The influence of soil maintenance systems on vigor, quantity and production quality at some grape varieties for wine

Dobrei A.,[1]*, Ghiță Alina[1], Cristea T.,[1] Sfetcu Andreea[1]

[1]USAMVB Timisoara, Facultatea de Horticultura si Silvicultura

*Coresponding author. Email: alin1969tmro@yahoo.com

Abstract Surveys were conducted in the vineyard-Buzias Silagiu in the years 2006-2008 and included the influence of soil maintenance systems on total annual growth and maturing, quantitative and qualitative production in the varieties: Cabernet Sauvignon, Pinot noir, Italian Riesling, Muscat Ottonel and Sauvignon blanc.

Maintenance of soil was done by the classical ploughed field variant but also by herbiciding, plant cultivation for green fertilizer and permanent grassing. During the growing season there have been several observations and separate determinations for each variety and variations on logs vigor, total and matured annual growth, production results, sugar content, acidity and the glucose-acidimetric index was calculated.

The maintenance of soil had a major influence on the quantity of production and a less significant influence on its quality. In all varieties the highest production was obtained for the maintenance of soil through cultivation of plants for green fertilizer, while the highest sugar content was recorded all varieties in the variant of ploughed field.

Key words

grapes,maintenance systems, quality

Cultivation of vines is intensive and occupies land for a long period of time, of at least 30-35 years and requires an annual volume of work on the soil. For these reasons the majority of vineyards soils are anthropogenic soils, poorly structured, with low humus content and a reduced capillary porosity. On such lands, the proper execution of the land works at the best moment is very important. By working the soil, a proper bond between capillary porosity and the non capillary one is created, a balance between soil gases with oxygen in proportions of 8-12% is ensure, all categories of soil fertilizer are incorporated in, stimulates the activity of microorganisms, favoring accumulation of heat in the soil and weeds are combated.

Quantity and quality are important characteristics of production in case of varieties of grapes for wine; they are influenced by genetic factors and the climate conditions of each year and the culture technology.

Regarding technology, the choice is very important for maintenance of soil as taking into account the year's climate conditions; this can have positive or negative effects on quantity and quality of grape production.

Biological Material and Method

Researches have been conducted in the period 2006-2008 in the vineyard-Buzias Silagiu and targeted several varieties of grapes for wine: Cabernet Sauvignon, Pinot noir, Italian Riesling, Ottonel Muscat and Sauvignon Blanc.

Experimental variants were different in the maintenance of soil: classic ploughed field, herbiciding, the cultivation of plants and green fertilizer, permanent greening, holding as witness the soil maintenance system of ploughed field.

The plantation in which researches have been carried out is a young one in its period of progressive maturity and the practiced type of cutting cord was Cazenave, planting distances used were 2.2 m between rows and 1m between the vines on a row.

During vegetation, observations were made on the vigor and determination logs, production quantity and quality. Vigor of logs was assessed based on total growth and maturity. The experience has been positioned according to randomized blocks, and the method of statistic calculation represented the analysis of the variance.

Results and Discussions

The maintenance of the soil used had positive influences on vigor of logs all varieties studied, total and maturated annual growth being superior to the witness in all experimental variants. The superior maturated growth in the case of experimental variants as compared to the witness shows better resistance of the logs at negative winter temperatures, an important fact in the case of very favorable weather conditions such as those in recent years.

Table 1

The influence of soil maintenance systems on logs vigor at some wine grape variations, the average of the years 2006-2008

Variation	Maintenance system	Annual growth			The difference compared to control (Total)	Significance
		Total (m/vine)	Matured			
			m/vine	% of total		
Cabernet Sauvignon	Ploughed field (C)	10,2	7,03	69	-	-
	Herbiciding	11,6	7,54	65	+ 1,4	*
	Green fertilizer	14,2	9,08	64	+ 4,0	**
	Permanent greening	12,3	7,74	63	+ 2,1	*
	Average	12,075	7,847	65,25	+ 1,8	*
Pinot Noir	Ploughed field (C)	,7	4,90	86	-	-
	Herbiciding	6,5	5,46	84	+ 0,8	*
	Green fertilizer	7,9	6,24	79	+ 2,2	**
	Permanent greening	6,6	5,61	85	+ 0,9	*
	Average	6,675	5,552	83,5	+0,9	*
Riesling italian	Ploughed field (C)	8,6	6,53	76	-	-
	Herbiciding	9,8	7,15	73	+ 1,2	*
	Green fertilizer	11,2	7,61	68	+ 2,6	**
	Permanent greening	9,9	7,02	71	+ 1,3	*
	Average	9,875	7,077	72	+ 1,2	*
Muscat Ottonel	Ploughed field (C)	6,8	5,3	78	-	-
	Herbiciding (C)	7,2	5,4	75	+ 0,4	-
	Green fertilizer	8,9	6,23	70	+ 2,1	**
	Permanent greening	7,4	5,4	73	+ 0,6	-
	Average	7,575	5,582	74	+ 0,7	-
Sauvignon blanc	Ploughed field (C)	7,9	5,84	74	-	-
	Herbiciding	8,6	6,02	70	+ 0,7	-
	Green fertilizer	9,8	6,66	68	+ 1,9	**
	Permanent greening	9,0	6,48	72	+ 1,1	*
	Average	8,825	6,250	71	+ 0,9	-

DL- Cabernet Sauvignon	-5% = 1,24	1% =2,39	0,1%= 4,17
DL- Pinot noir	-5% = 0,74	1% = 1,43	0,1% = 2,35
DL- Riesling Italian	-5% = 0,93	1% = 1,75	0,1%=3,28
DL- Muscat Ottonel	-5% =0,82	1% =1,57	0,1%=2,98
DL- Sauvignon blanc	-5% =0,96	1% = 1,82	0,1%=3,52

Productions obtained on the cycle of research have been influenced by climatic conditions less favorable to vines, especially in 2006 which led to the achievement of lower yields, as potential varieties investigated.

The highest values of production were obtained in all varieties in the variant of soil maintenance through the cultivation of plants for green fertilizer, which has registered differenced from the witness of 599 kg / he in variety Sauvignon blanc, 516 kg / he to Italian Riesling and 489 and kg / he in Muscat Ottonel. The variant that registered lower values to the witness has been the one of soil maintenance through permanent herbiciding to all studied varieties.

Table 2

The influence of soil maintenance systems on production at some grape varieties for wine, the average of years 2006-2008

Variation	Maintenance system	Production			The difference compared to control (kg/ha)	Significance
		Kg/vine	Kg/ha	%		
Cabernet Sauvignon	Ploughed field (C)	1,64	7455	100	-	-
	Herbiciding	1,67	7619	102	+ 164	-
	Green fertilizer	1,74	7913	106	+ 458	**
	Permanent greening	1,61	7319	98	- 136	-
	Average	1,67	7576	102	-	-
Pinot Noir	Ploughed field (C)	1,45	6603	100	-	-
	Herbiciding	1,51	6852	104	+ 249	*
	Green fertilizer	1,56	7069	107	+ 466	**
	Permanent greening	1,41	6399	97	- 204	0
	Average	1,48	6731	102	-	-
Riesling Italan	Ploughed field (C)	1,99	9051	100	-	-
	Herbiciding	2,05	9321	103	+ 270	*
	Green fertilizer	2,10	9567	106	+ 516	**
	Permanent greening	1,95	8876	98	- 175	-
	Average	2,02	9204	102	-	-
Muscat Ottonel	Ploughed field (C)	1,77	8029	100	-	-
	Herbiciding	1,81	8250	103	+ 221	*
	Green fertilizer	1,89	8518	106	+ 489	**
	Permanent greening	1,72	7824	97	- 205	0
	Average	1,79	8155	102	-	-
Sauvignon Blanc	Ploughed field (C)	1,89	8615	100	-	-
	Herbiciding	1,96	8949	104	+ 334	*
	Green fertilizer	2,03	9214	107	+ 599	**
	Permanent greening	1,87	8490	98	- 125	-
	Average	1,94	8817	102	-	

DL- Cabernet Sauvignon -5%= 224 1%=416 0,1%= 759
DL- Pinot noir -5% =198 1% =372 0,1%=685
DL- Riesling Italian -5% =235 1% =472 0,1%= 803
DL- Muscat Ottonel -5% =201 1% = 385 0,1%= 698
DL- Sauvignon blanc -5% =215 1% = 420 0,1%=765

Regarding the influence of the soil maintenance systems of on the quality of production, this was less obvious, all variants have lower values as compared to the witness, but without being surpassed from a statistic point of view. On average, the lowest in sugar content was recorded in a maintenance of soil by cultivating green plants, the differences from witness ploughed field ranging from - 4.66 at Sauvignon blanc variety and -7.34 at Pinot noir variety.

Conclusions

Vineyards are usually placed on land with a lower natural fertility, considered unsuitable for most crops. On this land is very important to run in a rational way the soil works.

In recent years the general trend in winemaking is to replace the classic maintenance of alternative systems of land with less energy that have a favorable impact on the environment without negative influence on the quantity and quality of crops.

All tested alternatives variants have proven to be viable, standing out in particular the variant of soil maintenance through cultivation of plants for green fertilizer which has obtained the best results.

Table 3

The influence of soil maintenance systems on the production quality at some wine grape variations, the average of the years 2006-2008

Variation	Maintenance system	Production quality			Difference as compaed to witness (sugar g/l)	Significance
		Sugar (g/l)	Acidity (g/l H_2SO_4)	Glucose-acidimetric index		
Cabernet Sauvignon	Ploughed field (C)	192,33	4,5	42,74	-	-
	Herbiciding	188,33	4,7	40,07	-4	-
	Green fertilizer	186	4,8	38,75	-6,33	0
	Permanent greening	187,66	4,6	40,79	-4,67	-
	Average	188,58	4,65	40,58	-3,75	-
Pinot Noir	Ploughed field (C)	198	4,5	44,00	-	-
	Herbiciding	195,33	4,6	42,46	-2,67	-
	Green fertilizer	190,66	4,7	40,56	-7,34	-
	Permanent greening	192,66	4,7	40,99	-5,34	-
	Average	194,16	4,62	42,00	-3,84	-
Riesling italian	Ploughed field (C)	190	4,7	40,42	-	-
	Herbiciding	188	4,9	38,36	-2	-
	Green fertilizer	184,66	5,1	36,20	-5,34	-
	Permanent greening	187	4,9	38,16	-3	-
	Average	187,41	4,9	38,28	-2,59	-
Muscat Ottonel	Ploughed field (C)	191	3,4	56,17	-	-
	Herbiciding	188	3,6	52,22	-3	-
	Green fertilizer	184	3,7	49,72	-7	0
	Permanent greening	186	3,6	51,66	-5	-
	Average	187,25	3,57	52,44	-3,75	-
Sauvignon blanc	Ploughed field (C)	193,66	4,3	45,03	-	-
	Herbiciding	191	4,5	42,44	-2,66	-
	Green fertilizer	189	4,5	42	-4,66	-
	Permanent greening	190,33	4,5	42,29	-3,33	-
	Average	190,99	4,45	42,94	-2,67	-

DL- Cabernet Sauvignon	-5%=6,25	1%= 11,17	0,1%=19,34
DL- Pinot noir	-5% = 7,5	1% =13,20	0,1%=23,45
DL- Riesling Italian	-5% = 5,74	1% =9,23	0,1%=17,21
DL- Muscat Ottonel	-5% =6,15	1% =10,75	0,1%= 18,90
DL- Sauvignon blanc	-5% =6,75	1% =12,3	0,1%=20,17

References

1. Dobrei A., Rotaru Liliana, Morelli S., 2008 – Ampelografie, Ed. Solness, Timişoara
2. Dobrei A., Sala F., Kociş Elisabeta, Savescu Iasmina, 2008 – Soil maintenance systems influence upon yield and quality in case of some vine varieties in Buzias-Silagiu viticultural center conditions, Lucrări ştiinţifice, Facultatea de Agricultură, pag. 59, vol.40, U.S.A.M.V.B.T., Ed. Agroprint, Timişoara
3. Dobrei A., Rotaru Liliana, Mustea M., 2005 – Cultura viţei de vie, Ed. Solness, Timişoara.