RESEARCH ABOUT THE INFLUENCE OF GREEN MANURE ON YIELDS OF SOME VARIETIES OF GRAPES FOR WINE

Alin DOBREI, Mariana POIANĂ, Alina GHIȚĂ, Mihaela MĂLĂESCU

Banat's University of Agricultural Sciences and Veterinary Medicine, Timisoara-Romania, Faculty of Horticulture

Corresponding author:alin1969tmro@yahoo.com

Abstract: *The concept of sustainable viticulture increasingly involves among others the current restrictions on the use of chemicals in viticulture and finding alternatives for their replacement without affecting the quantity and quality of grape production, which is responsible to these studies. In this research has concerned the replacement of conventional fertilization with chemical fertilizers, by using of green fertilizers in several variants for fertilization bearing vines. In the western area in recent years began to have concerns regarding alternatives to traditional technology, but they limited themselves to an alternative grassing intervals without taking into account the use of green fertilizer plant by intake of nutrients to the ground partially or totally replace chemical fertilizers. Experimental variants were found in cultivation in the interval between rows of vines of: V1 - Hungarian vetch, V2 - vetch;, V3 sainfoin . Were left rooted to the line protection strips of 40 cm. I followed for three years (2007-2009) the effect of experimental variations on wood maturation, bud viability, maturation of the grapes, the quality and quantity of production in some varieties of wine grape grown in the vineyard Buziaş-Silagiu. The results were encouraging, all variants providing numerous advantages compared with control version (use of complex fertilizers). In the future importance of these types of research will become increasingly important with increasing environmental concerns and obtain wine products as healthy for human body.*

Key words**:** *sustainable viticulture, green manure, quantity – quality, impact, environment*

INTRODUCTION

The concept of fertilisation in viticulture has been steadily changing these years to better fit the concept of sustainable viticulture.

Intensive chemical fertilisation of the previous years is less used nowadays, being replaced partially or even totally by organic fertilisation. Limiting or even replacing chemical fertilisers, aims at obtaining high-quality viticultural and wine products that do not endanger, in time, because of their cumulative effect, the consumer's health.

At the same time, organic fertilising diminishes the negative impact of viticultural activity on the environment, contributing to the improvement of the physical and chemical features of viticultural soils exposed to complex man-made activities.

MATERIALS AND METHODS

Research was carried out between 2007 and 2009, on a viticultural plantation in progressive maturity, located in the viticultural centre Buziaş-Silagiu.

Experimental variants consisted in cultivating, between the rows green manure crops as an alternative to classical maintenance of the black field soil. Experimental variants were as follows: V_1 – interval cultivated with Hungarian vetch; V_2 – interval cultivated with vetch; V_3 – interval cultivated with sainfoin; V_4 – interval maintained as black field (control variant).

Green crops were sown in stripes along the intervals between the rows, leaving close to the vine protective stripes 40 cm broad that were maintained through tillage.

The crops were mowed during flowering, when they could ensure the proper biomass amount. They were left on the soil as mulch and incorporated later during the fall tillage.

Research aimed at the varieties Riesling Italian, Sauvignon Blanc, Muscat Ottonel, Pinot noir, and Cabernet Sauvignon.

We made observations and measurements concerning total and mature annual growths, bud viability, amount and quality of the grapes.

RESULTS AND DISCUSSION

The impact of experimental variants on total and mature annual growths is obvious, above the control variant, and with statistically ensured differences.

The higher annual increases compared with the black field control were in the varieties with higher growth vigour, Cabernet Sauvignon and Riesling Italian.

Higher annual increases determined a higher yielding potential as a result of a superior photo-synthesised area.

As for the annual mature growths, there were values close to that of the black field and to the experimental variants, which denotes that vigour increase had no significant consequences on the maturation of the shoot tissues.

To note, nevertheless, a decrease in all the variants of the share of mature chord compared to total growths; there was no negative impact on the stocks, since the immature wooden portions were at the tip of annual chords, to be normally removed during fructification cutting.

Table 1

Impact of green manure crops on total and mature annual growths (average for the period 2007-2009)

Variety	Experimental variants	Total annual growths (m/vine)	Maturated annual growths		Difference to the control	Significance
			m/vine	% from total		
Riesling italian	V_1- Hungarian vetch	15,7	10,7	68,2	+2,8	**
	V_2 – vetch	17,2	10,7	62,3	+4,3	**
	V_3- sainfoin	16,5	10,6	64,7	+3,6	**
	V_4- black field (Control)	12,9	10,5	81,4	-	-
Sauvignon blanc	V_1- Hungarian vetch	13,1	8,4	64,5	+1,4	*
	V_2 – vetch	14,2	8,7	61,7	+2,5	**
	V_3- sainfoin	13,8	8,5	62,3	+2,1	*
	V_4- black field (Control)	11,7	8,9	76,5	-	-
Muscat Ottonel	V_1- Hungarian vetch	10,9	7,6	70,5	+1,1	-
	V_2 – vetch	12,3	8,1	66,2	+2,5	*
	V_3- sainfoin	11,6	8,05	69,4	+1,8	*
	V_4- black field (Control)	9,8	7,9	81,3	-	-
Pinot noir	V_1- Hungarian vetch	10,4	7,8	75,9	+0,9	-
	V_2 – vetch	11,6	8,1	70,3	+2,1	**
	V_3- sainfoin	10,8	7,8	72,4	+1,3	*
	V_4- black field (Control)	9,5	8,1	85,2	-	-
Cabernet Sauvignon	V_1- Hungarian vetch	17,5	12,1	69,3	+1,9	*
	V_2 – vetch	19,2	11,7	61,2	+3,6	**
	V_3- sainfoin	18,3	11,8	64,5	+2,7	*
	V_4- black field (Control)	15,6	12,5	80,3	-	-

Riesling italian	DL5 %=1,50	DL 1 %=2,61	DL 0,1 %=4,72
Sauvignon blanc	DL5 %=1,35	DL 1 %=2,42	DL 0,1 %=4,37
Muscat Ottonel	DL5 %=1,27	DL 1 %=2,35	DL 0,1 %=3,96
Pinot noir	DL5 %=1,08	DL 1 %=1,96	DL 0,1 %=3,17
Cabernet Sauvignon	DL5 %=1,59	DL 1 %=2,83	DL 0,1 %=4,98

As for the impact of green manure on bud viability, there is a decrease of the share of viable eyes compared to the control, the differences being rarely ensured statistically.

During normal winters, green manure had no negative effect on bud viability, despite the fact that the number of buds affected by the frost was larger. Since they are located to the tip of the chords, they were not taken into account in fructification charge calculus.

Among experimental variants, the variant V_1 – Hungarian vetch – had the lowest impact on the decrease of the share of viable eyes, reason for which in bud frost risk areas this is the most favourable of the three variants.

As for the yield, the impact of experimental variants is obvious, ranging above the control in all the varieties.

The largest yields were obtained in the variant V_2 – vetch, which yielded, compared to the control, differences of 1,109 kg/ha in the case of the variety Riesling Italian, 1,197 kg/ha in the Sauvignon blanc variety, 825 kg/ha in the Muscat Ottonel variety, 949 kg/ha in the Pinot noir variety, and 901 kg/ha in the Cabernet Sauvignon variety. All these differences are ensured statistically.

The smallest differences were in the variant V_3 – sainfoin, which is not ensured statistically no matter the variety.

The variant V_1 – Hungarian vetch yielded superior results ensured statistically only in the case of the varieties Riesling Italian, Sauvignon Blanc and Pinot noir.

Table 2

Impact of green manure crops on bud viability

Variety	Experimental variants	Buds viability(%) (Mean 2007-2009)	Difference to the control	Significance
Riesling italian	V_1- Hungarian vetch	85,3	-4,4	-
	V_2 – vetch	79,3	-10,4	0
	V_3- sainfoin	83,2	-6,5	-
	V_4- black field (Control)	89,7	-	-
Sauvignon blanc	V_1- Hungarian vetch	87,2	-0,1	-
	V_2 – vetch	79,6	-7,7	0
	V_3- sainfoin	82,5	-4,8	-
	V_4- black field (Control)	87,3	-	-
Muscat Ottonel	V_1- Hungarian vetch	84,2	-6,4	-
	V_2 – vetch	81,2	-9,3	0
	V_3- sainfoin	83,6	-6,9	0
	V_4- black field (Control)	90,5	-	-
Pinot noir	V_1- Hungarian vetch	90,9	-3,3	-
	V_2 – vetch	86,8	-7,4	0
	V_3- sainfoin	87,6	-6,6	0
	V_4- black field (Control)	94,2	-	-
Cabernet Sauvignon	V_1- Hungarian vetch	87,9	-3,9	-
	V_2 – vetch	83,7	-8,1	-
	V_3- sainfoin	86,2	-5,6	-
	V_4- black field (Control)	91,8	-	-

Riesling italian	DL5 %=7,3	DL 1 %= 12,8	DL 0,1 %=21,2
Sauvignon blanc	DL5 %=6,98	DL 1 %= 11,16	DL 0,1 %=20,32
Muscat Ottonel	DL5 %=6,42	DL 1 %= 10,33	DL 0,1 %=18,16
Pinot noir	DL5 %=5,98	DL 1 %=9,76	DL 0,1 %=17,2
Cabernet Sauvignon	DL5 %=8,23	DL 1 %=15,26	DL 0,1 %=28,73

Table 3

Impact of green manure crops on yield

Variety	Experimental variants	Production								Difference to the control (mean kg/ha)	Significance
		2007		2008		2009		Mean			
		Kg/ vine	Kg/ha	Kg/vine	Kg/ha	Kg/ vine	Kg/ha	Kg/vine	Kg/ha		
Riesling italian	V_1- Hungarian vetch	2,66	12115	2,72	12385	2,77	12593	2,72	12364	+910	*
	V_2 – vetch	2,7	12310	2,76	12579	2,81	12800	2,76	12563	+1109	*
	V_3- sainfoin	2,62	11935	2,63	11975	2,72	12385	2,66	12098	+644	-
	V_4- black field (Control)	2,47	11260	2,51	11425	2,56	11678	2,52	11454	-	-
Sauvignon blanc	V_1- Hungarian vetch	2,22	10025	2,22	10120	2,28	10380	2,23	10175	+772	*
	V_2 – vetch	2,26	10315	2,33	10610	2,39	10875	2,33	10600	+1197	**
	V_3- sainfoin	2,14	9730	2,18	9920	2,23	10175	2,18	9942	+539	-
	V_4- black field (Control)	2,01	9150	2,04	9310	2,14	9750	2,06	9403	-	-
Muscat Ottonel	V_1- Hungarian vetch	1,85	8410	1,93	8790	1,97	8975	1,91	8725	+615	-
	V_2 – vetch	1,91	8720	1,97	8975	2,00	9110	1,96	8935	+825	*
	V_3- sainfoin	1,82	8275	1,87	8517	1,92	8760	1,87	8517	+407	-
	V_4- black field (Control)	1,74	7915	1,78	8120	1,82	8295	1,78	8110	-	-
Pinot noir	V_1- Hungarian vetch	1,66	7560	1,75	7995	1,80	8217	1,74	7924	+687	*
	V_2 – vetch	1,72	7825	1,81	8236	1,86	8497	1,80	8186	+949	**
	V_3- sainfoin	1,56	7130	1,61	7327	1,76	8005	1,64	7487	+250	-
	V_4- black field (Control)	1,52	6950	1,56	7135	1,67	7625	1,59	7237	-	-
Cabernet Sauvignon	V_1- Hungarian vetch	1,82	8275	1,85	8410	1,93	8810	1,86	8498	+574	-
	V_2 – vetch	1,87	8535	1,92	8765	2,01	9175	1,94	8825	+901	**
	V_3- sainfoin	1,78	8120	1,80	8205	1,87	8535	1,82	8287	+363	-
	V_4- black field (Control)	1,67	7620	1,71	7813	1,83	8340	1,74	7924	-	-

Riesling italian DL5 %=724 DL 1 %=1275 DL 0,1 %=1973
Sauvignon blanc DL5 %=652 DL 1 %=1097 DL 0,1 %=1763
Muscat Ottonel DL5 %=635 DL 1 %=974 DL 0,1 %=1426
Pinot noir DL5 %=572 DL 1 %=873 DL 0,1 %=1275
CabernetSauvignon DL5%=631 DL1%=926 DL0,1%=131

Table 4

Impact of green manure crops on yield quality

Variety	Experimental variants	Sugar (g/l) (Mean 2007-2009)	Acidity(g/l H_2SO_4) (Mean 2007-2009)	Difference to the control(sugar g/l)	Significance
Riesling italian	V_1- Hungarian vetch	185	5,6	-5	-
	V_2 – vetch	184	5,7	-6	-
	V_3- sainfoin	185	5,6	-5	-
	V_4- black field (Control)	190	5,5	-	-
Sauvignon blanc	V_1- Hungarian vetch	186	4,9	-6	-
	V_2 – vetch	185	4,9	-7	-
	V_3- sainfoin	187	4,8	-5	-
	V_4- black field (Control)	192	4,6	-	-
Muscat Ottonel	V_1- Hungarian vetch	192	3,6	-3	-
	V_2 – vetch	190	3,8	-5	-
	V_3- sainfoin	193	3,6	-2	-
	V_4- black field (Control)	195	3,5	-	-
Pinot noir	V_1- Hungarian vetch	204	4,5	-6	-
	V_2 – vetch	202	4,6	-8	0
	V_3- sainfoin	205	4,5	-5	-
	V_4- black field (Control)	210	4,2	-	-
Cabernet Sauvignon	V_1- Hungarian vetch	202	4,6	-6	-
	V_2 – vetch	201	4,7	-7	-
	V_3- sainfoin	203	4,6	-5	-
	V_4- black field (Control)	208	4,5	-	-

Riesling italian DL5 %= 6,01 DL 1 %=9,16 DL 0,1 %=17,25
Sauvignon blanc DL5 %=7,21 DL 1 %=13,62 DL 0,1 %=23,41
Muscat Ottonel DL5 %=6,16 DL 1 %= 11,72 DL 0,1 %=21,31
Pinot noir DL5 %=7,82 DL 1 %= 14,01 DL 0,1 %=27,16
CabernetSauvignon DL5%=7,63 DL1%=14,51 DL0,1%=24,16

Les obvious results in the case of the variant V_3 – sainfoin can be explained through a lower vegetal volume in the Buziaş – Silagiu area compared to the other two variants.

As for the impact of green manure on yield quality (sugar content and acidity), the differences compared to the control are much less obvious.

Experimental variants recorded a surplus of acidity and a minus of sugar compared to the control, but these differences were not ensured statistically.

CONCLUSIONS

With more and more concern for sustainable viticulture, for diminishing environmental pollution, and for healthy viticultural and wine products, maintaining the soil through the cultivation of green manure crops is more and more important.

Experimental variants had a positive impact in all the varieties, yielding more without affecting grape quality.

Yield increases were higher due to higher amounts of vegetal volume which, incorporated in the soil led to an important supply of nutrients, particularly nitrogen.

Green manure can at least periodically replace chemical fertilisers thus diminishing the degree of chemisation of this crop.

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