Proceedings

VIII INTERNATIONAL TERROIR CONGRESS

June 14th - 18th, 2010 SOAVE (VR) ITALY

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THE INFLUENCE OF CLIMATE ON THE GRAPEVINE PHENOLOGY AND CONTENT OF SUGAR AND TOTAL ACIDS IN THE MUST

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SUMMARY

For the period of 10 years in the condition of Skopje vineyard area, at two regional (Vranec and Smederevka) and two international (Cabernet sauvignon and Chardonnay) grapevine cultivars, the researches are done.

The influences of temperatures sum on the duration of following phenological stages (number of days) are analyzed: from budburst to full maturity; from budburst to flowering and from veraison to full maturity. The temperature sum has a high impact on the duration of each phenological stage, especially from budburst to full maturity and from budburst to flowering. The climate has the influence on the content of sugar and total acids in the must. These parameters show grater variation at the cultivars Cabernet sauvignon and Chardonnay than cvs. Smedervka and Vranec.

Key words: climate, fenology, grape variety, sugar, acids

INTRODUCTION

Temperature sum during the period vegetation are the basic indicator in the choice of variety in a region. Varieties with a different epoch in maturity to grapes in need of different woods in a temperature of individual phenophases vegetation period. In phenophase from verasion to full maturity, varieties have the need to sum the highest temperature and lowest in the phenophase-budburs. The need of the vine varieties of a particular temperature depends on the amount of points (biological properties and varietal characteristics as it is length of vegetation period, epoch of maturity on grapes, etc. Skopje vineyards are characterized by the annual average temperature air of 12.4 0C (1984/2006), vegetation of 18.8 0C (1984/2006), the annual temperature sum (from 4.789 0C vegetation temperature and amount of 3673.9 0C (1984/2006).

MATERIALS AND METHODS

Analasys are made for the period 1984-2006 among the varieties vranec, smederevka, merlot and chardonnay which are grown in the national collection at the Agricultural Institut, the Department of viticulture and wine Skopje.

Climate data are used by RHMZ-RM, and the climatic conditions for the Skopje vineyards are analysed, especially the temperature sum and their influence on particular phenophases of the

development of the vine . The monitoring of the phenophases development is carried out by the method of phonological monitoring among each variety separately.
The chemical content is determined by standard methods for he content of sugar and total acids in the must .

RESULTS AND DISCUSSION

In table 1 are presented the vegetational temperature sum data and the number of days from shoot elongation to full (technological) maturity. In the years of examination the vegetacional temperature sum varies and ranges from 3838.4°C in 1984 to 4260,7°C in the year 2000 .The period (number of days) from shoot elongation to full maturity of the grape varies as in the years of examination also among species examined . The shortest period is concluded in 2000 among all varieties, when we have the highest temperature sum (4260.7°C). Among examined species it ranges from 126 days among Chardonnay, 129 days among Vranec, 139 among Cabernet sauvignon to 152 days among Smederevka. Among the specie Vranec the period of shoot elogation to full maturity lasts 140 days in average for the examination period, among Cabernet sauvignon 155 days , among Smederevka 163 days and among Chardonnay 137 days .

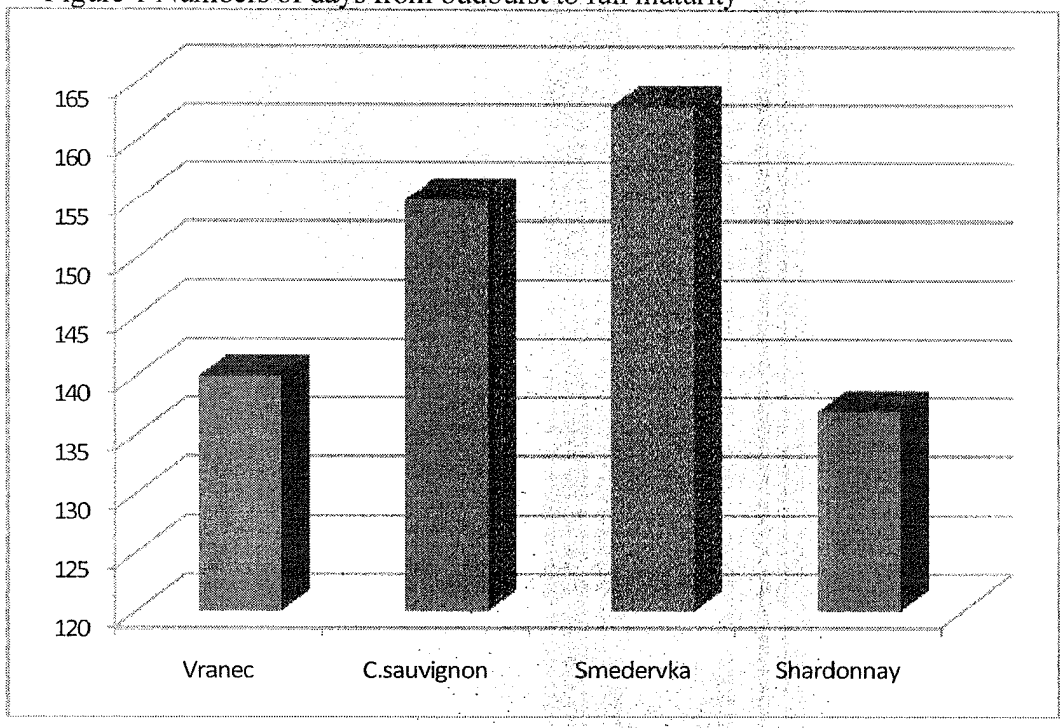
Table 1 Temperature sum during vegetation and numbers of days from shoot elongation to full maturity

Year	Temperature sum during vegetation ^{0}C	From shoot elogation to full maturity			
		Vranec	Cabernet sauvignon	Smederevka	Chardonnay
1984	3838.4	151	152	160	127
1998	4207.1	148	171	177	147
1999	4128.4	142	161	166	140
2000	**4260.7**	**129**	**139**	**152**	**126**
2001	4225.1	138	140	167	132
2002	3893.7	126	151	161	138
2003	4173.2	131	142	158	138
2004	4010.5	143	155	173	139
2005	3961.9	148	148	155	148
2006	4038.4	153	148	166	147
84/06	3673.9	140	155	163	137

Table 2 Temperature sum during vegetation and numbers of days from budburst to flowerin

Year	Temperature sum during vegetation oC	From budburst to flowering			
		Vranec	Cabernet sauvignon	Smederevka	Chardonnay
1984	854.6	42	42	44	46
1998	959.1	51	42	54	52
1999	944.8	40	42	46	43
2000	**1035.9**	**32**	**34**	**37**	**31**
2001	924.4	42	40	48	35
2002	890.3	43	44	40	46
2003	944.2	35	44	38	46
2004	879.3	45	50	49	45
2005	936	33	42	41	42
2006	956.8	39	36	40	38
84/06		41	42	43	42

Figure 1 Numbers of days from budburst to full maturity



In table 2 vegetational temperature sum data and number of days from shoot elongation to full maturity are presented.

Vegetational temperature sum in the phenophase from shoot elongation to full maturity ranges from 856.6°C in 1984 to 1036°C in 2000.

The period (number of days) from shoot elogation to flowering varies as in years of examination and also among examined species.The shortest period is concluded in 2000 among all species, when we have the highest vegetational temperature sum (1036.9°C) , and it amounts 31 days among Chardonnay , 32 among Vranec, 34 among Cabernet sauvignon to 37 days among Smederevka.

In Table 3 vegetational temperature sum data and number of days from verasion to full maturity are presented

According to the data analysed, it has been concluded that vegetational temperature sum in this phenophase during the years of investigation slightly varies,and the grape of the sorts examined has been matured in time.

Vegetational temperature sum in the phenophase of verasion to full maturity is ranging from 1891.4 in 1984 to 2175.5 degrees Celsius in 2001.

The Phenophase (number of days) from grapes turning red to full maturity varies through the years of investigation,and among the sorts as well. Regarding the Vranec variety, ranging from 32 days in 1984 up to 53 days in 2005 or 42 in average;Cabernet sauvignon from 37 days (1984,2001)to 53 days in (1988/1989)-avarage 45 days; at Smederevka it ranges from 43 in 2000 to 58 days in 2004-average 52 days; Chardonnay ranges from 28 days in 1999 up to 38 days(2002,2003,2005,2006) or 34 days average phenophase in the period of investigation.

Table 3 Temperature sum during vegetation and numbers of days from verasion to full maturit

Year	Temperature sum during vegetation oC	From verasion to full maturity			
		Vranec Vranec	Cabernet sauvignon	Smederevka Smederevka	[ardone Chardonnay
1984	1891.4	41	37	45	29
1998	2148.7	32	53	48	30
1999	2106.6	42	53	50	28
2000	2144.8	37	44	43	35
2001	2175.7	42	37	51	32
2002	1970.2	40	49	51	38
2003	2124.4	43	40	57	38
2004	2024.1	49	43	58	30
2005	2005.2	53	38	49	38
2006	2029.6	52	45	53	38
84/06		42	45	52	34

The results of the sugar contents and total acids in the must of the sorts of grapes that have been investigated are shown in table 4.

The must of Vranec grapevine has 222 grams in cubic decimeter(g/dm3) average sugar content, therefore in the years of investigation ranges from 214 g/dm3 in the year 2000, to 237 g/dm3 in 1998.According to Bozinovic (1996) Vranec grapevine concentrates between 210-230 g/dm3. According to Pejovic and his associates (1996) it is 213 g/dm3.

The contents of total acids averages 6.2 g/dm3 for the same period of investigation.

The contents of sugar in the must of Cabernet sauvignon is cca. 227 g/dm3 for the years of investigation, and the total acid contents is 7.3 g/dm3. However, Milosavljevic (1998) claims that this sort could concentrate more than 8.0 g/dm3 of total acids.

The must of the Smederevka grape variety, average concentration of the sugar content is 183 g/dm3,but in the years of investigation varies from 173 g/dm3 in 2004 to 199 g/dm3 in the year 2000. As for the total acid contents,average value is 6.0 g/dm3,but it also varies from 5.5 in 1998 to 6.3 g/dm3 in 1984/2002.

The must in the Chardonnay grapevine contains average 194 g/dm3 and 6.9 g/dm3 total acid content for the investigation period. According to Srebra Ilic-Popova and ascts.(1999) Chardonnay grapes grown in the area of Skopje concentrates 219 g/dm3 of sugar and 7.2 g/dm3 total acids.

The common conclusion is that the content of sugar and total acids in the sorts above mentioned are within the limits of the biological features,so it meets the requirements for quality wine producing.

Table 4 Content of sugar and total acids in the must (g/dm3)

Year	Vranec		Cabernet sauvignon		Smederevka		Shardonnay	
	sugar	t.acids	sugar	t.acids	sugar	t.acids	sugar	t.acids
1984	235	5.0	245	8.6	178	6.3	219	7.5
1998	237	6.0	235	7.2	178	5.5	197	5.9
1999	223	6.9	233	7.8	185	5.7	222	6.9
2000	214	6.8	205	7.1	199	5.3	228	6.4
2001	221	5.9	212	6.5	188	5.9	230	6.6
2002	220	6.9	223	7.1	177	6.3	208	8.2
2003	215	6.7	220	7.5	182	6.2	208	6.9
2004	218	6.3	248	5.5	173	6.1	223	6.7
2005	218	6.0	226	7.9	182	5.9	232	6.7
2006	223	5.5	226	7.9	189	5.4	202	6.8
84/06	222	6.2	227	7.3	183	6.0	194	6.9

CONCLUSIONS

The Vineyard area of Skopje is characterized by substantial vegetation temperatute summ,enabling succesfully growing of the mentioned sorts of grapewine,and the maturity of the grapes in time.

At the average vegetation temperature of 3.673.9 degrees Celsius, the period from budburst to full maturity is as follows: Vranec-140 days; Cabenet sauvignon -155 days; Smederevka-163 days and Chardonnay-137 days.

Average for the period of investigation,there is 1-2 days difference among grapevines investigated- from budburst to blooming phenophase.

The sugar content and total acids in the must among these sorts of grapes meets the criterias for production od quality vines.

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