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**THE INFLUENCE OF CLIMATIC CONDITIONS VARIABILITY
ON THE INTENSITY OF GRAPEVINE PHYSIOLOGICAL PROCESSES**

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ABSTRACT

The areas favourable to grapevine cultivation have most various pedoclimatic conditions which, correlated with the ecological requirements of varieties and parent stocks, are key elements in obtaining high level production of grapes and wine in terms of both quantity and quality. The quality of viticultural and wine-making products depends to a great extent on environmental conditions that leave their mark on production areas. The knowledge of physiological particularities determined by the pedoclimatic conditions is important for elaborating and supporting the viticultural technical activities. In this paper studies were focused on the influence of the climatic variable regime on physiological processes.

INTRODUCTION

The effect of climatic conditions on the growth and development of grapevines has been subject to several research studies. The ecological offer holds an important role in establishing the grapevine areas. The climatic conditions influence the development of physiological and biochemical processes inside the plant, determine the length of the vegetation period, influence the quality of crops, and offer singularity to the grapes and wines obtained expressed by the specificity of the viticultural area. Physiological processes (photosynthesis, transpiration and stomatal conductance) may vary considerably with environmental conditions.

Amongst climatic factors, the hydric regime along with the environmental temperature have the highest influence on production quality. In order to perform durable and sustainable viticulture, studies were made attempting to identify the reaction mechanisms of grapevine under conditions of environmental stress (Burzo I et al 1999, Costea D.C & Daniela Doloris Cichi 2008, Daniela Cichi et al 2007, 2016); understanding how water use efficiency changes under drought (Prieto J et al, 2020, Medrano H et al 2015); interpreting adaptive responses of grapevine to abiotic stress (Merli M et al, 2015, Poni et al, 2014); evaluating the levels of climate favourability for viticulture (Buzatu Gilda.Diana & Mărăcineanu L.C 2015, Toniato J. & Carbonneau A, 2004)

MATERIAL AND METHODS

In accordance with the research topic proposed, the observations and determinations were focused on monitoring climatic factors in order to assess the favourableness of the years under study and analyse the influence of the varied hydro-thermal regime specific to the study years on physiological processes.

Observations and determinations concerning the results of grapevine cultivation were made during the year 2021 in a private 10-year-old vineyard located in Şimnicu de sus village, where the trunk length of Cabernet Sauvignon varieties grafted to Kober 5BB was 80 cm and the pruning by Guyot training system was performed.

The determination of the physiological indicators (the intensity of transpiration and photosynthesis, stomatal conductance) was made with Lci equipment during the vegetation period, in the second decade of each month. In order to highlight the effect of the hot temperatures, the determinations were made in July in two days with different thermal profile. The values of climate data were taken from the site www.worldweatheronline.com. Other observations and determinations that have been made are specific to the research field.

RESULTS AND DISCUSSIONS

The estimation of the climatic favourability of the cultivation year in the viticultural region was made as a synthesis of several climatic factors with positive and negative influence, by studying the normal conditions, the deficits or the excesses of the recorded values.

The 2021 vegetation period when determinations were made is characterised by time intervals of favourable temperature and humidity followed by time intervals of hot weather and no precipitations (figures 1- a, b, c, d).

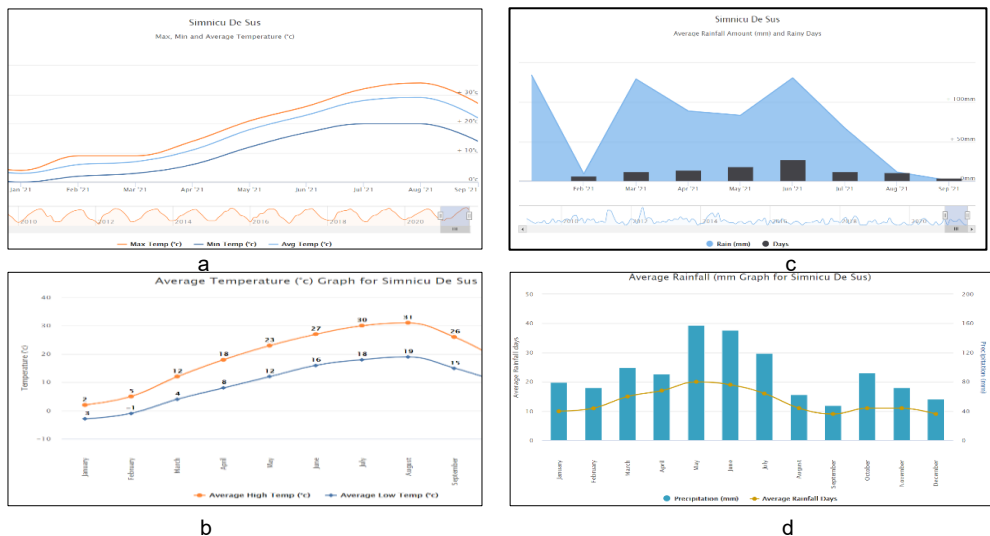


Figure 1. Climatic conditions during the experimental stage annual temperature (a); multiannual average temperature (b); annual precipitations (c); multiannual average precipitations (d) (according to www.worldweatheronline.com)

The analysis of climate data indicates that during the second part of the vegetation period close to the maturity-ripening stage, 2021 monthly average maximum temperatures higher with 2-3 °C were recorded (32 °C and 34 °C respectively compared with the multiannual average of 30 and 31 °C during July and August) and there was lower humidity, as well, due to the low precipitation volume.

Such climatic conditions allowed determinations to be made concerning the progress of physiological processes during both normal and hot weather.

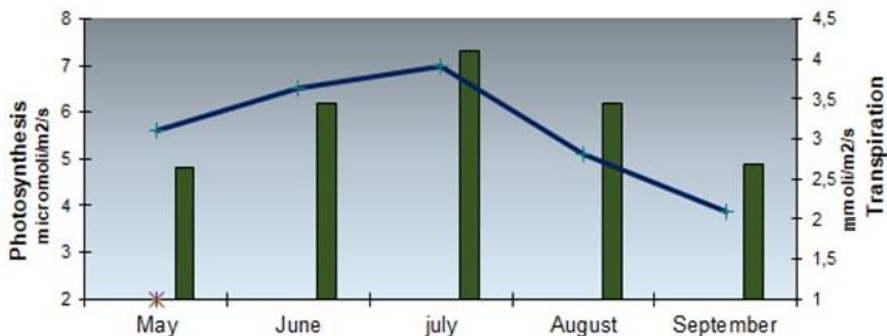


Figure 2 The intensity of transpiration and photosynthesis

Out of the determinations made during the vegetation period one can notice the increase of the intensity of physiological processes (photosynthesis and transpiration) until July, after which the transpiration intensity dropped more compared with the photosynthesis intensity due to the specific climatic conditions (lack of precipitations and high temperatures) – Figure 2.

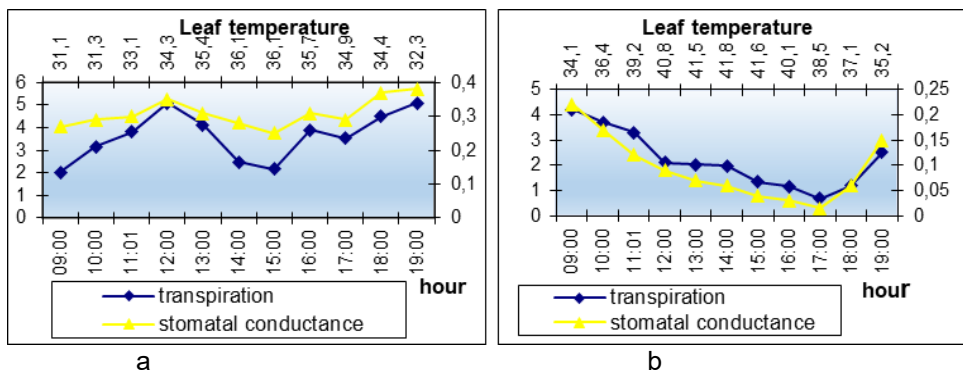


Figure 3 Transpiration intensity and stomata conductance
a) normal weather temperature; b) hot weather temperature

Research studies showed a good correlation between the transpiration intensity and the stomatal conductance to the limit of approximately 36 °C (fig 3 a). Between 31 °C -36 °C (25.07.2021), transpiration dropped more compared to stomatal conductance. For temperatures at the level of the leaf at which the determination was made between 36 °C to 42 °C (29.07.2021), the variation of the two factors followed a similar evolution curve, big differences being noticed between successive determinations, yet the stomatal conductance dropped more than transpiration did (fig 3 b).

CONCLUSIONS

The diversity of climatic conditions during the research period was found in the variations of the bio-physiological indicators studied.

The studied variety interacted with environment conditions, expressing their adaptive potential in a specific way.

Under conditions of year 2021 due to low precipitations during the early vegetation period, the variety under study faced hot weather temperatures with no major impact.

To conclude, the viticultural year 2021 has not met the conditions for high production levels, yet prerequisites do exist to be considered a high-quality production year.

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