Volume 15(2), 57- 61, 2011
JOURNAL of Horticulture, Forestry and Biotechnology

Researches concerning the report of foliar surface-quantity-quality of some red wine vine varieties cultivated in different ecosystems

Mălăescu Mihaela[1*],Drăgunescu Aneta Anca[1], Dobrei A.[1], Ghiță Alina[1]

[1]U.S.A.M.V.B.Timişoara, Faculty of Horticulture and Silviculture

*Corresponding author. Email: malaescuioanamihaela@yahoo.com

Abstract The goals of this research aimed the behaviour of some red wine vines: Cadarcă, Pinot noir, Merlot, Burgund, Cabernet Sauvignon in different ecosystems (Minis vinery, Recas vinery and the Didactic Station Timisoara) in order to establish the best direct correlations between their foliar surface and grape production, quantitative, but also qualitative, starting from the premise that foliar surface is essential in obtaining vegetative biomass, respectively the production. A large foliar surface can be useless and can even diminish the production.
Deepening our knowledge of these relationships allows the correct application of green works and operations of the rational culture technologies, coupled with the biological characteristics of vine varieties and harmonized with the wine potential of climatic and technological capabilities of each vineyard holding (2).

Key words

red wine vines, foliar surface, production, quality, quantity

Nature has always been generous to our country and fructification, respectively the production and capitalization of the vinery potential of soil and climate depends only on us, vine growers and oenologists.

Wine, in which's composition are more than one hundred components (sugars, ethylic alcohol, glycerine, organic acids, tannins, aldehydes, vitamins, minerals etc.), is one of the first aliments that man has used to complete food. Hippocrates, medicine father (V century b.Chr.) considered wine as "the most wonderful remedy at the same time useful for the sick ones, but for the healthy ones", while the well-known French chemist and biologist Pasteur said that "wine is the most healthy and hygienic of the drinks". Researches showed that of the numerous substances in grapes, respectively in wine, an important one in resveratrol, a natural antioxidant and an anti-inflammatory substance that protects organisms' cells, the same as the nervous and cardiovascular system, which can have favourable effect on disease recovery or for people with a weak immune system. Resveratrol quantity is higher in red wines, but it depends on many factors: the vine culture place, the harvesting period, the clime and others. The highest quantity can be found Pinot noir grapes.

Quality is a very important parameter of wine vine production and it is appreciated according to the sugars content, accumulated at full maturity, and total acidity, which has a value reverse proportional with the obtained sugar (1).

Material and Method

The researches were made on five red wine vine varieties, Cadarcă, Pinot noir, Merlot, Burgund and Cabernet Sauvignon, chosen of the most spread varieties in the established culture areas. Variety choice aimed a diversity concerning the productive and quality potential of varieties, their biological features and maturity period (3.)

The studied varieties can be found in vineries with a variable age, between 25 and 50 years, the planting distances of these culture systems being, in general the usual ones, respectively 2 m between the rows and 1.2 m between the vines. The pruning types where Guyot on the trunk and cordon Cazenave.

The researches were done in the period 2009-2010, while the research methods followed to determine the foliar surface per vine and per hectare, the productions obtained per vine and reporting the results per hectare, the quality of production by determining sugars content and total acidity of must analysed at full maturity of grapes.

Results obtained

During the research, the following observations, measurements and calculations

performed on the five varieties of red wine vines studied in different natural conditions, namely the three growing areas considered, foliar surface indicator values ranged from 3.74 m^2/vine for Pinot noir and 8.7 m^2/vine for Cabernet Sauvignon (table 1).

It may be noted that Pinot noir, variety of low vigour and low production potential, had lower values of foliar surface in all areas of culture, but offset by the high quality of production

Out of the varieties of middle vigour, we remark a high foliar surface, respectively 8.13 m^2/vine, for the high production variety Cadarcă.

High vigour varieties have high values of the foliar surface. So, Merlot variety had average values of the foliar surface of 6.76 m^2/vine, while Burgund and Cabernet Sauvignon varieties registered the highest values of foliar surface, of 8.19 m^2/vine, respectively 8.71 m^2/vine, values which were in correlation with their productive and quality potential.

By analysing these values, we conclude that in terms of foliar surface, the varieties echelon according to their genetic potential, correlated with soils' fertility and with the favourable climatic conditions of the culture area in that year, so that in the three culture areas the varieties known as vigorous registered values that surpassed the low vigour varieties.

Table 1

Foliar surface, average values 2009 – 2010

No.	The variety	The culture area	the foliar surface	
			m^2/vine	m^2/ha
1	Cadarcă	Recaş	8,03	33452,98
		Miniş	7,67	31953,22
		Timişoara	8,69	36202,54
		Media	8,13	33869,58
2	Pinot noir	Recaş	3,85	16039,1
		Miniş	3,37	14039,42
		Timişoara	4,00	16664
		Media	3,74	15580,84
3	Merlot	Recaş	6,73	28037,18
		Miniş	6,15	25620,9
		Timişoara	7,40	30828,4
		Media	6,76	28162,16
4	Burgund	Recaş	8,37	34869,42
		Miniş	7,91	32953,06
		Timişoara	8,29	34536,14
		Media	8,19	34119,54
5	Cabernet Sauvignon	Recaş	8,93	37202,38
		Miniş	7,98	33244,68
		Timişoara	9,22	38410,52
		Media	8,71	36285,86

During the research period (2009-2010), minimum values of production were obtained for Pinot noir variety, 5832.4 kg/ha, followed by Cabernet Sauvignon with 7207.18 kg/ha. High values can be remarked for Merlot and Burgund varieties, the obtained productions being of 9831.76 kg/ha, respectively 9956.74 kg/ha. The highest production has been obtained from Cadarcă variety, of 14081.08 kg/ha (table 2).

Out of this, it is shown that the production value is correlated to varieties' vigour, but also to the quality potential of grape production and vinery's protection in the culture area, so that the quality varieties and those with less vigour give lower productions than the vigorous varieties and high production ones, in all culture areas.

Production's quality of the studied varieties was expressed by sugars content, total acidity and the report of these two parameters, respectively the sugar-acidity index. Overall the two years, sugars content varies from 196.55 g/l for Pinot noir, followed up at small difference by Cabernet Sauvignon (196.52 g/l), and the other varieties, such as Merlot, with 191.78 g/l, Burgund, with 188.07 g/l and the lowest content of sugars has been reached in Cadarcă quantity variety, with 169.85 g/l (table 3).

The high quality varieties achieve, in all culture areas, superior sugars quantity comparative with the high production varieties, which can assure superior quality wines in favourable pedo-climatic conditions.

In the culture area, the highest sugars accumulation is favoured less fertility soils and sloping land (Recaş), while in plain conditions with fertile soil these values are reduced (Timişoara).

Table 2

Grape production, in the culture areas – average values 2009-2010

No.	The variety	The culture area	The grape production	
			kg/vine	kg/ha
1	Cadarcă	Recaş	3,91	16289,06
		Miniş	3,90	16247,4
		Timişoara	2,33	9706,78
		Media	3,38	14081,08
2	Pinot noir	Recaş	1,66	6915,56
		Miniş	1,24	5165,84
		Timişoara	1,31	5457,46
		Media	1,40	5832,4
3	Merlot	Recaş	2,96	12331,36
		Miniş	1,89	7873,74
		Timişoara	2,23	9290,18
		Media	2,36	9831,76
4	Burgund	Recaş	3,06	12747,96
		Miniş	1,91	7957,06
		Timişoara	2,20	9165,2
		Media	2,39	9956,74
5	Cabernet Sauvignon	Recaş	2,24	9331,84
		Miniş	1,42	5915,72
		Timişoara	1,54	6415,64
		Media	1,73	7207,18

Table 3

Production's quality of the studied varieties

The variety	The culture area	Sugar, g/l	Acidity, g/l H_2SO_4	Sugar-acidity index	Obtained must, l/vine
Cadarcă	Recaş	179,80	7,85	22,90	3,10
	Miniş	173,75	8,15	21,32	3,09
	Timişoara	156,00	8,25	18,91	1,82
	Media	169,85	8,08	21,02	2,66
Pinot noir	Recaş	203,75	4,30	47,38	1,28
	Miniş	200,50	4,15	48,31	0,95
	Timişoara	185,40	4,10	45,22	0,99
	Media	196,55	4,18	47,02	1,07
Merlot	Recaş	199,30	4,25	46,89	2,34
	Miniş	195,23	4,21	46,37	1,44
	Timişoara	180,80	4,50	40,18	1,67
	Media	191,78	4,32	44,39	1,82
Burgund	Recaş	195,75	4,26	45,95	2,40
	Miniş	190,45	4,61	41,31	1,48
	Timişoara	178,00	5,00	35,60	1,71
	Media	188,07	4,62	40,71	1,86
Cabernet Sauvignon	Recaş	203,75	4,15	49,10	1,78
	Miniş	199,70	4,50	44,38	1,12
	Timişoara	186,10	4,80	38,77	1,21
	Media	196,52	4,48	43,87	1,37

The report between the foliar surface and the quantity production (table 4) shows that the lowest values of the foliar surface required for one kilogram of grapes has been obtained for the middle vigour and quantity variety – Cadarcă and the highest values of the foliar surface per grape kilogram was registerd for superior vigour and quality variety – Cabernet Sauvignon (5.03 m^2/kg).

Pinot noir, a quality variety with low vigour and low yield, had middle values of the report between the foliar surface and quantity production (2.67 m^2/kg).

High values of this report were registerd for Merlot (2.86 m^2/kg) and Burgund (3.43 m^2/kg) varieties.

Statistically, Pinot noir has significant negative differences to the average value of the experiment, considered as control variant, in Recaş and significant positive in Timişoara, while in Miniş area, the differences were not statistically assured.

Merlot variety had statistically assured differences than the control in all culture areas, as it follows: distinct significant negative in Recaş and significant positive in Miniş and Timişoara.

Cadarcă variety is statistically assured by significant negative differences in Recaş and Miniş and by distinct significant positive differences in Timişoara.

Burgund variety had distinct significant negative differences in Recaş distinct significant positive differences in Miniş, while in Timişoara the differences were significant positive.

Cabernet Sauvignon variety is statistically assured in all culture area by having distinct significant negative differences in Recaş, significant positive in Miniş and distinct significant positive in Timişoara.

Table 4

The report between the foliar surface and the quantity production

The variety	The culture area	The production, kg/vine	The foliar surface, m^2/vine	The foliar surface, m^2/kg grapes	Difference to the control (The foliar surface, m^2/kg grapes)	Significance
Cadarcă	Recaş	3,91	8,03	2,05	-0,36	0
	Miniş	3,90	7,67	1,97	-0,44	0
	Timişoara	2,33	8,69	3,73	1,32	xx
	Average	3,38	8,13	2,41	-	control
Limit differences (m^2/kg grapes)			DL5%=0,29	DL1%=0,72	DL0,1%=1,43	
Pinot noir	Recaş	1,66	3,85	2,32	-0,35	0
	Miniş	1,24	3,37	2,72	0,05	-
	Timişoara	1,31	4,00	3,05	0,38	x
	Average	1,40	3,74	2,67	-	control
Limit differences (m^2/kg grapes)			DL5%=0,27	DL1%=0,53	DL0,1%=1,08	
Merlot	Recaş	2,96	6,73	2,27	-0,59	0
	Miniş	1,89	6,15	3,25	0,39	x
	Timişoara	2,23	7,40	3,32	0,45	x
	Average	2,36	6,76	2,86	-	control
Limit differences (m^2/kg grapes)			DL5%=0,31	DL1%=0,60	DL0,1%=1,22	
Burgund	Recaş	3,06	8,37	2,74	-0,69	0
	Miniş	1,91	7,91	4,14	0,71	xx
	Timişoara	2,20	8,29	3,77	0,34	x
	Average	2,39	8,19	3,43	-	control
Limit differences (m^2/kg grapes)			DL5%=0,34	DL1%=0,69	DL0,1%=1,45	
Cabernet Sauvignon	Recaş	2,24	8,93	3,99	-1,05	00
	Miniş	1,42	7,98	5,62	0,59	x
	Timişoara	1,54	9,22	5,99	0,95	xx
	Average	1,73	8,71	5,03	-	control
Limit differences (m^2/kg grapes)			DL5%=0,44	DL1%=0,90	DL0,1%=1,82	

Knowing the interactions between the variety – the quality potential – and the culture conditions, is very important in vine culture because it allows us to establish an optimum value of the foliar surface and according to this, correctly apply the works and operations in green, in the culture technology.

Out of the research made, we can see that the highest value of the report between foliar surface and quality production is registered for Cabernet Sauvignon, of 32.35 m^2/kg sugars, middle-high vigour variety, and the lowest value for Pinot noir – low vigour variety, of 17.78 sugar m^2/kg (table 5). \Merlot variety, with high vigour and quality, has a foliar surface needed for one kilogram of sugars of 19.37 m^2/kg.

Considering the culture areas, the highest values for this report were obtained on fertile and plain soil (Timişoara), than on slope lands and less fertile soils (Miniş and Recaş).

Table 5

The report between the foliar surface and the quality production

The variety	The culture area	The foliar surface, m^2/ha	The foliar surface, m^2/vine	Sugars			Foliar surface m^2/ kg sugar
				g/l	g/vine	Kg/ha	
Cadarcă	Recaş	33452,98	8,03	179,80	557,38	2322,05	14,41
	Miniş	31953,22	7,67	173,75	536,89	2236,67	14,29
	Timişoara	36202,54	8,69	156,00	283,92	1182,81	30,61
	Average	33869,58	8,13	169,85	451,80	1882,20	17,99
Pinot noir	Recaş	16039,1	3,85	203,75	260,80	1086,49	14,76
	Miniş	14039,42	3,37	200,50	190,48	793,52	17,69
	Timişoara	16664	4,00	185,40	183,55	764,65	21,79
	Average	15580,84	3,74	196,55	210,31	876,15	17,78
Merlot	Recaş	28037,18	6,73	199,30	466,36	1942,86	14,43
	Miniş	25620,9	6,15	195,23	281,13	1171,19	21,88
	Timişoara	30828,4	7,40	180,80	301,94	1257,87	24,51
	Average	28162,16	6,76	191,78	349,04	1454,10	19,37
Burgund	Recaş	34869,42	8,37	195,75	469,80	1957,19	17,82
	Miniş	32953,06	7,91	190,45	281,87	1174,25	28,06
	Timişoara	34536,14	8,29	178,00	304,38	1268,05	27,24
	Average	34119,54	8,19	188,07	349,81	1457,31	23,41
Cabernet Sauvignon	Recaş	37202,38	8,93	203,75	362,68	1510,90	24,62
	Miniş	33244,68	7,98	199,70	223,66	931,78	35,68
	Timişoara	38410,52	9,22	186,10	225,18	938,10	40,94
	Average	36285,86	8,71	196,52	269,23	1121,62	32,35

Conclusions

1. Vine culture technology requires for each variety the report between the foliar surface and the quantity and quality production, because each variety has an optimum value of the foliar surface needed to obtain one kilogram of grapes, respectively sugar.

2. By knowing the interaction between the variety, its quality production and the culture conditions allows a good performing of the works and operations in green from the rational culture technology, correlated to the biological features of vine varieties and harmonized with the vine-wine potential of the pedo-climatic conditions and the technological possibilities of each vinery.

3. Quality red wine vine varieties (Merlot, Cabernet Sauvignon, Pinot noir, Burgund) accumulates in all culture areas superior quantities of sugars comparative to the high production variety (Cadarcă), which, in favourable pedo-climatic conditions can assure quality wines.

4. The best values of the foliar surface/kg of grapes and foliar surface/kg of sugars of all the studied varieties were obtained in the fertile plain soils of Timişoara, than in the slope lands and less fertile soils of Minş and Recaş.

References

1.Dobrei A., Rotaru Liliana, Morelli S., 2008 – Ampelografie, Editura Solness, Timişoara

2.Drăgunescu Aneta Anca, 2007- Teză de doctorat, Timişoara

3.Oşlobeanu M., 1991- Zonarea soiurilor de viţă de vie în România, Editura Ceres, Bucureşti.