RESEARCH ON THE BEHAVIOR OF SOME WINE GRAPE VARIETIES IN THE CONTEXT OF CLIMATE CHANGE AT DEALU BUJOR VINEYARD

CERCETARI PRIVIND COMPORTAREA UNOR SOIURI DE STRUGURI DE VIN IN CONTEXTUL SCHIMBARILOR CLIMATICE, IN PODGORIA DEALU BUJORULUI

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Abstract. *In the recent years a climate change with consequences on Vine behaviour has been noticed. Clime data analysis has revealed an increased average annual temperature with regional differences. Also some changes in the regime of extreme thermic values have been noticed as follows: an increased annual frequency of tropical days (maximum day value > 30 ˚ C) and a decreased annual frequency of winter days (maximum day value <0 ˚ C), a significant increase of summer average minimum temperature and of winter and summer average maximum temperature. As a result of deeper warming and water deficit during summer season the phenomenon of dryness is continuously intensifying. On the background of climate change trend a comparative study on the behaviour of some wine grapes has been carried out at Dealu Bujorului Vineyard, Romania. The experiments have been carried out within the Project entitled „Research concerning the global climate change upon the viticultural ecosystem* , Project no. 51075/Sept 2007, PNII*" run within Partnership Programme* .

Key words: variety , vine , production , temperature, rainfalls**.**

Rezumat. *In ultimii ani s-a observat o modificare a climei cu repercusiuni asupra comportarii vitei de vie. Analiza datelor climatologice a evidentiat o crestere a temperaturii medii anuale, existand diferentieri regionale. S-au observat si schimbari in regimul unor valori termice extreme: cresterea frecventei anuale a zilelor tropicale (maxima zilei >30˚C) si descresterea frecventei anuale a zilelor de iarna (maxima zilnica < 0˚C), cresterea semnificativa a mediei temperaturii minime de vara si a temperaturii maxime de iarna si vara. Urmare a incalzirii mai pronuntate si a unui deficit hidric in crestere din timpul verii s-a intensificat fenomenul de aridizare . Pe fondul tendintei de modificare a climei s-a realizat un studiu comparativ asupra comportarii unor soiuri struguri de vin din podgoria Dealu Bujorului. Studiul întreprins face parte integrantă din proiectul „Cercetări privind impactul schimbărilor climatice globale asupra ecosistemului viticol,* Proiect 51075/sept 2007, PNII*" derulat în cadrul programului Parteneriate*.

Cuvinte cheie: soi, vita de vie, productie, temperatura, precipitatii**.**

INTRODUCTION

The viticultural plantations from the South Moldavia area are affected by climate change appeared during the last period of time. The climate trend leads

most of times to a change of environment conditions with a dep impact upon quantity and quality of grape production (Viorica Enache, 2007**).** The reduction of grape harvest from a quantitative and qualitative point of view and the damages upon vine stumps in the viticultural plantations due to the climate events (realy autumn frost, late spring frost, excessive negative temperatures) results to substantial losses in the viticultural inventory (Gh.Calistru, Doina Damian, 1998**).**

MATERIAL AND METHOD

The experiments have been organized in the viticultural plantation of Bujoru Research and Development Station for Viticulture and Vinification during the period 2005-2009. Three grape varietes for wine have been used as biological material as folows: Black Băbească, Black Feteasca and Merlot. In order to analyse the climate factors, the data registered by Meteo Forecast Station of Bujoru Research and Development Station for Viticulture and Vinification have been used. The following parameters have been analysed: the trend of climate factors, grape yield and its quality.

RESULTS AND DISCUSSIONS

In order to analyse the behaviour of some vine varieties for wine grapes in the context of global climate change at Bujoru Hills Vineyard where the Research and Development Station for Viticulture and Vinification is situated, the data registered for a period of five year (2005-2009) have been processed and interpreted. The climate factors noticed during the analyzed period correspond to a few years with different conditions (table 1).

Table 1

The main Climate Parameters at Bujoru Research and Development Station for Viticulture and Vinification in the period 2003-2009

Climate Parameter	2005	2006	2007	2008	2009
Global Thermic Balance , (Σt°g)	3,576.7	3,605.5	3,671.5	3,694.9	3,664.2
Active Thermic Balance , (Σt°a)	3,516.6	3,563.6	3,618.3	3,645.3	3,510.9
Net Thermic Balance , (Σt°u)	1,716.2	1,598.3	1,858.3	1,875.3	1,660.9
Σ Annual Rainfalls , mm	474.2	430.5	554.4	364.7	357.4
Σ Rainfalls during the Vegetation Period , mm	292.0	330.2	254.5	224.8	174.6
Σ Number of Insolation Hours in the Vegetation Period , Hours	1175.3	1287.6	1477.4	1332.7	1560.6
Average Annual Temperature,°C	11.8	11.7	13.5	12.9	11.2
Average Temperature in the month of - July ,°C	24.3	24.2	28.1	24.0	23.8
– August,°C	23.3	23.5	25.5	25.9	22.1
– September,°C	19.1	18.1	17.4	17.1	17.2
Air Absolute Minumum Temperature,°C	-13.6	-21.0	-13.0	-14.5	-15.2
	8, 10, 11.II	23.I	25.II	5.I	9.I
The Average of Maximum Tepmerature in the month of August,°C	28.0	29,7	30,6	32,0	30,8
Average Temperature in the I-st and II-nd decades of the month of June	20.0	20.2	25.2	21.9	20.5
Wind Speed (km/hour	1.9	2.1	2.3	2.0	2.5
Relative Air Humidity (%)	72	69	57	54	74,1

Nebulosity	5.9	5.5	5.6	6.2	3.3
No. Of days with Maximum Temperatures > 30 °C	29	44	66	52	44
Length of Bioactive Period , days	190	195	178	177	186
Real Heliothermic Index	2.02	2.06	2.75	2.50	2.56
Hydrothermic Coefficient	0.83	0.9	0.7	0.6	0.49
Vine Bioclimate Index	7.73	7.59	11.5	11.8	17.0
Index of Oenoclimate Amplitude	4,649.3	4,771	5,091.2	5,003.2	5,149.1

Bujoru Hills Vineyard is situated in a dry area, characterized by a multi annual average temperature of 12,2ºC and 451.1 mm annual average rainfalls. In the period 2005-2009, it was noticed an increased average air temperature, except the year 2009. It is noticed an average annual temperature of 13.5ºC/2007 and 12.9ºC/2008, with a thermic gain of 1.4-2.0ºC compared to the average multiannual temperature. In the year 2007, the monthly evolution of air average temperature has put into evidence high montly multiannual average temperature, during the period of vegetation and in the year 2009 lower values than the multiannual temperature, except the months of January and February (fig.1).

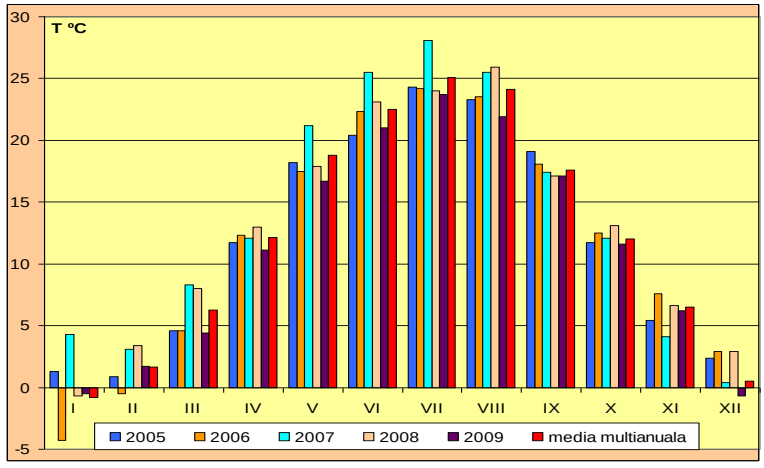

Fig.1. Montly Evolution of Air Temperature during the period 2005-2009

The Global Thermic Balance during the period of vegetation, registered 3.576,7-3.694,9 ^{0}C showing that at Bujoru Hills Vineyard there are assured conditions for grape maturation till the stage V and VI, and with caution for the stage VII. The Active and Net Thermic Balance has increased during the analyzed period, except the year 2009. Under the temperate climate peculiar to Bujoru Hills Vineyard, the frequence of absolute minimum temperatures is important for vine growing, the Winter absolute minimum temperature during the period 2005-2009 have varied between -13,0ºC/Febraruy 25, 2007 to -21,0 ºC /January 23, 2006.

The Average Rainfalls during the studied period have been 431.8 mm, dof which 255.5 mm during the vegetation period. During the last years, we assist to a reduction of rainfalls during the period of vegetation, with an ununiform distribution across the time. Frequently, torrential rainfalls alternate with long

periods of low rainfalls. The deficitary rainfalls are manily noticed during the vegetation period and are due to high air temperature with a deep influence upon vine growing. The years 2006, 2008 and 2009 were very dry, with low annual rainfalls much lower than the multiannual avergare (fig.2). The month of July of the year 2007 was terrible dry. The deficit of rainfalls during the vegetation period has been compensated by the precipitations supply during the Winter period, which is leading theoretically to annual precipitations at the level of the multiannual average, covering vine requirements concerning this climate item, despite that it is about very dry periods. Many times for vine growing, annual averages are not so important, but the extreme values of some climate items (absolute minimum temperature, maximum temperatures in the month of August, average temperature in the I-st and II-nd decades of the month of June, the number of days with a maximum temperature higher than 30 ºC).

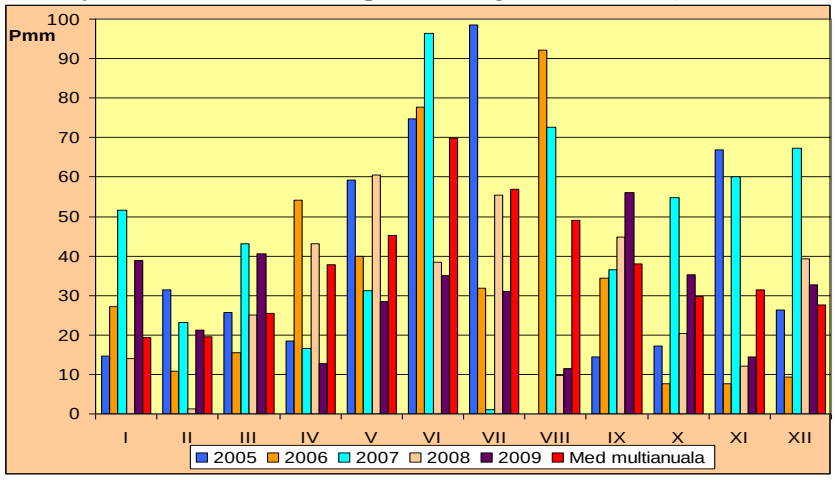

Fig.2. The monthly Evolution of Rainfalls during the years 2005-2009

The values registered by the synthetical indicators (Heliothermic Index, Bioclimatic Index, Oenological Amplitude and Hydrothermic Coefficient) show a favourable and balanced area for vine growing and a good favorability for the growing of varieties for red and white wines.

Compared to the records of the climate indices, mentioned above, the varietes included in the experiments have shoiwn a different reaction, depending on its genetical backgound, applied growing measures, grape yield achieved in the previous years etc.

The average grape production has varied for Black Babeasca from 3.677 kg /ha/2007 to 7.547 kg/ha/2008, for Merlot from 3.040 kg/ha/2007 to 8.800 kg/ha/2008 and for Royal Fetească from 5.376 kg/ha/2009 to 13.188 kg/ha/2008. Depending on the average grape production per surface unit, the variety hyerarchization in the decreasing order is the following one: Royal Fetească, Merlot and Black Băbească (fig.3). Concerning the obtained production, the year 2007 has been deeply influenced by the evolution of climate factors.

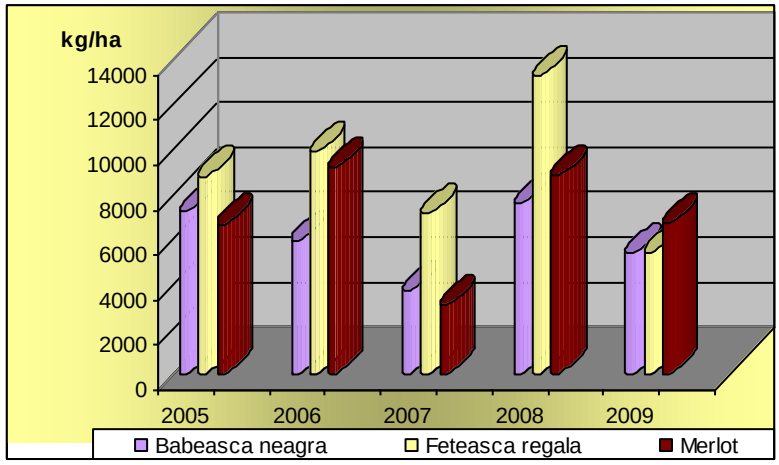

Fig.3. Grape Production during the period 2005-2009

We must mention that the climate trend in the year 2006 has deeply affected grape production in the year 2007. The grape sugar content is closely related to temperature evolution. The differences between the maximum and minimum temeperatures are 68 g/l/ Black Babească and 40 g/l/ Royal Fetească and Merlot. The highest sugar concentration was achieved in the year 2009 for Black Babească /243 g/l, in 2007 for Royal Fetească /243 g/l and in 2006 for Merlot/217 g/l (fig.4).

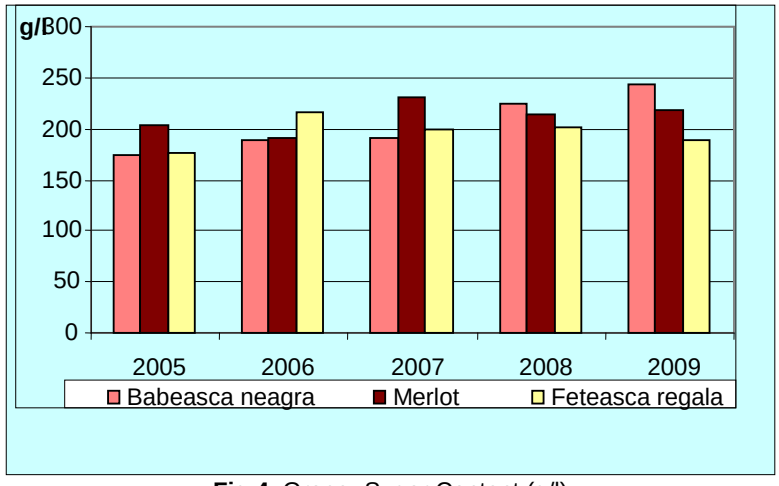

Fig.4. Grape Sugar Content (g/l)

Must Acidity has recorded a decrease in 2007 and 2008. The minimum values registered in the year 2008 have been: 4.0 g/l H_2SO_4/Black Babească, 3.6 H_2SO_4/Royal Fetească and 3.3 H_2SO_4/Merlot (fig.5).

The evolution of sugar content has a reverse relationship with must acidity. Assessing the evolution of grape varieties during the period 2005-2009, Royal Fetească has achieved balanced productions, with quantitative and qualitative

performances specific to this vine type. On the second position is coming Merlot and then on the third one Black Băbească.

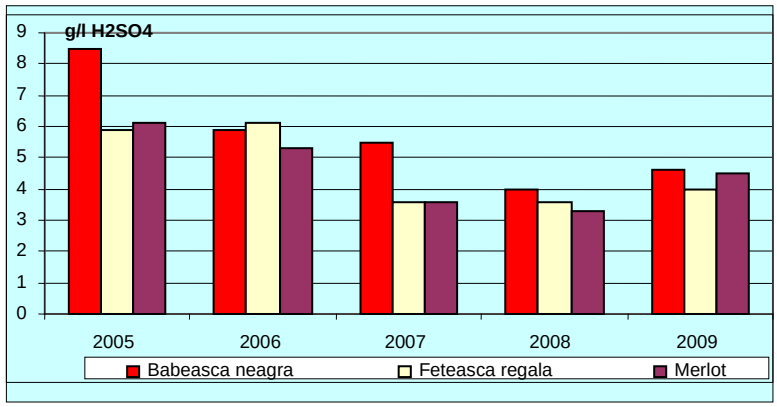

Fig.5. Must Acidity (g/l H_2SO_4)

CONCLUSIONS

In the period 2005-2009, the evolution of climate factors has had a deep impact upon production potential and grape quality for each vine variety.

1. During the last years, we have noticed a reduction of precipitations during the vegetation period and their ununiform distribution, frequently torrential rainfalls have alternated with long deficitary periods. The deficit of rainfalls has been mainly noticed during the vegetation period and is closely related to very high temperatures of the air with a deep impact upon vine growing.

2. The years 2006, 2008 and 2009 were very dry, the annual rainfalls were below tha multiannual average. The compensation of rain deficit during the vegetation period by Winter precipitations leads, theoretically, to annual precipitations at the level of the multiannual average, covering vine needs, despite than theses periods are very dry.

3. Assessing the evolution of vine varieties in the period 2005-2009, we may say that Royal Fetească has registered balanced grape productions, the quantitative and qualitative indices being specific to this vine type, followed by Merlot and Black Băbească.

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