ASPECTS ABOUT THE INFLUENCE OF THE CLIMATIC CHANGES ON THE VITICULTURAL ECOSYSTEM IN DEALU BUJORULUI VINEYARD

ASPECTE PRIVIND INFLUENȚA SCHIMBĂRILOR CLIMATICE ASUPRA ECOSISTEMULUI VITICOL DIN PODGORIA DEALU BUJORULUI

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Abstract. *By its actions, beside t normal limits and depending on the vine bioclimate, the climate risk causes violent destructions, finally resulting in total or partial losses of biological capacity. In establishing the climate risk it should be taken into account the limit of vine climate risk. A viticultural ecosystem is that functional unit of biosphere created and controlled by humans, in order to obtain a high quality grape production in ever profitable social and economic conditions. The viticultural ecosystem is directly influenced by the global climate changes. The existence of extreme weather phenomenon problem and some major climatic changes have imposed a new approach in order to establish their impact upon vine-growing ecosystem. In order to practice a durable viticulture, climate changes must be taken into consideration, evaluated and monitored, not only to mention that at present we are facing with unknown phenomena. The global climatic changes have modified precipitation frequency with sequels in drought spreading and desertification phenomenon expansion. Researchers sustain that it is possible as high temperatures, drought and atmospheric pollution to stimulate the evolving of diseases and pest with negative results on wine-growing ecosystem health. The evolution of climatic factors during have last years have had an unfavorable impact on the vineyards from the South Moldavia, recording a frequent change of the multiannual average. In this paper, the restrictive climatic factors who influence the development and fructification of vine (minimum absolute temperatures in the winter, maximum absolute temperatures, rainfall and sunstroke) are analysed.*

Key words: Dealu Bujorului, vineyard, ecosystem, climatic changes, climat risks,

Rezumat. *Prin acțiunile sale, exceptând limitele normale şi în funcție de climatul viței de vie, riscul climatic cauzează distrugeri violente, având în cele din urmă drept rezultat pierderi parțiale sau totale ale capacității biologice. În fond, riscul climatic ar trebui să aibă în vedere limita de risc pentru vița de vie. Un ecosistem viticol este ca un bloc funcțional creat şi controlat de om pentru a obține o producție de struguri de înaltă calitate, în condiții sociale şi economice avantajoase. Ecosistemul viticol este influențat în mod direct de schimbările globale de climat. Problema existenței unui fenomen climatic extrem şi multe alte schimbări climatice majore au impus un nou mod de abordare în stabilirea impactului asupra ecosistemului culturilor de viță de vie. Pentru a practica o viticultură durabilă, schimbările climatice trebuie luate în considerare, evaluate şi monitorizate, mai cu seamă că, în prezent, ne confruntăm cu*

fenomene climatice necunoscute. Schimbările climatice globale au modificat frecvența precipitațiilor, cu urmări în răspândirea secetei şi expansiunea fenomenului de deşertificare. Cercetătorii susțin că este posibil ca temperaturile ridicate, seceta şi poluarea aerului să stimuleze evoluția unor boli şi dăunători, cu rezultate negative pentru sănătatea ecosistemului viței de vie. Evoluția factorilor climatici din ultimii ani a avut o influență nefavorabilă asupra podgoriilor din sudul Moldovei, înregistrând o schimbare frecventă a mediei anuale. În această lucrare sunt analizați factorii climatici restrictivi care influențează dezvoltarea şi rodirea viței de vie (temperaturile minime absolute - iarna, temperaturile maxime absolute, ploile torențiale şi insolația).

Cuvinte cheie: Dealu Bujorului, podgorie, ecosistem, schimbari climatice, riscuri climatice

INTRODUCTION

The vine plantations from the Southern Moldavia are more and more affected by climate changes noticed during the last decade. The climate evolution has a deep impact upon the environment conditions involving changes of metabolism, growing and development processes, with positive or negative influences on plant quality and viability (T. Martin, 1968). The decrease of grape yield and quality and vine affected in the vine plantations due to the early autumn frosts, extreme negative temperatures, spring late frosts and excessive drought during the vegetation period, leads to important losses for the viticultural patrimony (Calistru Gh and colab.1998). Analysing the average monthly temperatures, air seasonal temperatures, the amount of rainfalls during the period 1901-2000, the frequency of high rainfalls and meteorological phenomena during the cold season, the climatologists from the National Meteorology Administration Bucharest have noticed an average warming of 0.3 ºC at country level, more evident in the Eastern part of the country, where this phenomenon is statistically put into evidence. From a pluviometric point of view it is noticed the diminishing of the annual amount of rainfalls, mainly in the central part of the country and a slight increase in the North-Eastern part and some Southern regions.

MATERIALS AND METHODS

In order to analyse the climate factors, the data recorded by the meteorological point of Bujoru Research and Development Station for Viticulture and Vinification were used. The observations and determinations have been run for Babeasca neagra, Merlot and Feteasca regala vine types during the period 2003-2008. The following aspects were studied: evolution of climate factors and indices and grape yield.

RESULTS AND DISCUSSIONS

In order to value the impact of global climatic changes upon the viticultural ecosystem of Dealu Bujorului Vineyard where Bujoru Research and Development Station for Viticulture and Vinification is situated, the data registered for a period of 6 years (2003-2008) have been analysed. In this way, the trend and frequency of climate elements have been put into evidence as well as their impact upon vine

behaviour. The climate factors in the studied period correspond to years with various conditions (table 1).

The Dealu Bujorului Vineyard is situated in a droughty area, where the average annual rainfalls are 451 mm and the multiannual air temperature is 11.5 ºC. During the last years, it was noticed an increase of annual temperatures. The average annual temperature was 13.5ºC in the year 2007 and 12.9 ºC in the year 2008, meaning an additional temperature of 1.4 – 2.0ºC compared to the average multiannual temperature.

The global temperature balance during the vegetation periods (2003-2008) have varied between 3,564.5-3,789.3, showing that, in general, at the Dealu Bujorului Vineyard, the conditions for grape maturity till the V th and VI th stages are assured, but less for the VIIth stage.

The amount of active and useful temperatures during the vegetation period has varied between 3,521.2-3,705, respectively between 1,598.3-1,945 (table 1). A slight increase of this indicator has been noticed during the last years.

Under the temperate climate conditions of our country, the frequency of the minimum absolute temperature has a major importance for vine culture. For the Dealu Bujorului Vineyard, during the analysed period, the minimum absolute temperatures in winter season have varied between –13.0 ºC and –21.0ºC.

In the Dealu Bujorului Vineyard the average multiannual rainfalls in the analysed period was 421.9 mm and the average multiannual rainfalls during the vegetation period was 262.5mm. During the last years, it has been noticed a decrease of rainfalls during the vegetation period, with an ununiform distribution along the year, frequent periods of lack of rainfalls, but alternating with showers for a short period. The deficit of rainfalls has been noticed mainly in the vegetation period when air temperatures are very high with a deep impact upon the starting moment of vine vegetation phenophases. In the analysed period, the driest years have been 2003, 2006 and 2008. But is important to mention that, the lack of rainfalls during the vegetation period is compensated during winter season, so that, at annual level, theoretically, the total rainfalls cover the vine water requirements.

The average temperature during the I and II decades of July registered the maximum value of 25.9 °C in the year 2008 and 20.0 °C in the year 2005. The average temperature from the hotest month (July) was 24.8 °C (the average value for the period 2003-2008), with a slight increasing trend. The average number of days with maximum temperatures higher than 30 °C was 43.8, with a maximum of 66 days in the year 2007.

The values of the synthetical indicators (heliotermic index, hydrotermic coefficient, bioclimatic index and oenologic amplitude index) at the Dealu Bujorului Vineyard show that the area is favourable to vine growing, offering a balanced environment mainly for vine types used for producing wine and red wines.

The values of the synthetically indicators varies according to the vine type, showing a different behaviour in close relanshionship to the genetic background

of each type and the applied crop measures, the position of vine in the field (up, middle, down), grape yield performed in the previous years, the maturity grade of the annual vine etc.

Table 1

The main climate items at Bujoru Research and Development Station for Viticulture and Vinification during the period 2003-2008

Climate items	2003	2004	2005	2006	2007	2008
Global termic balance, (Σt°g)	3789,3	3564,5	3576,7	3605,5	3671,5	3694,9
Active termic balance, (Σt°a)	3705	3521,2	3516,6	3563,6	3618,3	3645,3
Useful termic balance, (Σt°u)	1945	1661,3	1716,2	1598,3	1858,3	1875,3
Σ annual rainfalls, mm	263,8	443,6	474,2	430,5	554,4	364,7
Σ rainfalls during the vegetation period, mm	153,1	320,1	292,0	330,2	254,5	224,8
Σ insoltation hours during the vegetation period, hours	1367,7	1302,3	1175,3	1287,6	1477,4	1332,7
Average annual temperature,°C	10,7	12,0	11,8	11,7	13,5	12,9
Average temperature in the month of –July,°C	24,4	23,8	24,3	24,2	28,1	24,0
– August,°C	25,2	22,8	23,3	23,5	25,5	25,9
– September,°C	16,9	17,9	19,1	18,1	17,4	17,1
Air minimum absolute temperature,°C	-18,5	-17,0	-13,6	-21,0	-13,0	-14,5
	13.I	26.I	8,10,11.II	23.I	25.II	5.I
Average of maxiumum temperature in the month of August,°C	30,8	28,0	28,0	29,7	30,6	32,0
Average tenperature in the decades I and II of the month of June	25,2	21,2	20,0	20,2	25,2	21,9
Wind speed (km/hour)	1,9	2,1	1,9	2,1	2,3	2,0
Relative air moisture (%)	71,8	72	72	69	57	54
Nebulousness	5,7	5,5	5,9	5,5	5,6	6,2
No. Of days with maximum temperatures > 30 °C	57	15	29	44	66	52
Duration of bioactive period, days	213	189	190	195	178	177
Heliotermic real Index	2,7	2,16	2,02	2,06	2,75	2,50
Hydrotermic Coefficient	0,41	0,9	0,83	0,9	0,7	0,6
Vine bioclimatic Index	18,0	7,8	7,73	7,59	11,5	11,8
Oenoclimatic amplitude Index	5169,6	4753,4	4649,3	4771	5091,2	5003,2

During the analysed period, the climate factors have allowed the studied vine types to pass through all the phenophases, counting 186 days of active vegetation in average. The evolution of climate factors has been directly reflected by grape yield which has varied from a year to another (table 2, fig. 1).

Table 2

Grape yield during the period 2003-2008

Year/Vine type	2003	2004	2005	2006	2007	2008
Băbească neagră	4900	10000	7200	5930	3677	7680
Fetească regală	9800	11571	8765	9850	7119	10640
Merlot	7200	10200	6650	9125	3040	10624

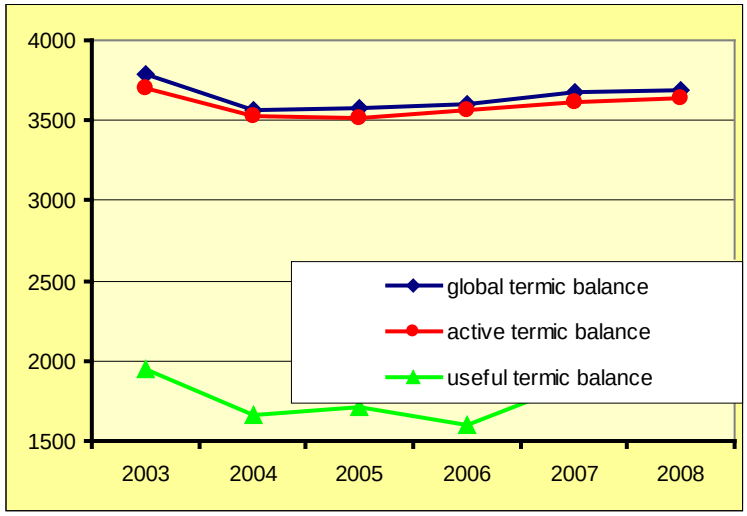

Fig.1. Global, active and useful termic balance registered at the meteorological station of Bujoru RDSVV

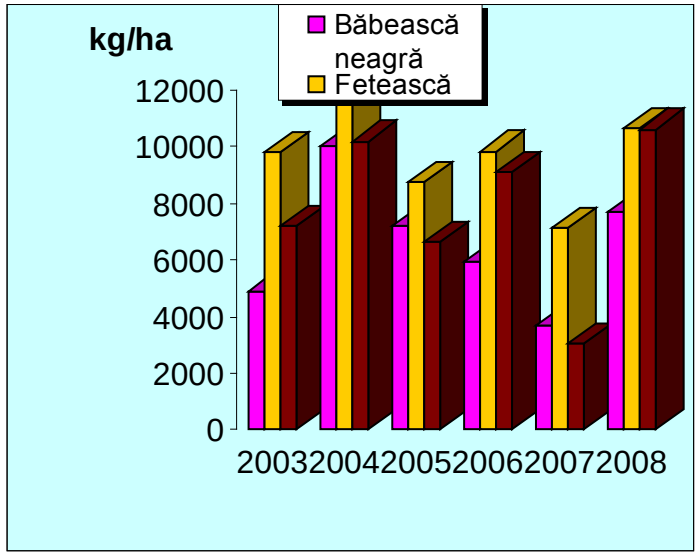

Fig. 2. Grape yield in 2003-2008 period

The studied types recorded average productions at the level of their biological potential in accordance with the evolution of the climate factors and the presence of some climate accidents (hail in the year 2007). The lowest yields were performed in the year 2007 due to the hail of the month of June and the highest productions were registered in the year 2004.

CONCLUSIONS

1. During the analysed period there were noticed some unfavourable trend in the evolution of the climate factors with a deep impact upon the production performance of the vine plantations.

2. It is recommended the permanent recover of vine affected by climate accidents – an important moment in the vine growing technology.

3. The grape productions have varied from year to another but according to the genetic potential of each vine type.

4. In the future, it is compulsory the permanent monitoring of climate factors and of their evolution, mainly of the extreme temperatures during winter and summer seasons, of atmospherical and pedological drought etc., in order to establish viable solutions able to diminish their negative effects.

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