The Assessment of the Main Climatic Conditions in North-West of Romania for Viticulture (1991-2013)

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Abstract

Vines act as an indicator in relation with climate changes and they are particularly sensitive to temperature changes. The aim of this article is to present the climatic conditions and their interaction expressed by some viticultural indices and coefficients from North-West of Romania between 1991-2013. For characterize the three areas, (Maramureş[1], Sălaj[2] and Satu Mare[3]) meteorological data from National Meteorological Agency has been used. The length of the growing season is within normal limits for the vine culture: 176 days in Maramureş, and 195 days in Sălaj and 184 days in Satu Mare. Comparing the thermal coefficient values (C_t) of our country (situated between the values 16-19), we can conclude that all three areas have sufficient thermal resources for vine growth and fruition. The highest values of the real heliothermic index (IH_r), hydrothermal coefficient (CH) and wine bioclimatic index (I_{bcv}) were recorded in Sălaj area: 1.5 (IH_r); 1.4 (CH); 8.5 (I_{bcv}). In contrast, with the lowest values: IH_r=1.0 and I_{bcv}=3.5, were registered in the area of Maramureş. Based on the results, it can be stated that vines can be cultivated in all three studied areas. The most favorable area is Sălaj, followed by Satu Mare, and the less favorable is the area of Maramureş, where vine culture falls more to amateurism.

Keywords: *climatic conditions, viticultural indices and coefficients.*

Introduction

Global warming has caused a disruption in the natural evolution of climatic factors in the vineyard's ecosystem, therefore summers have become extremely dry, autumns have become either cold, wet, or warmer than usual, while winters have become shorter, but with extremely low temperatures (Alexandru *et al.* 2014).

Aims and objectives

The main objective of this paper is to present the climatic conditions (temperature, insolation, rainfall) and their interaction, expressed by some viticultural indices and coefficients, from North-West of Romania, between 1991-2013, in three areas (Maramureş[1], Sălaj[2] and Satu Mare[3]), but also to determine if this areas are friendly culture of the vine.

Materials and methods

In order to characterize the three areas, meteorological data from the National Meteorological Agency has been used. Based on their specific formulas, ecoclimatic indicators were determined, important for the growth and the fruition of vines, such as global thermal balance ($\sum t^o g$); active thermal balance ($\sum t^o a$); useful thermal balance ($\sum t^o u$); thermal coefficient (C_t); annual and monthly rainfall amount; amount of hours of sunshine (Σir) and real sunburn coefficient (C_i). To get a broader picture on how climatic factors influence the growth and fruition

Tab. 1. Climate data from the three studied areas, between 1991-2013

Area	Studied elements		Specific			Critical limits for vines
			Average values	Extreme limits		
				Min.	Max.	
MM[1]	The vegetation period (days)		176	173	179	150-160
	Thermal balance	Global ($\sum t^0g$)	2881	2878	2893	2100-2500
		Active ($\sum t^0a$)	2836	2831	2840	2300-2400
		Useful ($\sum t^0u$)	1157	1153	1161	850-1000
		Thermal coefficient (C_t)	16.4	16.2	16.9	16-19
	Insolation (hours)	Real ($\sum ir$)	1172	1170	1176	-
		Coefficient of insolation (C_i)	6.65	6.63	6.66	-
	Precipitations (mm)	Total annual ($\sum pp$)	817.5	789.3	826.3	500
		Coefficient of precipitation (Cp)	3.08	3.02	3.12	-
	The interaction of climatic factors	Real heliothermic Index (IH_r)	1.0	0.9	1.1	1.35-2.70
		Hydrothermal coefficient (CH)	2.4	2.2	2.5	0.7
		Bioclimatic index (I_{bcv})	3.5	3.4	3.9	5
SJ[2]	The vegetation period (days)		195	187	199	150-160
	Thermal balance	Global ($\sum t^0g$)	3673	3670	3680	2100-2500
		Active ($\sum t^0a$)	3247	3242	3253	2300-2400
		Useful ($\sum t^0u$)	1539	1536	1546	850-1000
		Thermal coefficient (C_t)	18.8	18.1	19.3	16-19
	Insolation (hours)	Real ($\sum ir$)	1514	1498	1530	-
		Coefficient of insolation (C_i)	7.76	7.72	7.81	-
	Precipitations (mm)	Total annual ($\sum pp$)	506.4	499.6	512.3	500
		Coefficient of precipitation (Cp)	1.72	1.69	1.84	-
	The interaction of climatic factors	Real heliothermic Index (IH_r)	1.5	1.3	1.6	1.35-2.70
		Hydrothermal coefficient (CH)	1.4	1.3	1.9	0.7
		Bioclimatic index (I_{bcv})	8.5	8.2	8.9	5
SM[3]	The vegetation period (days)		184	182	193	150-160
	Thermal balance	Global ($\sum t^0g$)	2989	2977	2996	2100-2500
		Active ($\sum t^0a$)	2936	2933	2954	2300-2400
		Useful ($\sum t^0u$)	1539	1536	1549	850-1000
		Thermal coefficient (C_t)	16.2	16.1	16.9	16-19
	Insolation (hours)	Real ($\sum ir$)	1394	1379	1399	-
		Coefficient of insolation (C_i)	7.57	7.56	7.87	-
	Precipitations (mm)	Total annual ($\sum pp$)	688.0	679.6	693.4	500
		Coefficient of precipitation (Cp)	2.36	2.34	2.42	-
	The interaction of climatic factors	Real heliothermic Index (IH_r)	1.3	1.2	1.5	1.35-2.70
		Hydrothermal coefficient (CH)	2.3	2.1	2.4	0.7
		Bioclimatic index (I_{bcv})	5.2	4.9	5.4	5.0

of vines, the heliothermic index (HI), hydrothermal coefficient (CH) and bioclimatic index (I_{bcv}) were calculated (Ţârdea *et al.* 1995).

Results and Discussion

The highest value of heat balance was recorded in Sălaj: global thermal balance ($\sum t^o g$) 3673^0C, active thermal balance ($\sum t^o a$) 3247^0C and useful thermal balance ($\sum t^0 u$) 1539^0C. The

highest coefficient of rainfall was recorded in Maramureş (Cp-3.08) and the lowest (Cp-1.72) was recorded in Sălaj area. The highest values of the real heliothermic index (IH_r), hydrothermal coefficient (CH) and wine bioclimatic index (I_{bcv}) were recorded in Sălaj area (IH_r=1.5; CH=1.4 and I_{bcv}=8.5). In contrast, with the lowest values: IH_r=1.0 and I_{bcv}=3.5, were registered in the area of Maramureş, but in this area, the hydrothermal coefficient (CH=2.4) is higher than in the other two areas, which expresses excess moisture and that favors quantitative productions to the detriment of quality.

The results are influenced by study area, so that the best area for vines is SJ[2], which is an area with a reputation**,** followed by SM[3] also this area is a best for vines culture. Regarding the MM[1] area, results indicate that in this area are less favorable for vine grow.

Conclusion

Based on the results, it can be stated that vines can be cultivated in all three studied areas. The most favorable area is Sălaj, followed by Satu Mare, and the less favorable is the area of Maramureş, where vine culture falls more to amateurism.

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