to intense climate changes, which is a major factor during the growing season. This gives grounds to deepen research in the field of economic analysis in connection with use of good practices in the choice of technology for growing vines and refining work processes during the growing season, reducing pesticide usage and increasing the investment efficiency and sustainability.

Key words*: Bulgaria, economic efficiency, global gap, production costs, table grapes.*

INTRODUCTION

Globally, the production of table grapes is developing dynamically, reaching 27 million tons in 2014, which is an increase of nearly 71% based on the amount produced in 2000 (FAO-OIV, 2016). Against the background of the general trend of reducing the harvested areas of table grapes vineyards in Europe, countries such as Italy, Spain, Greece and Bulgaria occupy a position on the world map of table grape production with a share of 27.2% of total production in 2014. Exports of table grapes globally reached 4.2 million tons in 2014, which is an increase of about 50% compared to the level reported in 2000 - 2.8 million tons. The main factors determining the framework of global trade are mainly related to changing consumer tastes, the entry of new producers and exporters (Dimitrova, D., 2018). This requires a change in wholesale and retail trade, improvement of cultivation technologies (Hooker et al., 1999), improvement of storage, packaging and transport of products, the use of information and communication technologies (Seccia et al., 2015, Seccia et al., 2017).

Although most food safety standards are designed to pursue legitimate objectives for the protection of human, plant and animal health, they can also serve as technical barriers to trade at random (David E., 1999). One of the brightest examples of this is an experiment conducted with table grapes in the Republic of Turkey. The experiment reported 172 pesticides as residues in table grapes. A total of 280 samples of table grapes were collected from supermarkets, farm markets and grocery shops located in four provinces of Turkey from August to October 2016. The samples were analysed by liquid chromatography combined with tandem mass spectrometry. The limit of quantification varies from 0.002 to 0.010 mg/kg^{-1}. The validation data revealed good repeatability and reproducibility and met the other requirements of the European guidelines SANTE/ 12682/2019 (Implemented by 01.01.2020). One or more pesticide residues were found in 59.6% of table grapes. Residues above the EU maximum levels are 20.4% of the samples. The most common pesticide residues are azoxystrobin, chlorpyrifos, boscalid and cyprodinil. In the worst case scenario, the hazard index (HI) is 9.42% for adults and 3.37% for children. Chlorpyrifos has a major contribution (65%) to HI (Ozgur & Kabak, 2018). In the harmonization of food safety measures, the EU, guided by the precautionary principle, requires the adoption of the strictest standards previously applied by individual Member States. Although European Union

legislation is the minimum access to the EU market, many wholesalers and retailers require their suppliers to demonstrate compliance with independently verifiable private standards, such as GLOBAL GAP.
This is an internationally recognized standard for agricultural production. Although many of the standards are seemingly voluntary, they become de facto standards for acquiring or maintaining access to certain buyers or market segments, having an important impact on the international competitiveness of individual market participants, industry or country.
Exporters from countries without a certification system may be forced to use the services of an accredited body in another country at significant costs, so it is important that each country builds certification capacity and parallel institutions for accreditation of certification bodies (Semerdzhieva, T., 2018).
The production of table grapes on the territory of Bulgaria is complicated by the fact that the average age of workers in the sector is increasing. This increases the hourly rates needed to grow and harvest table grapes. This is essential for the sustainable development of table grape production, as well as issues of its economic efficiency.

MATERIALS AND METHODS

The research was conducted in the period 2020-2021 in vineyards planted with table variety 'Victoria'. The soil surface is covered with natural grass cover between the rows. The vineyards were planted in 2013 on the land of the village of Iskra on an area of 6.5 ha.
The scheme of the experimental work includes two variants with an area of 1 ha each. The cultivation of variant I is in the open outdoor cultivation, and variant II grown under a safety net (Figure 1).

Figure 1. Variant I - outdoor cultivation (left), Variant II - grown under a safety net (right)

The economic efficiency of the production of table grapes from fruit-bearing vineyard, in both variants are established by taking into account the following indicators:
- Product per unit area - kg/ha;
- Value of total revenue per unit area - euro/ha;
- Production costs (total) - euro/ha;
- Material costs - euro/ha;
- Labour costs - euro/ha;
- Own value - euro/kg;
- Profitability rate (based on production costs) - %;
- Net income (profit) per unit area - euro/ha
- Qualification of grape production according to the standard "GLOBAL GAP" - Regulation EU-396/2005 and Regulation 1107/2009.

RESULTS AND DISCUSSIONS

For the production of table grapes it is very important to know what is the economic result of cultivation, as well as very carefully to take into account the change in net income from the application of one or another cultivation technology.

The application of various means of protection against the intensity of sunshine in its various spectrum and hail, creates real prerequisites for changing the berries epidermal structure. Differences are observed in the size of the total production, collected from the two variants.

The second variant shell 36,560 kg of First class grapes. The production of grapes with this technology allows us to form a larger quantity and better quality grapes, unlike the first variant, which produces 32,940 kg of First class. This variant forms twice the amount of

Nevertheless, the higher selling price gives an advantage in financial results. Comparative analysis shows the level of key economic indicators vary. In both variants the yields are high due to the fact that the experiment meets the agronomic requirements for cultivation. They provide maximum manifestation of the biological capabilities of the vine and the potential capabilities of the applied waste - 7220 kg, which is unsuitable for subsequent use and remains between the rows, as a siderant (Table 1). This is due to one important limiting factor - the lack of anti-hail net. High temperatures during the months June, July, according to the quality of the grapes and their

presence on the commodity exchanges and retail shops. Respectively, this is determined by the fact related to the load of vines with grapes.

The growth rates of the average selling price depend on cultivation technology and quality of grapes in accordance with the standard "GLOBAL GAP" (Table 2).

This has a positive effect on the overall cost and cost of production. As a result, the profitability rate on cultivation for both technologies is respectively 92.30% for Variant I and 94.87% for Variant II (Table 1).

August (Table 3), in combination with the small amount of precipitation that took place in the same period (Table 4), also contribute to the large amount of grapes falling out during the grape harvest.

This set of environmental factors significantly affects the level of average yields.

The values of total revenues are influenced by the level of purchase prices of end products. The average purchase price fluctuates technologies. The production price is formed on the basis of tracking the dynamics and sales from the beginning to the end of the supply in the retail shops. The value of the incurred material costs is determined on the basis of the amounts actually paid for their purchase and the quantities according to accounting documents. Labor costs are set and realized on the actual wages. They are reduced due to the use of less manual labour in various operations. The lower production cost of 0.18 EUR in Variant I is due to the reduced costs of harvesting and sorting the final product. High yield, average sales price and relatively optimal production costs are factors that determine high

profit achieved during the study period. The profit per unit area in the open-air variant is 10887.56 EUR, and profitability rate 92.30%.

In the net covered variant, the profit margin is 15721.54 EUR and the profitability rate is 94.87%. One of the reasons for this is the higher sales prices, the better commercial appearance and the lower loss of production during the grape harvest. It should be noted that the increase in yield in table grape production has a limit in terms of product quality.

The GLOBAL GAP standard must be applied when we offer table grapes in retail market.

Table 1. Economic efficiency in the production of 'Victoria' grapes

№	Indicators	Measure	Variant I outdoor cultivation (1 ha)	Variant II grown under a safety net (1 ha)
1	Product per unit area	kg	40160	40160
2	First class grapes	kg	32940	36560
	Secondary product (in variant I it is eliminated in the rows)	kg	7220	3600
3	Average sales price	Euro/kg	0.50	0.64
4	Total value of production (Total revenues)	Euro/ha	17156.25	25665.64
5	Material costs	Euro/ha	2750.77	4618.46
	Labour costs	Euro/ha	3267.82	5325.64
	Total costs	Euro/ha	6018.59	9944.10
6	Own value	Euro/kg	0.18	0.25
7	Net income	Euro/ha	10887.56	15721.54
8	Profitability rate	%	92.30	94.87

Table 2. Qualification of table grapes according to GLOBAL GAP standard

Variant	First class, %	Secondary product, %
I outdoor cultivation	82.02	0.00
II grown under a safety net	91.11	8.89

Table 3. Air temperatures for the study period, ^{0}C

Measurement point Iskra village	Period	MONTHS										
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Maximum	2021	25.8	23.9	22.8	31.1	34.1	41.2	44.4	43.2	34.6	25.2	23.7
Average	2021	4.2	5.2	5.9	10.6	17.8	21.8	26.2	25.7	19.2	11.2	7.7
Minimum	2021	-6.8	.14.2	-8.1	-3.6	-1.6	6.5	11.2	12.1	4.8	-1.4	-5

Table 4. Precipitation for the study period, l/m^2

Measurement point Iskra village	Period	MONTHS											
Total	2021	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		0.25	50.5	85	109	47.5	42.75	35	77.75	3.25	74	16.5	46

Until recently, it was known as Eurep GAP and has been gaining ground worldwide since the beginning of the 21st century. By 2002, 5,000 certificates had been issued, and at the end of 2007 their number exceeded to 100,000 (Petrov, 2009). This guarantees control over production and packaging, as well as higher purchase prices (Figure 2).

From a production point of view, we can conclude that the second technology allows us to reach the amount of First class to 91.11%, and in the first case it is 82.02% (Table 2). The formation of the so-called secondary product was also established during the experiment. The grapes that remain at 8.89% in Variant II provide an opportunity to generate additional

Figure 2. Grapes, classified and packed according to the GLOBAL GAP standard

income on agricultural holdings (Figure 3). The market for table grapes is very demanding as the competition is fierce, which is why producers need to focus on the introduction of systems to combat climate change, such as high temperatures and hail.

Figure 3. Grapes from Variant I - outdoor cultivation (left), Variant II - grown under a safety net (right)

The sale of table grape products on the country territory can be guaranteed in practice on three grapes should be done in the presence of anti-hail systems. This will lead to the provision of:

1. Higher labour productivity by mechanizing technological processes.
2. Reduction of operating costs for growing vines.
3. Production of larger batches of high-quality products to compete in the domestic and main lines, and they are in retail market, exchanges and through exports within the EU and third countries. Nevertheless, the main distributor and consumer remains the Romanian trader and consumer.
4. Taking into account the overproduction of large countries, which produce and export more and more often and on a larger scale, as a production unit part of the EU we must select grape harvest. It should be noted that the increase in yield in table grape production has a limit in terms of product quality.

CONCLUSIONS

The economic analysis shows that there are prerequisites for growing the 'Victoria' variety on the proposed technological solutions and on larger areas. The increase of the production and economic size of the farms growing table foreign markets.

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