ASSESSING OF THE THERMIC AND HYDRIC RISK IN DEALUL BUJORULUI VINEYARD UNDER LIKELY CLIMATE CHANGE

EVALUAREA RISCULUI TERMIC ŞI HIDRIC ÎN PODGORIA DEALUL BUJORULUI ÎN CONDIȚII DE SCHIMBĂRI CLIMATICE PROBABILE

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Abstract. *Characterization of a wine year consist of to analyze Agro-meteorological of the growing season of the vine (April to September) and the dormant period (October-March). It has placed particular emphasis on the evolution of hydro-thermal regime from air and soil, analysis is performed during the vegetation and repose period and limiting the action of these factors have an important role on the production of grapes obtained. The paper presents the agro-meteorological conditions in 2014-2015 periods, with direct effects on vine culture. Were processed and analyzed data specialist on temperature, rainfall and soil water content accessible on various depths (0-20 cm, 20-40 cm, 40-60cm, 60-80cm, 80-100cm and 0-100 cm). In assessing the potential agro-climatic resources available were considered data recorded at the weather Tg Bujor station (AGROEXPERT system).The trend of rains characteristics is the presence of torrential rains increasing rainfall number greater than 0,1mm and less than 5,0mm and decreases the number of leverage able rains (> 5 mm). Knowledge of the agro-meteorological characteristic is required for establish trend of thermic and hydric risk on the culture of the vine. By monitoring and surveillance phenomena risk / temperature and water stress can apply the most effective measures to prevent and mitigate negative effects on the culture of the vine.*
Key words: climate risk, vine, rainfall, water stress

Rezumat. *Caracterizarea unui an viticol constă în analiza agrometeorologică a perioadei noiembrie-octombrie, respectiv perioada de vegetație a viței de vie (aprilie-septembrie) şi perioada de repaus vegetativ (octombrie-martie). S-a pus un accent deosebit pe evoluția regimului hidro-termic din aer şi sol, analiza efectuându-se pe perioada de vegetație şi de repaus vegetativ, în care acțiunea limitativă a acestor factori au un rol deosebit de important asupra producției de struguri obținută. Lucrarea prezintă evoluția condițiilor agrometeorologice în perioada 2014-2015, cu efecte directe asupra culturii de viță de vie. S-au prelucrat şi analizat date de specialitate privind temperatura, precipitații şi conținutul de apă din sol accesibil pe diferite adâncimi (0-20 cm, 20-40 cm, 40-60 cm, 60-80 cm, 80-100 cm şi 0-100 cm). În scopul evaluării potențialului resurselor agroclimatice disponibile s-au luat în considerare datele agrometeorologice înregistrate la stația meteo Tg Bujor(sistem AGROEXPERT). Temperatura medie a anului viticol 2014-2015 este comparabilă cu multianuala, însă pe perioada de vegetație valorile temperaturilor medii înregistrate în aer au fost mai mici decât valorile normale, urmare a amplitudinii mari dintre*

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temperatura din cursul zilei şi nopţii. Regimul hidric anual este excedentar comparativ cu normala dar pe perioada de vegetaţie suma precipitaţiilor înregistrate nu satisface necesarul de 250 mm necesar culturii viţei de vie. Tendinţa caracteristicilor ploilor este prezenţa ploilor torenţiale, creşterea numărului de ploi mai mari de 0,1 mm şi mai mici de 5,0 mm şi scăderea numărul de ploi valorificabile (>5 mm). Cunoaşterea caracteristicilor agrometeorologice este necesară în stabilirea tendinţei riscului termic şi hidric asupra culturii viţei de vie. Prin monitorizarea şi supravegherea permanentă a fenomenelor de risc/stres termic şi hidric se pot aplica cele mai eficiente măsuri de prevenire şi diminuare a efectelor negative asupra culturii de viţă de vie.
Cuvinte cheie: risc climatic, viţă de vie, precipitaţii, stres hidric

INTRODUCTION

Today we are witnessing global change in climatic factors due to the amplification of global warming caused by the greenhouse effect. Climate change have been manifested more frequently in recent decades by increasing air temperatures, a considerable decrease of precipitation (rain and snowfall) and the occurrence of extreme weather events like: heat waves, prolonged droughts, storms, hail, floods , the frosts (Enache, 2007). Climate change is now recognized as one of the most serious environmental challenges facing humanity. Climate change affects many sectors, agriculture is one of the areas most exposed because of to its dependence on weather conditions. Most of the effects of climate change on agriculture are derived from water. The lack of water has a major impact on agricultural production. The existence of climate databases and use phenological observations, both in relation to climate change as well as the various fields of activity, are of particular importance (Scheifinger *et al.,* 2002).

MATERIAL AND METHOD

The research was conducted in plantations Research and Development Station for Viticultural and Winemaking Bujoru. Were processed and analyzed specialist data on temperature, precipitation, wettability, sunstroke and soil water content accessible on various depths (0-20 cm, 20-40 cm, 40-60cm, 60-80cm, 80-100cm and 0 -100 cm). In assessing the potential available agro-climatic resources were considered data recorded from the Tg. Bujor agrometeorological station (AGROEXPERT system).

RESULTS AND DISCUSSIONS

Observations and measurements were performed in the period 2014-2015 and taking into account the intended purpose data obtained were compared to the annual average.

The thermal regime 2014-2015 (tab. 1)

Compared to the annual average mean temperature of 2014 it was lower and in 2015 was comparable to it. During the growing season average temperatures recorded in air were lower in 2014 than normal values, due to the large amplitude of the temperature during the day and night. Absolute maximum temperatures in 2015 were lower than in 2014. Absolute minimum temperature was -18,5ºC in 2014 and in 2015 of -23.0 °C.

Table 1

The thermal regime 2014-2015

Month	Air temperature ˚C						
	Average			The absolute maximum		The absolute minimum	
	Normal	2014	2015	2014	2015	2014	2015
I	-1.2	-1.3	-1.2	13.0	10.6	-18.5	-23.0
II	0.1	-0.6	1.2	10.3	12.0	-13.7	-11.6
III	5.2	8.1	5.2	21.0	17.3	-5.2	-5.7
IV	11.7	11.0	10.4	23.3	27.2	0.8	-3.0
V	18.1	15.6	17.0	30.7	30.2	-0.2	4.4
VI	21.8	20.7	20.3	31.0	32.3	9.7	8.0
VII	24.1	22.1	23.7	32.6	37.3	10.8	18.9
VIII	23.1	22.3	23.0	35.8	36.2	7.4	11.1
IX	17.5	17.0	19.0	30.9	33.6	-1.5	11.1
X	11.4	10.0	9.5	25.3	23.5	-1.8	-3.1
XI	5.2	4.3	6.6	17.4	21.3	-6.2	-5.1
XII	0.4	0.0	1.6	15.6	16.6	-20.5	-9.2
Annual	**11.5**	**10.8**	**11.4**	**35.8**	**37.3**	**-20.5**	**-23.0**
Vegetation period	**19.4**	**18.1**	**18.9**	**35.8**	**37.3**	**-1.5**	**-3.0**

The hidryc annually regime (tab. 2) in 2014 was comparable to multianual, 2015 was with a surplus rainfall of 70.5 mm. If 2014 precipitation during the growing season totaled 258.0 mm in 2015 although was a surplus annually in during the vegetative period rainfall amount of 218.2 mm did not satisfy the requirement of minimum 250 mm for the vine.

Table 2

Rainfall 2014 - 2015

Month	Rainfall (mm)								
	Normal	2014	No. deys with rain			2015	No. deys with rain		
			>0.1	>5	>10		>0.1	>5	>10
I	21.5	16.8	6	1	0	27.0	3	1	3
II	19.2	4.8	3	0	0	35.6	4	2	1
III	26.7	29.2	7	3	0	59.0	14	1	0
IV	36.5	72.4	8	2	2	32.0	7	3	0
V	48.0	4.1	8	3	3	13.8	8	2	1
VI	72.1	38.5	6	1	2	53.0	8	0	2
VII	50.5	84.6	6	3	2	23.0	7	1	0
VIII	48.6	55.0	1	1	2	74.4	7	2	1
IX	40.3	3.4	3	0	0	22.0	8	2	0
X	32.4	44.4	4	0	2	74.0	4	2	1
XI	29.5	53.4	3	1	3	111.4	4	2	1
XII	30.5	43.6	4	2	1	1.2	4	1	3
Annual	**455.9**	**450.2**	**59**	**17**	**17**	**526.4**	**78**	**19**	**13**
V. P.	**296.0**	**258.0**	**32**	**10**	**11**	**218.2**	**45**	**10**	**4**

The trend of characteristics rainffal was the presence of torrential rains, increasing rainfall greater than 0.1mm and less than 5.0mm and decrease the number of leverageable rains (> 5 mm).

The hygroscopicity and insolation 2014 – 2015 (tab. 3)

The requirements for the vines of hygroscopicity mean values ranged from 50-80%, depending on the phenological phase of vegetation. In 2014, monthly higroscopicity was comparable or better than that multiannual. In 2015, correlated with rainfall, hygroscopicity was lower multiannuality minimum extent and optimum vine to the climatic element. The amount of hours of sunshine presented a multi-annual surplus in 2015 and a deficit in 2014.

Table 3

The hygroscopicity and insolation 2014 – 2015

Month	Hygroscopicity %			Heatstroke (hours)		
	Normal	2014	2015	Normal	2014	2015
I	84.1	87.0	86.7	44.7	22.2	50.2
II	80.4	90.8	79.4	74.5	24.5	83.9
III	73.2	66.8	73.5	126.7	128.8	121.1
IV	67.3	71.9	55.9	162.4	143.1	193.1
V	64.3	84.9	58.6	232.7	237.2	291.9
VI	64.6	82.1	58.2	236.0	208.7	284.0
VII	62.4	69.5	58.3	266.2	279.4	302.2
VIII	63.0	63.7	55.7	246.0	274.0	250.8
IX	69.3	58.2	55.6	172.4	194.6	158.5
X	76.3	71.8	77.2	114.6	96.3	124.1
XI	82.9	84.4	87.4	54.6	32.3	32.3
XII	85.8	87.4	76.6	30.3	38.0	27.2
Annual	**72.8**	**76.6**	**68.6**	**1761.1**	**1679.1**	**1919.3**

With the help of climatic elements were calculated indices (tab. 4) that comprise several climatic factors (high variability of the amount of hours of insolation, the number of days of the growing season, etc.).

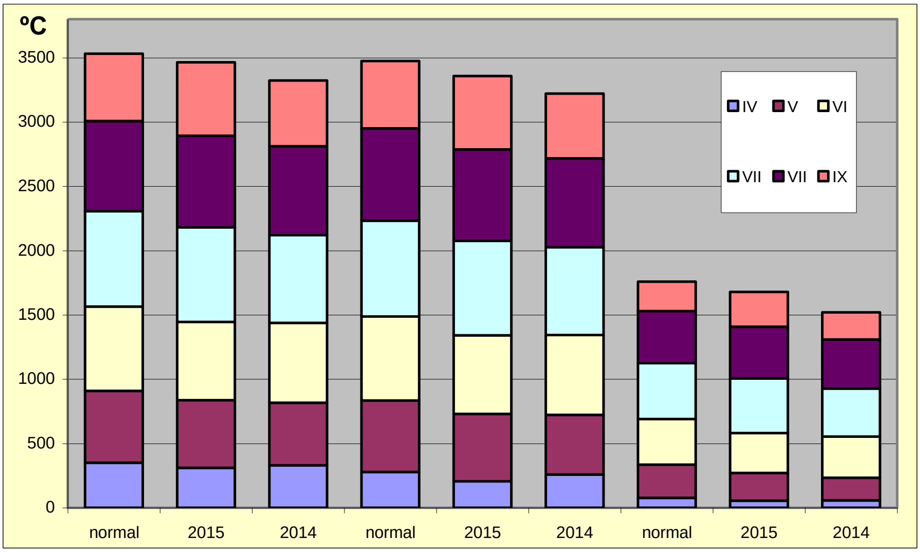
Knowledge of the characteristics agrometeorological of the wine years 2014 and 2015 was necessary in setting trend of the temperature and water risk on the vine culture. By monitoring and surveillance phenomena risk / temperature and water stress can apply the most effective measures to prevent and mitigate negative effects on the culture of the vine.

Table 4

The main indicators used in viticulture (2014-2015)

Indicator	multiannual average	2014	2015
Index of real heliothermal (IHr)	2.31	2.03	2.48
Hydrothermical Coefficient (CH)	0.85	0.8	0.65
Bioclimatic index of the vine (Ibcv)	8.58	9.2	11.99
Oenoclimatice aptitude index (IAOe)	4742.8	4549.3	4870.9

Global thermal, active and useful balance, was lower multiannual period under review and in close connection with the evolution of air temperature.



Month	The global temperature			Active temperature			Useful temperature		
	Normal	2015	2014	Normal	2015	2014	Normal	2015	2014
IV	349.5	310.8	331.4	278.8	205.6	257.2	78.06	55.6	57.2
V	560.4	525.7	484.7	555.9	525.7	465.7	257.5	215.7	175.7
VI	654.1	610.1	620.7	654.1	610.1	620.7	353.9	310.1	320.7
VII	744.2	733.9	683.7	744.2	733.9	683.7	435	423.9	373.7
VIII	698.6	713.2	690.5	716.7	712.2	690.5	406.7	403.2	380.5
IX	525.6	570.1	510.9	523.7	570.1	502.5	226.2	270.1	212.5
Total	**3532.4**	**3463.8**	**3321.9**	**3473.4**	**3357.6**	**3220.3**	**1757.3**	**1678.6**	**1520.3**

Fig. 1 Global thermal balance, active and useful
in the vegetation period 2014- 2015

Soil moisture was presented in dynamic on profile 0-100 cm (fig. 2). It was influenced both by the evolution of precipitation and vegetation phenophase. In 2014 soil moisture in April, May and June was at the minimum level plafon, reaching in September at 10-15% of the water capacity useful. The rainfall in during the winter period 2014-2015 have recovered some of the soil hydric deficit, but deficit rainfall in July, August and September, cumulated with consumption of vines on the same period led to a soil moisture the end of the vegetation period of 2015 close to wilting coefficient.

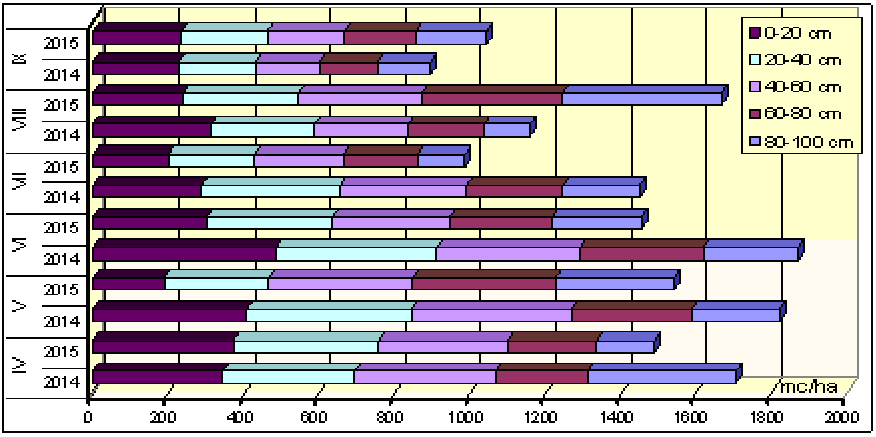


Fig. 2 The dynamics of soil moisture on profil (0-100 cm)

CONCLUSIONS

1. In Dealul Bujorului vineyard water and temperature risk was accentuated in certain decades of the vegetation period. Evolution of annual precipitation and temperatures have directly influenced the hydric regime of vineyards.

2. Was noted a downward trend of the precipitations especially during the vegetation period. The presence of torrential rain followed by long periods without precipitation and extreme temperatures led to stressful conditions for the culture of vines.

3. The trend characteristics rains - the presence of of torrential rains, increase the number of rainfall greater than 0.1 mm and less than 5.0 mm and decrease the number of leverageable rains (> 5 mm).

4. Global thermal, active and useful balance - lower multiannual in analyzed period, closely related to the evolution of air temperature.

5. The soil moisture and accessible water supply degree were influenced by the evolution of precipitation, diurnal average consumption of the vine and restoring the water supply during

6. Soil moisture in 2015 compared to 2014 was deficient, reaching at the end of the growing season to values comparable to the coefficient of wilting, particularly on the profile of 80-100 cm.

REFERENCES

1. Enache Viorica, 2007 - *Researches Regarding the Tendency in Some climatic factors evolusion from Moldavia south hilly region with reference ti viticultural plantation,* Lucrări ştiinţifice, Anul L, vol. 1 (50), Seria Horticultura, Editura Ion Ionescu de la Brad

2. Sheifinger, H.,A. Et al, 2002 – *Atmospheric mechanism governing the spatial and temporal variability of phenological phases in central Europe, Int.J.climatol.*

3. *, 2005** – *Mic atlas de risc agrometeorologic ANM*-Sectia de meteorologie dinamică, climatologie şi agrometeorologie