THE INFLUENCE OF CLIMATIC FACTORS ON THE MAIN PHYSIOLOGICAL PROCESSES IN VINES

INFLUENȚA FACTORILOR CLIMATICI ASUPRA PRINCIPALELOR PROCESE FIZIOLOGICE LA VIȚA DE VIE

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Abstract. *Extreme weather phenomena such as atmospheric and pedological drought and rain in the insufficient quantity and unevenly distributed during the vegetative period disrupt the vine metabolism by directly affecting the main physiological processes responsible for growth, development and maturation of the grapes. During 2007-2010, SCDVV Murfatlar develop, in collaboration with the University of Craiova, a research project funded by the CNMP-PNII, which follows, between the main objectives, making eco-physiology research at grapevine varieties prevalent in both centres Murfatlar and Banu Maracine, which wants to give response to next issues: establishing correlations between soil moisture, foliar mass and evolution of physiological processes; dynamics of physiological processes in different varieties; the influence of water regime on the quality and quantity of grape production. These studies will give a background for to developing a new technologic procedure for growing vines in the a restrictive regime of precipitations.*

Key words: climatic conditions, soil moisture, physiological processes, grapes quality

Rezumat. *Fenomenele climatice extreme cum ar fi seceta atmosferică şi pedologică din unele luni de vară şi precipitaţiile slabe cantitativ şi neuniform repartizate pe parcursul anului perturbă metabolismul viţei de vie, prin afectarea directă a desfăşurării principalelor procese fiziologice responsabile de creşterea, dezvoltarea şi maturarea strugurilor. In perioada 2007-2010, SCDVV Murfatlar realizează în colaborare cu Universitatea din Craiova-Facultatea de Horticultură un proiect finanţat de CNMP-PNII, care urmăreşte, ca principale obiective, realizarea de cercetări de eco-fiziologie la soiuri reprezentative pentru centrele viticole Murfatlar şi Banu Mărăcine prin care se doreşte să se dea răspuns la urmatoarele problematici: stabilirea corelaţiilor între umiditatea solului, masa foliară şi evoluţia proceselor fiziologice; dinamica proceselor fiziologice pe diferite soiuri în cele două centre; influenţa regimului hidric asupra calităţii şi cantităţii producţiei de struguri. Studiile respective vor sta la baza elaborării unui procedeu tehnologic de cultivare a viţei de vie în regim hidric restrictiv*

Cuvinte cheie: condiţii climatice, umiditatea solului, procese fiziologice, calitatea strugurilor

INTRODUCTION

Deepening the drying phenomenon in the areas of southern and south-eastern Romania impose to adapt vine growing technology for better use of natural water resources or their substitution by modern methods of irrigation. Balance between production cost and quality grapes depends on the growing system adopted (pruning method, foliage management, supply of water and fertilizer), whose effect can be monitored by determining the development of key physiological processes that manage future harvest

The research project has as a primary aims to deepen understanding of physiological mechanisms to adapt vine growing technology to make better use of water resources, ensuring a high quality of wines.

MATERIAL AND METHOD

It was placed two experimental plots in Murfatlar and Banu Maracine centers, planted with varieties Riesling Italian and Cabernet Sauvignon (non-irrigated and drip irrigated).

Were made the following observations and determinations:

• monitoring of climatic factors: air temperature, sunlight, rain (it is shows only the data from Murfatlar)

• highlight the effect of lack of water on leaves growth conditions (leaf volume): were considered mature leaves located over grapes, scan and analyze with Win-Folia software specialized

• dynamic tracking of key physiological processes: it was made determinations by a porometer and a clorofilmeter

• physic-chemical analysis at grapes and musts

RESULTS AND DISCUSSIONS

Annual average temperatures calculated for the range studied are higher than normal by about 3 ^{0}C (14,27^{0}C in 2007 and 14,5^{0}C in 2008 and 2009 compared with 11.40 ^{0}C - normal). It shows a group of high temperatures (monthly average) in the period from May to August (figure 1).

Concerning **the sunlight**, the first two years of study at Murfatlar see a 5-7% increase in the number of annual sunshine hours, including during the growing season, which increased by 57 hours in 2008 and 86 hours in 2007 (figure 2). Year 2009 is approaching normal

Rainfall regime. Multiyear average rainfall fell in one year is 436 mm at Murfatlar. Between 2007 and 2009 was substantially exceeded this value (579 617.5 mm respectively) because of rain fell between August to November 2007, respectively in July and December 2009. It is noted, however, in recent years, a great variability in rainfall distribution, particularly dry months occurring between May to June in all three years, in June and August 2008 and June 2009 (figure 3), which has influence the processes of growth and development of vines (growing shoots and grain binding.

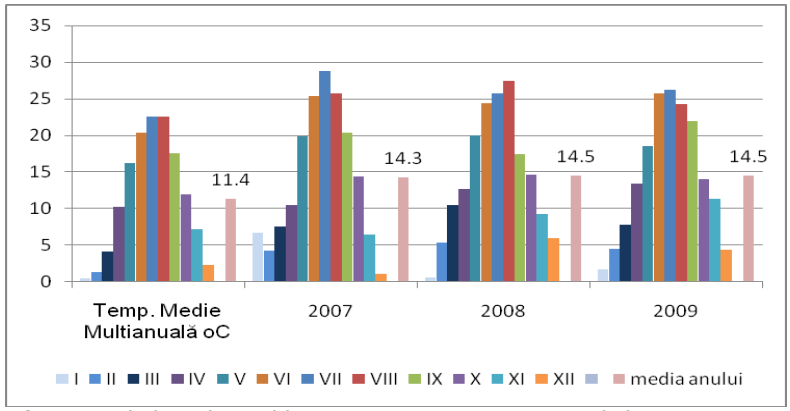

Fig. 1. Evolution of monthly average temperatures. Murfatlar, 2007-2009

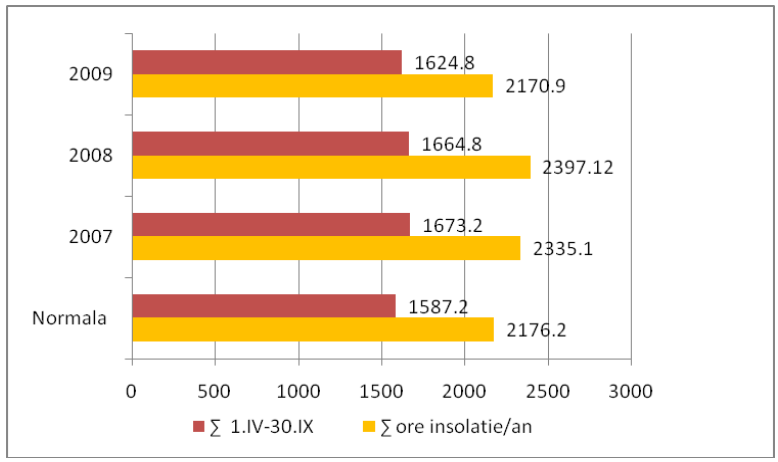

Fig. 2. Amount of insolation hours. Murfatlar 2007-2009

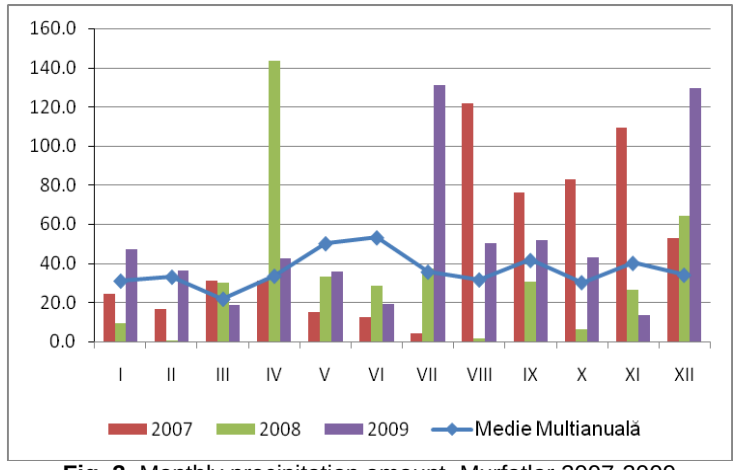

Fig. 3. Monthly precipitation amount. Murfatlar 2007-2009

As the **soil moistur**e in most months, momentary ground water provided was much lower than normal (field capacity), moisture deficit gradually increased with the depth, a maximum value registered at depth of around 80 -100 cm.

Establishing correlations between soil moisture,foliar mass and evolution of physiological processes

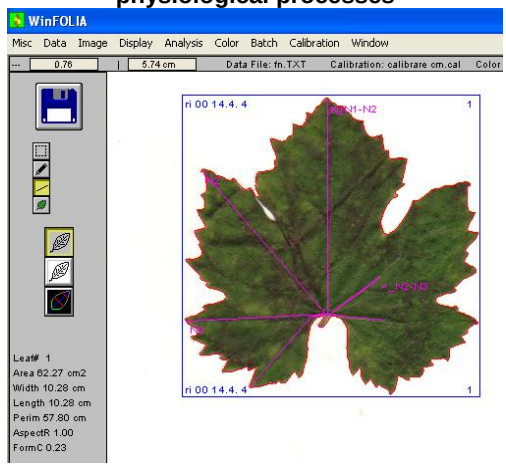

Fig. 4. Example of measurements made in variety Riesling italian with Win Folia (Banu Mărăcine)

The both studied varieties had larger leaves in 2008 and 2009, years characterized by providing a minimum of water resources in intensive growth period (May-July), lower values of leaf area were determined in 2007 when in intense growth period the water content in soil was some lower.

To get a clear picture of the influence of the distribution of water resources affecting leaf size and final length of shoots in the two vine varieties we studied calculated correlation coefficients between length of shoots and water-supply for the entire duration of the growing season and for the beginning of the growing season, when shoots are intensive growing.

Correlation coefficient value shows whether and to what extent the final size of leaf (leaf area) were influenced by moisture conditions in the period under review.

The analysis of correlations between the availability of water and leaf size at the studied varieties show the major influence of water-supply conditions in the interval of intensive growing of leaves (table 1), the period for which correlation coefficients exceeding the P theoretical is significantly distinct at variety Riesling Italian and very significant for Cabernet Sauvignon.

Table 1

Correlations between leaf size and water-supply conditions for different periods of the varieties studied (Banu Mărăcine)

Variety	Interval	Correlation coefficient – r	Signification
Riesling Italian	Vegetative period	0.589	-
	April-July	0.936	***
Cabernet Sauvignon	Vegetative period	0.420	-
	April-July	0.900	**

P 5% - 0,707 P 1%- 0,834 P 0.1% - 0.925

Dynamic key physiological processes

In the interval between beginning of ripening and full maturity were done in dynamic the determinations of stomata conductance values - an important indicator of plant water stress condition and the amount of chlorophyll (table 2). Determinations were performed on experimental variants irrigated (I) / irrigated (nI).

Tabel 2

Evolution of stomata conductance, Murfatlar 2009

Stomata conductance (mmol H2O m-2 s -1)					
	Variant	20 Aug.	27 Aug.	3 Sept.	10 Sept.
Riesling Italian	nI	189.9	143.6	131.9	163.1
	I	202.7	157.1	132.7	185.6
Cabernet Sauvignon	nI	101.7	128.8	112.1	157.1
	I	188.8	160.9	174.1	196.8
Clorophile (mycrograme/scm)					
		20 Aug.	27 Aug.	3 Sept.	10 Sept.
Riesling Italian	nI	41.15	43.1	44.3	40.41
	I	45.11	42.2	41	40.83
Cabernet Sauvignon	nI	43.56	38.9	42.5	41.6
	InS	46.36	46	47.08	44.06

It is noted an increasing of values of stomata conductance on both variants, in the situation of the irrigated variant the values are higher.

Chlorophyll content is not influenced by irrigation factor, dropping it with the grape maturation

Influence of water regime on production quality

Diversity of hydrothermal regime of the period study is reflected in changes in biochemical indices examined. Carbohydrate content in the studied varieties had the highest values, as was normal, in the year with low precipitation regime (2008), while high total acidity values were recorded in years with rich water resources during the verraison- full ripening (2007 şi 2009).

Table 3

Values of the biochemical index which characterize the potential quality for wine quality varieties studied, at the harvest

Variety / Year	Riesling Italian		Cabernet Sauvignon	
	Carbohydrates (g/l)	**Acidity (g/l H_2SO_4)**	**Carbohydrates (g/l)**	**Acidity (g/l H_2SO_4)**
BANU MARACINE				
2007	208.5	4.5	221.3	3.9
2008	214.1	4,1	232,4	3.1
2009	211.3	4.5	230.4	4.0
MURFATLAR				
2007	198	4.5	209	5.0
2008	204	4.1	218	3.8
2009	201.28	4.7	206.58	4.9

Sugars in the must are higher in 2008, when the precipitation regime ensures the proper development of physiological processes. Acidity was normal to low with the data recorded in both centres.

CONCLUSIONS

On the two varieties, it can notice a quality increase in case of variants with drip irrigation.

To ensure smooth grapes production, both qualitatively and quantitatively, during intense vegetative growth, if there is not enough precipitations is recommended to supplement the water resources by located irrigation.

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