

RESEARCH ON THE INFLUENCE OF SOME TECHNOLOGICAL FACTORS ON GRAPE PRODUCTION UNDER THE CONDITIONS OF THE TÂRNAVELOR VINEYARD

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Abstract: The paper presents the results of the researches carried out during the period 2017-2019, under the conditions of the Târnavelor Vineyard, in the Jidvei-Alba area, regarding the influence of some technological factors on the level of grape production. The factors considered in the study were: Factor A - irrigation regime, with graduations a1 - non-irrigated, a2 - irrigated at 50% IUA; Factor B - fertilization, with graduations b1 - basic fertilization, b2 - basic fertilization + chemical fertilization; b3 - organic fertilization; Factor C, biological material, with graduations c1 - Muscat Ottonel variety, c2 - Feteasca Regala variety, c3 - Sauvignon Blanc variety. The production results recorded during the three years of experimentation highlighted in particular the favorable effect of irrigation on the production of grapes, in all three varieties, regardless of the applied fertilization level.

Keywords: grapevines, irrigation regime, fertilization, *Vitis vinifera*, vineyard

INTRODUCTION

The town of Jidvei is located in the eastern part of Alba county, on the lower course of the Târnavă Mică river, occupying the two moors of the river. The relief forms, on the area of the commune of Jidvei are the Târnavă Mici hills, in the northern part of the Târnaveni Plateau, in the southern part of the Blajului Plateau, the meadows respectively the Târnavă Mici terraces, with depressions having different widths, on the sectors and on the level of the terraces. The soil is fertile and various forms of relief are encountered. From Lunca Târnavă Mici (250 - 270 m) to the area of hills (400 - 450 m) the passage takes place through a corrugated relief, characterized geologically by sandy marls and maroon clays.

The experiences that underlie this work were organized in an experimental field belonging to S.C. JIDVEI S.R.L (Târnavă vineyard), Alba county. Jidvei company owns 2500 ha, being the largest vineyard plantation in Romania.

The vineyard plantation is at an altitude of 200-500 meters, the vineyards being placed on the slopes with southern exposure, so that the sun's rays and the atmospheric circulation are favorable to the vines.

The area offers the best conditions for vines culture, where the brown forest soil and the continental plateau climate meet. In autumn, in the valleys of the Târnavas the temperatures are moderate, sometimes the fog is persistent, sometimes the days are sunny, contributing to the accumulation of sugar and aromas, and the acidity has a harmonious balance. The climate of the area is typically continental, with the average annual temperature being 8.6°C.

The average daily temperature with a value of over 10°C is recorded starting with the second decade of April and drops below this threshold from the second decade of October.

The hottest months are July and August. During the vegetation period, the annual rainfall ranges from 542 - 570 l/sqm (1,2,3,4,5,6,7,8).

MATERIAL AND METHOD

The research carried out during the period 2017-2019, under the conditions of the Târnavelor Vineyard, the Jidvei-Alba area, had the purpose of determining the degree of influence of some technological factors on the level of grape production. The factors taken into consideration in a multifactorial experience were: Factor A - irrigation regime, with graduations a1 - non-irrigated, a2 - irrigated at 50% IUA; Factor B - fertilization, with graduations b1 - basic fertilization, b2 - basic fertilization + foliar fertilization; b3 - organic fertilization; Factor C, biological material, with graduations c1 - Muscat Ottonel variety, c2 - Feteasca Regala variety, c3 - Sauvignon Blanc variety.

The biological material experienced was represented by three varieties of vines cultivated with good results in the Târnavelor Vineyard: Muscat Ottonel, Feteasca Regalã and Sauvignon Blanc.

The **Muscat Ottonel variety** has a medium vegetation period (165-175 days), the thermal demands are reduced, and they require 2500-2900°C active thermal balance. Its growth force is medium, the fertility being very high; the fertile shoots being in proportion of over 85% often have two floors of inflorescences. The variety makes good use of the slopes, with sunny exposures, on soils with medium or low fertility but with good humidity. Fertilization and irrigation ensure high yields.

The variety accumulates 190-210g/l sugars, and at the maturation reaches 250-270 g/l and holds aromatic substances.

The **Feteasca Regala variety** has a medium vegetation period (160-170 days), a period in which it needs 2500-3200°C. The growth force is medium, the fertility is high, and the fertile shoots are in the proportion of 80-85%. Climate accidents that sometimes occur are easily restored. It starts to grow rapidly, in the first days of April, the grapes enter the harvest in the first part of August, and the full maturity is in the 4th-5th period.

Feteasca Regala is the variety that harnesses almost all soil types, but requires optimum moisture. It reacts well to fertilization, yielding crop yields.

The **Sauvignon Blanc variety** has a medium vegetation period (165-175 days), requesting 2600-3400°C active temperature. The growth force is medium, the

fertility being good, meaning 60-70% fertile shoots. The ripening period is in the second decade of April, the grapes entering the harvest at the beginning of August and the full ripening takes place in the 4th or 5th period. This variety meets good conditions on the slopes with southern or southwest exposure, which contributes to the over-ripening of the grapes.

During the vegetation period, complex observations were made regarding the evolution of the crop, climatic factors and soil moisture.

The production results were statistically processed according to the method of analysis of variance.

RESULTS AND DISCUSSIONS

In the experiences carried out under the conditions of the Târnavelor Vineyard, the effect of the irrigation factor on the grape production in three of the varieties cultivated on a large scale, with good results in this area, was followed with priority.

Tables 1, 2 and 3 show the production results recorded for the whole experience, in 2017, 2018 and 2019, compared to the non-irrigated variants, respectively to those irrigated at the level of 50% IUA.

Table 1.
The influence of irrigation on the production of grapes under the conditions of the area of Jidvei - Alba, 2017

Variant	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
Non-irrigated	10079.63	100.0	0.00	Control
Irrigated, 50 % IUA	13523.70	134.2	3444.07	**
	DL (p 5%)		773.23	
	DL (p 1%)		1785.63	
	DL (p 0.1%)		5682.37	

Table 2.
The influence of irrigation on the production of grapes under the conditions of the area of Jidvei - Alba, 2018

Variant	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
Non-irrigated	13087.04	100.0	0.00	Control
Irrigated, 50 % IUA	15881.48	121.4	2794.44	**
	DL (p 5%)		788.39	
	DL (p 1%)		1820.63	
	DL (p 0.1%)		5793.76	

Table 3.
The influence of irrigation on the production of grapes under the conditions of the area of Jidvei - Alba, 2019

Variant	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
Non-irrigated	11785.56	100.0	0.00	Control
Irrigated, 50 % IUA	15424.81	130.9	3639.26	***
	DL (p 5%)		317.07	
	DL (p 1%)		732.21	
	DL (p 0.1%)		2330.10	

It is noted that in each of the three years of experimentation, irrigation obtained distinctly significant production increases (in 2017 and 2018) and very significant (in 2019), increases between 2794.44 kg/ha, in 2018 and 3639.26 kg/ha in 2019.

The average results, recorded over the entire period 2017-2019 (Table 4), clearly confirm the increases achieved by irrigation in each of the three years of experimentation. Thus, if on the whole of the experiences performed, for the non-irrigated variants an average production of 11650.74 kg/ha was registered, by irrigation, the level of production reached almost 15000 kg/ha, respectively 14943.33 kg/ha.

The production increase achieved by irrigation, on average over the three years, was very significant, of 3292.59 kg/ha.

Table 4.
The influence of irrigation on the production of grapes under the conditions of the area of Jidvei - Alba, 2017 – 2019 average

Variant	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
Non-irrigated	11650.74	100.0	0.00	Control
Irrigated, 50 % IUA	14943.33	128.3	3292.59	***
	DL (p 5%)		218.20	
	DL (p 1%)		330.42	
	DL (p 0.1%)		530.81	

Of the three varieties tested (Table 5), Feteasca Regala and Sauvignon Blanc varieties harnessed best the water used for irrigation.

Particularly noteworthy is the evolution of the Feteasca Regala variety, which spectacularly surpassed the control variety, with 4775.74 kg/ha, on the whole of the experiences of the three years, 2017-2019.

The production gains recorded by the Feteasca Regală and Sauvignon Blanc varieties compared to the control variety, Muscat Ottonel, were very significant.

Table 5.
Influence of biological material on grape production under the conditions of Jidvei – Alba area, average 2017 - 2019

Variety	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
Muscat Ottonel	11261.85	100.0	0.00	Control
Fetească Regală	16037.59	142.4	4775.74	***
Sauvignon Blanc	12591.67	111.8	1329.82	***
	DL (p 5%)		179.16	
	DL (p 1%)		238.40	
	DL (p 0.1%)		308.44	

A more complex picture regarding the influence of the three technological factors tested in the experiences from the Târnavelor Vineyard, respectively the degree of influence of the interaction of factors irrigation x fertilization x biological material (AxBxC), on the grape production, is presented in table 6. Thus, it can be seen that in

all cases, each of the three factors contributed - separated and in interaction with the other two factors, to obtain production increases that proved to be very statistically significant.

Variant $a_2b_2c_2b_2$ - irrigated x basic fertilization + foliar fertilization x Feteasca Regala - recorded, on average during the three years of experimentation, the highest level of production, being in the first place with 17826.67 kg/ha, exceeding control variant, $a_1b_2c_2$ with 3816.67 kg/ha, a very statistically significant difference.

Table 6.
The influence of the interaction of factors irrigation x fertilization x biological material (AxBxC) on the grape production under the conditions of the Jidvei - Alba area, average 2017 – 2019

Variant	Grapes production		Difference, kg/ha	Significance of difference
	Kg/ha	%		
$a_1b_1c_1$	9744.44	100.0	0.00	Control
$a_2b_1c_1$	12837.78	131.7	3093.33	***
$a_1b_1c_2$	14235.56	100.0	0.00	Control
$a_2b_1c_2$	17760.00	124.8	3524.44	***
$a_1b_1c_3$	11156.67	100.0	0.00	Control
$a_2b_1c_3$	14165.56	127.0	3008.89	***
$a_1b_2c_1$	9716.67	100.0	0.00	Control
$a_2b_2c_1$	13070.00	134.5	3353.33	***
$a_1b_2c_2$	14010.00	100.0	0.00	Control
$a_2b_2c_2$	17826.67	127.2	3816.67	***
$a_1b_2c_3$	10856.67	100.0	0.00	Control
$a_2b_2c_3$	14352.22	132.2	3495.56	***
$a_1b_3c_1$	9636.67	100.0	0.00	Control
$a_2b_3c_1$	12565.56	130.4	2928.89	***
$a_1b_3c_1$	14661.11	100.0	0.00	Control
$a_2b_3c_2$	17732.22	120.9	3071.11	***
$a_1b_3c_3$	10838.89	100.0	0.00	Control
$a_2b_3c_3$	14180.00	130.8	3341.11	***
	DL (p 5%)		473.75	
	DL (p 1%)		649.06	
	DL (p 0.1%)		886.62	

CONCLUSIONS

Following the analysis of the production results, recorded during the period 2017-2019 in the experiences organized under the conditions of the Târnave Vineyard, it was found that in each of the three years of experimentation, by irrigation, there were obtained significantly significant production increases (in the years 2017 and 2018) and very significant (in 2019) increases between 2794.44 kg/ha in 2018, and 3639.26 kg/ha in 2019.

On the whole of the experiences performed, the non-irrigated variants registered an average production of 11650.74 kg/ha and through irrigation, the production level reached almost 15000 kg/ha, respectively 14943.33 kg/ha. The

production increase achieved by irrigation, on average over the three years, was very significant, of 3292.59 kg/ha.

It was found that in all cases, each of the three factors also contributed separately and in interaction with the other two factors, to obtain production increases that proved to be very statistically significant.

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