

RESEARCH REGARDING THE PRETABILITY OF GOLIA VINE VARIETY FOR ECOLOGICAL CULTIVATION

STUDII PRIVIND PRETABILITATEA SOIULUI DE VIȚĂ-DE-VIE GOLIA LA CULTIVAREA ÎN SISTEM ECOLOGIC

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Abstract. *In the North-eastern part of the country, the cultivation of vines in ecological system is a real challenge due to specific climatic conditions from the last years with an unfavorable impact on vineyards. In ecological viticulture the identification and cultivation of vine varieties with increased productivity and genetic resistance present a particular importance. In this regard, studies have been carried out on the behavior of Golia variety, a variety for white wines, in terms of agrobiological and technological value, under the condition of applying phytosanitary treatments with products based on copper and sulfur. The results obtained regarding the response to the attack of the main pathogens, as well as the productivity and quality characteristics, has been showed the possibility of gradual adoption and implementation of the ecological cultivation system of Golia variety, in the condition of the Copou-Iași viticultural ecosystem.*

Key words: ecological system, vine varieties, resistance, pathogens.

Rezumat. *În zona de nord-est a țării, cultivarea viței-de-vie în sistem ecologic constituie o adevărată provocare, datorită condițiilor climatice specifice din ultimii ani cu impact nefavorabil asupra plantațiilor viticole. În viticultura ecologică, identificarea și cultivarea soiurilor de viță-de-vie cu productivitate și rezistență genetică sporită, prezintă o importanță deosebită. În acest sens, s-au realizat studii privind comportarea soiului Golia, soi pentru vinuri albe, sub aspectul valorii agrobiologice și tehnologice, în condițiile aplicării de tratamente fitosanitare doar cu produse pe bază de cupru și sulf. Rezultatele obținute privind răspunsul la atacul principalilor agenți patogeni, precum și însușirile de productivitate și calitate, demonstrează posibilitatea adoptării și implementării treptată, a sistemului ecologic de cultură la soiul Golia, în condițiile ecosistemului viticol Copou - Iași.*

Cuvinte cheie: sistem ecologic, soiuri viță-de-vie, rezistență, patogeni.

INTRODUCTION

In ecological viticulture, resistance to cryptogamic diseases present a particular importance due to the limited number of organic phytosanitary products available for their management, the negative effect of repeated treatments with copper and sulfur products and possible crop losses as a result of the application of inadequate crop technologies (Basler and Pfenninger, 2003; Bravdo, 2004; Ranca *et.*

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al., 2018; Ranca *et. al.*, 2020, Reiff *et. al.*, 2021). In the North-eastern part of the country, organic cultivation of grapes is a real challenge, due to climatic conditions of the last years when were record frequent extreme events, frost, prolonged drought, heavy rains during the flowering, with unfavorable impact on vineyards (Zaldea *et al*, 2005).

In order to diversify the assortment of grapes for wine, scientific research has been concerned with creating new genotypes with increased genetic resistance to disease and wintering (Oprea and Moldovan, 2007). The promoting in production of this varieties which requires a small number of treatments, contributes to reduction of maintenance costs, the reduction of environmental pollution and to the achievement of a constant productions every year (Doboș, 2011, Pertot *et. al.*, 2016). In this sense, at SCDVV Iași was approved in 1999 and patented in 2004 the variety for white wines Golia, which is distinguished by increased genetic resistance to frost, medium tolerance to drought and gray mold, as well as good resistance to downy mildew and powdery mildew (Calistru and Damian, 1999).

MATERIAL AND METHOD

The Golia variety obtained through the intraspecific sexual hybridization of the Sauvignon and Șarba genitors was studied in comparison with one of the varieties established in the Iași vineyard assortment, Feteasca regala. The vineyards in which research was carried out are located on lands with a slope of 7-8%, predominantly southern exposure, cambic chernozemic soil, with planting distances of 2,2 m between rows and 1,2 m per row, bilateral cordon pruning system with stem height of 0,8 m, being in full fruiting capacity. The agro-technical measures specific to the area and correlated with the level of climatic factors consisted in dry cutting and burning of the ropes, spring plowing at intervals maintained as a black field, weed control by manual plows in turn, and mechanical mowing of long grass strips, disease control and pests in the ecological system, green works (weeding, tying shoots, sausage). During two years (2020, 2021) were carried out observation and determination regarding the development of vegetation phenophases, frost resistance, behavior to attack pathogens, evaluation of quantitative and qualitative production expressed by the average number of grapes per vine, average weight of a grape, production per vine, sugars, acidity and total polyphenols must content.

RESULTS AND DISCUSSIONS

The analysis of climatic factors from 2020 – 2021 period, compared to the multiannual average (1981 – 2010), showed an increase in the thermal regime characterized by average annual temperatures higher than the multiannual average of 9,8°C (12,0°C in 2020), absolute minimum temperatures in normal limits, without values below the freezing point of the vine, a large number of days with maximum temperatures higher than 30°C (47 days in 2020 and 31 days in 2021), hot summer, with absolute maximum temperatures between 34,5°C (2021) and 36,2°C (2020). The pluviometric regime was deficient in 2020, being considered the driest year, precipitation being irregular distributed and quantitatively reduced (300 mm compared to 398,1). In 2021, the amounts of precipitation recorded were

enough, in some places higher than normal, only September was deficient, with only 10,4 mm. The data regarding the browse of vegetation phenophases highlight the similar way they develop at Golia variety compared to Feteasca regală control variety. The succession and physiological perfection of the phenophases of the studied varieties was conditioned by the level and cumulative action of climatic factors, with a delay of about two weeks in 2021 compared to 2020 (tab. 1).

Table 1

Development of vegetation phenophases in the conditions of the Copou Iași viticultural area

Year	Variety	Debudding		Flowering		Veraison		Ripening	
		date	$\Sigma^{\circ}\text{tu}$	date	$\Sigma^{\circ}\text{tu}$	date	$\Sigma^{\circ}\text{tu}$	date	$\Sigma^{\circ}\text{tu}$
2020	Golia	15.04	18,7	12.06	294,0	16.08	815,9	24.09	448,9
	Fetească regală - ct	15.04	18,7	08.06	243,0	16.08	729,8	24.09	586,0
2021	Golia	30.04	18,8	22.06	343,3	20.08	774,2	07.10	248,5
	Fetească regală - ct	30.04	18,8	20.06	317,7	16.08	761,2	29.09	275,2

At the end of the annual vegetation cycle, both varieties totaled an approximately equal number of days, as well as approximate values for the sum of the degrees of useful temperature ($\Sigma^{\circ}\text{tu}$). The absolute minimum temperatures recorded in the two years did not cause significant buds losses, the viability of the buds being superior at Golia variety (tab 2).

Table 2

Frost behavior of the studied vine varieties

Variety	The minimum absolute temperatures, °C				% viable buds			
	air		soil		primary		secondary	
	2020	2021	2020	2021	2020	2021	2020	2021
Golia	-8.4	-16.3	-7.0	-22.1	100	95	100	100
Fetească regală - ct					91	84	100	100

Taking into account the requirements of organic viticulture, in the two experimental plantations cultivated with Golia and Feteasca regala varieties was granted special attention to preventive measures. Thus, through the works applied to the plant and the soil, it was followed the avoid clustering of bunches, by normalizing the load of buds at cutting, exposing the bunches to light in order to achieve a better microclimate for grapes and maintaining an optimal ratio between the vegetative system and production, mobilization and aerating soil, maintaining weeds under control by manual and mechanical hoeing and repeated mowing of grass strips.

To elaborate the treatments schedule it was taking into account the sensitivity of the studied varieties, Golia and Feteasca regala, the economic damage threshold, as well as the the restrictions imposed by the legislation in force (tab. 3). Phytosanitary treatments were performed according to warnings and climate conditions of the year, with products accepted in the ecological control based on copper and sulfur, aiming to maintaining healthy of the foliar

system that supports the production and ensures in addition a good differentiation of the buds for the next year's vintage.

Table 3

Phytosanitary treatments program – ecological control SCDVV Iasi

No. crt	Phenological stage	Pathogen or pest controlled	The active substance/ plant protection product	Dose/ha
1	BBCH 11 Sprout 3 - 5 cm	Mildew + Mites	Sulfocalcic gravy	20 L
2	BBCH 15 Sprout 10-25 cm	Powdery mildew + Downy mildew + moths	Kocide Kumulus AtraBot traps	1,5 kg 3.0 kg 3 buc
3	BBCH 55 Before flowering	Downy mildew + Powdery mildew	Altosan Thiovit	1.5 kg 3.0 kg
4	BBCH 65 End of flowering	Downy mildew + Powdery mildew	Funguran Kumulus AtraBot traps	1.5 L 3.0 kg 3 buc
5	BBCH 73 Growing grains	Downy mildew + Powdery mildew	Kocide Kumulus	1.5 kg 3.0 kg
6	BBCH 77 Compaction of bunches	Downy mildew + Powdery mildew	Bouillie bordelaise Kumulus	5.0 kg 3.0 kg
7	BBCH 81 Beginning the ripening	Powdery mildew	Kumulus	3.0 kg
8	BBCH 85 - 89 Ripening	Downy mildew	Bouillie bordelaise	5.0 kg

Climatic conditions and aggression degree of the main pathogens led to performing six treatments in 2020, until the compaction of bunches (phenological stage BBCH 77), and in 2021, heavy rainfall from the summer month required the performance of two additional treatments, both at the beginning the ripening and during it.

In 2020, for the genotypes studied, the values for frequency, intensity and degree of attack of pathogens were low, compared to 2021, the climatic conditions during the vegetation period not being favorable for the development and evolution of the attack of pathogens (tab. 4).

Downy mildew degree of attack presented similar values for the two varieties in 2020, and in 2021 the Golia variety was highlighted with a lower value compared to the control (1.72 compared to 6.24%). The appearance and evolution of pathogen that produces powdery mildew, *Uncinula necator*, was influenced by the values of climatic factors that conditions its development, thus, in condition of 2021, the powdery mildew attack didn't manifest itself. It was also found that there were favorable conditions for the attack of gray mold on grapes (*Botrytis cinerae*), which generated a degree of attack on grapes (AD%) in the Golia variety between 0.20% (2020) and 0.42% (year 2021), respectively between 0.30 and 0.67% for the Feteasca regala variety.

In the condition of application anti-cryptogamic treatments, the Golia variety showed a good resistance to downy mildew and gray mold and a very

good resistance to powdery mildew compared to control.

Table 4

Behavior of varieties at the attack of the main pathogens

Pest agent	Golia				Fetească regală - control			
	I, %	F, %	AG, %	EF%	I, %	F, %	AG, %	EF%
2020								
Downy mildew (<i>Plasmopara viticola</i>)								
Attack on leaves and shoots	8.2	11.5	0.90	89	6.5	5.0	0.3	90
Attack on grape bunches	7.1	3.5	0.30	86	6.0	3.5	0.2	89
Powdery mildew (<i>Uncinula necator</i>)								
Attack on leaves and shoots	0	0	0	100	0	0	0	100
Attack on grape bunches	0	0	0	100	0	0	0	100
Bunch rot (<i>Botrytis cinerea</i>)								
Attack on grape bunches	3.9	4.0	0.2	90	9.0	3.0	0.3	89
2021								
Downy mildew (<i>Plasmopara viticola</i>)								
Attack on leaves and shoots	0	0	0	100	3.77	4.76	0.17	91
Attack on grape bunches	14.25	12.12	1.72	90	17.85	35.00	6.24	82
Powdery mildew (<i>Uncinula necator</i>)								
Attack on leaves and shoots	0	0	0	100	0	0	0	100
Attack on grape bunches	0	0	0	100	0	0	0	100
Bunch rot (<i>Botrytis cinerea</i>)								
Attack on grape bunches	6.66	6.45	0.42	90	3.77	18.0	0.67	88

Studies on the technological potential of the Golia variety compared to control, Feteasca regala, revealed that it was influenced by the level of climatic factors from the ecosystem and the technology of applied culture, a fact reflected in the production of grapes, but especially in its quality (tab. 5).

Table 5

The technological potential of the studied varieties

Items determined	Golia		Fetească regală - control	
	2020	2021	2020	2021
Crop of grapes date	23.09	07.10	24.09	29.09
Number of grapes/stump	32	56	59	65
The average weight of a grape, g	66	102	62	82
The weight of 100 berries, g	92	88	128	162
Effective production, kg/stump	2.10	5.7	3.7	5.3
Sugar, g/L	234	205	191	190
Total acidity g/L C ₄ H ₆ O ₆	4,9	7.6	6,2	8,8
pH	3.39	2.78	3.10	2.71
Glucoacidimetric index	47.75	26.79	28.85	21.46
Total polyphenols, g/L gallic acid	0.88	0.033	0.96	0.032
Total polyphenolic index (TPI)	8.24	6.6	8.94	9.30

In the climatic and phytosanitary protection conditions mentioned above, the studied varieties have achieved quantitatively harvests well below their biological potential in 2020, due to the drought phenomenon and normal production in 2021. The grape production was quantitatively superior, the

analysis of the chemical composition of the must highlight a potential for sugar accumulation between 205 and 234 g/L at Golia variety and 190 – 191 g/L at Feteasca regală, accompanied by a normal acidity between 4.9 – 7.6 g/L tartaric acid, respectively between 6.2 – 8.8 g/L tartaric acid, values specific to the varieties for white wines.

CONCLUSIONS

1. In the specific climatic condition of the years 2020 – 2021 and an ecological cultivation system, the Golia variety showed an increased resistance to frost, good tolerance to downy mildew and gray mold, compared to the control variety Feteasca regală.

2. The results of research regarding the behavior to the main pathogen attack, as well as the characteristics of productivity and quality confirm the suitability of the Golia vine variety for cultivation in an ecological system, in the Copou-Iași wine center.

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