BIOMETRIC AND ECOPHYSIOLOGICAL RESEARCH IN SOME GRAPEVINE VARIETIES GROWN IN COPOU, IAŞI AREA, DURING THE GROWING SEASON OF 2012

CERCETĂRI ECOFIZIOLOGICE ŞI BIOMETRICE LA UNELE SOIURI DE VIȚĂ DE VIE CULTIVATE ÎN ZONA COPOU, IAŞI, ÎN PERIOADA DE VEGETAȚIE A ANULUI 2012

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Abstract. *Drought and high temperatures in recent years have acted negatively on plants, disturbing their metabolism (Dry and Loveys, 1999, Ferrini et al., 1995, Jitareanu et al., 2011). Very high air temperature, relative low humidity, high temperature on the soil surface and the absence of rainfall during the growing season produce an imbalance in the water balance in the plant. Excessive sweating can dehydrate plants foliar level, close stomates and reduces gas exchange in the process of photosynthesis (Lebon et al., 2006). Size of leaf area influences vegetative growth, grape production, accumulation of sugars in the grape and other "noble" products (anthocyanins, flavor, etc.) (Burzo el al., 2002; Irimia, 2012). Since the grapevine is a major consumer of water, with a large and well-developed vegetative apparatus, the optimum soil moisture is an important limiting factor, estimating that lower moisture values are favorable to grape ripening, whereas a high value are favorable to shoots growth.*
Key words: *ecophysiological, grapevine, drought, high temperatures*

Rezumat. *Seceta şi temperaturile ridicate din ultimii ani au acționat negativ asupra plantelor, perturbând metabolismul acestora (Dry and Loveys, 1999, Ferrini et al., 1995, Jitareanu et al., 2011). Temperatura aerului foarte ridicată, umiditatea relativă a aerului scăzută, temperatura la suprafața solului ridicată şi lipsa precipitațiilor în perioada de vegetație produc un dezechilibru al bilanțului hidric în plante. Transpirația excesivă la nivel foliar poate deshidrata plantele, închide ostiolele şi diminuează schimbul de gaze în procesul de fotosinteză (Lebon et al., 2006). Mărimea suprafeței foliare influențează creşterile vegetative, producția de struguri, acumularea zaharurilor în boabe precum şi a altor produşi "nobili" (antociani, arome etc) (Burzo el al., 2002, Irimia, 2012). Având în vedere că vița de vie este un mare consumator de apă, cu un aparat vegetativ mare şi bine dezvoltat, umiditatea optimă a solului reprezintă un important factor limitativ, apreciindu-se că valorile mai mici sunt favorabile maturării boabelor, iar cele mari creşterii lăstarilor.*
Cuvinte cheie: *ecofiziologic, vita de vie, seceta, temperaturi ridicate*

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INTRODUCTION

In the early stages of vegetation, high temperature is a stronger stress factor than lack of water, with a direct and immediate effect on photosynthetic apparatus, acting through degradation of chlorophylls in antenna chlorophyll, especially chlorophyll a and fotoinhibarea of assimilation device.

Eco-physiological response of the vine was assessed by analysis of indicators of the process of photosynthesis: leaf morphogenesis (leaf is the main organ of photosynthesis) and photosynthetic pigment content (chlorophyll and flavonoids).

MATERIAL AND METHOD

As research material were studied four varieties of vine grapes: Gelu, Coarnă neagră, Moldova and Purpuriu cultivated in vineyard Centre Iasi, Farm SDE the U.Ş.A.M.V. Iaşi, the climatic conditions of the growing season of 2012. Temperature and rainfall were recorded every ten days in the spring-autumn season, and the temperatures and average monthly precipitation amount were reported to the average annual values.

The growth of plants was determined by biometric measurements as: leaf area per shoot and leaf area per grapevine plant.

Leaf morphogenesis was assessed by determining in dynamics of the leaf area on the sterile and fertile shoots, measurements were made with apparatus for measuring leaf area AM300, portable instrument, compact, non-destructive measurement method (FJ Montero, 2000).

Foliar pigment content was assessed in the field and determined by CCM200 device plus a portable tool for the determination of chlorophyll content that reveals the chlorophyll content expressed in CCI (Chlorophyll Content Index), measurements being non-destructive and fast.

Measurements were performed in dynamics during the growing season, focused on the main phenophases: in June - intensive shoot growth and flowering, in July - the first stage of fruit growth, in August - phenophase of firstfruits.

RESULTS AND DISCUSSIONS

Changing climate conditions in Copou area, Iaşi in 2012 was estimated by processing and analysis of monthly temperature and rainfall amount compared to the annual average of the monthly temperature.

From the thermal point of view it was found that 2012 was a warmer year than normal, the mean air temperatures Moldova being 0.6 to 5.1^{0}C higher than normal climatological values (Tab. 1).

Table 1

Variation of the monthly average temperatures (ºC) in 2012 compared with the average of multiannual monthly temperature

	I	II	II	IV	V	VI	VII	VIII	IX	X
monthly average	-2.5	-9.5	4.0	13.0	18.2	23.3	26.3	23.1	18.9	12.0
normal	-3,1	-1,2	3,4	10,4	16,3	19,7	21,2	20,5	15,8	10,1
deviation	+0,6	-8,3	+0,6	+2,6	+1,9	+3,2	+5,1	+2,6	+3.1	+1.9

Monthly average temperatures in 2012 had a normal outcome for the geographical location of the study area, with a maximum in July and a minimum in February (Fig. 1). In February and December the monthly average temperatures were 2.9 (December) to 8.3 0C (February) lower than normal.

In terms of precipitation, it was recorded in 2012 poor values specially at the weather stations in the northern half of Moldova.

Table 2

Variation of the monthly amount of precipitation (mm) in 2012 compared with the average of multiannual precipitation amount

	I	II	II	IV	V	VI	VII	VIII	IX	X
monthly amount	12.0	61.0	19.4	56.2	98.2	16.3	22.2	32.1	50.1	34.0
normal	30,5	28,4	32,8	49,1	59,1	88,7	82,8	56,9	52,0	32,8
deviation	-18,5	+32,6	-13,4	+7,1	+39,1	-72,4	-60,6	-24,8	-1,9	+1,2

Regarding the monthly rainfall can be said that, except February, April, May, October and December in all other months they were poor (Table 2). It notes in particular the summer months with a deficit of 72.4 mm and 24.8 mm in June to August. In Copou Iasi, seasonal precipitation amounts are distributed unevenly both within a year and from year to year, changes in precipitation amounts profile share multiannual showing increases and decreases repeated milder or more pronounced (Jităreanu 2011, Marta, 2012).

In February, April and May 2012 the rainfalls recorded have exceeded the multiannual average values (Tab. 2), which in the spring of 2012 contributed to the achievement of an optimum soil moisture for the plants vine. The dryness of the atmosphere was most eloquently expressed by the relative humidity, distribution and evolution characteristics of this element value while presenting meteorological real practical importance.

Annual regime relative humidity ranged between 53% in July and 92% in December, the specific values continental climate regions, indicating the close correlation between this element and temperature climate. Minimum values were recorded in the summer months, June to August, between 69.4-70.6% and the peak in the winter months, up from 92% in December.

Biometric and physiological measurements in grapevine. The increasing of the vine shoots is dependent of the increasing of leaf area, the leaves exporting carbohydrates synthesized by the adult leaves the shoot tip, a process favored by increasing temperature, insolation and solar radiation. The growth rate is achieved in the most intense period of flowering, after flowering carbohydrates products geared towards grape leaves.

Average *shoot leaf area analysis* was performed to measure the leaf surface AM300 device, the device is made of a high-resolution scanner and scanning plate and the measurements can be made on the plate or on a flat surface, high resolution (0.065 mm^2) allowing the accurate measurement and the lower leaves.

During the growing season of 2012 was analyzed both average leaf area per shoot and average leaf area per vine, both having the same behavior.

There is a progressive increase in leaf area from one to another phenophase by Moldova and Purpuriu varieties, with a minimum at flowering (180 and 103.7 dm^2 in Moldova and Purpuriu) and a maximum accumulated in the ripening phenophase (397.8 208.3 dm^2 in Moldova and the Purpuriu), these results are consistent with characteristics of the variety, Moldova having large leaves while Purpuriu is a variety with medium leaves (Târdea and Rotaru, 2003). The leaf area at the Coarnă neagră variety had curve uniapicale behavior with a maximum grain growth phenophase and lower values at flowering and ripening (Fig. 1, Fig. 2).

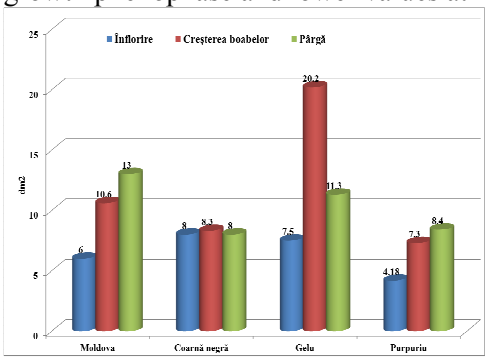

Fig. 1 - Dynamics of average shoot leaf area

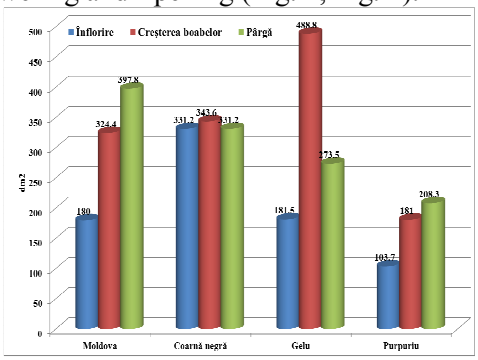

Fig. 2 - Average leaf area dynamics on hub

A different behavior had Gelu variety, with a maximum grain growth phenophase, due to both the large number of shoots per vine and leaf area, one of the characters ampelographic the large leaf area (17-18 cm^2) (Târdea and Rotaru, 2003). The ripening phenophase leaf area of this variety was much lower, Gelu with a maturity period during this time and the accumulation of sugars, anthocyanins and flavors in grapes not allowing the development of the leaves.

The analysis of the leaf area was stopped in the ripening phenophase because in this period the vegetative development of the grapevine has the maximum level.

Eco-physiological reaction of the vine varieties studied, according to global warming-induced climatic conditions, was estimated based on the dynamics of chlorophyll content as an indicator of the processes of photosynthesis and plant resistance to stress conditions.

The foliar pigment content was assessed by field measurements performed with CCM200 plus (portable instrument for the determination of chlorophyll), which revealed chlorophyll content expressed in CCI (Chlorophyll Content Index).

Dynamic analysis of the studied varieties showed the highest content of chlorophyll (CCI) in Coarnă neagră variety, throughout the growing season (Fig. 3) with a maximum grain growth phenophases and maturation grape (18.3 or 18.2). In other phenophases (flowering and ripening) chlorophyll content was low, but higher in value compared with the other varieties analyzed.

Gelu, the earliest variety analyzed as follows by Coarnă neagră as chlorophyll content, with maximum grain growth phenophase and firstfruits (15.1 CCI) and lower values at flowering and ripening of grapes (Fig. 3).

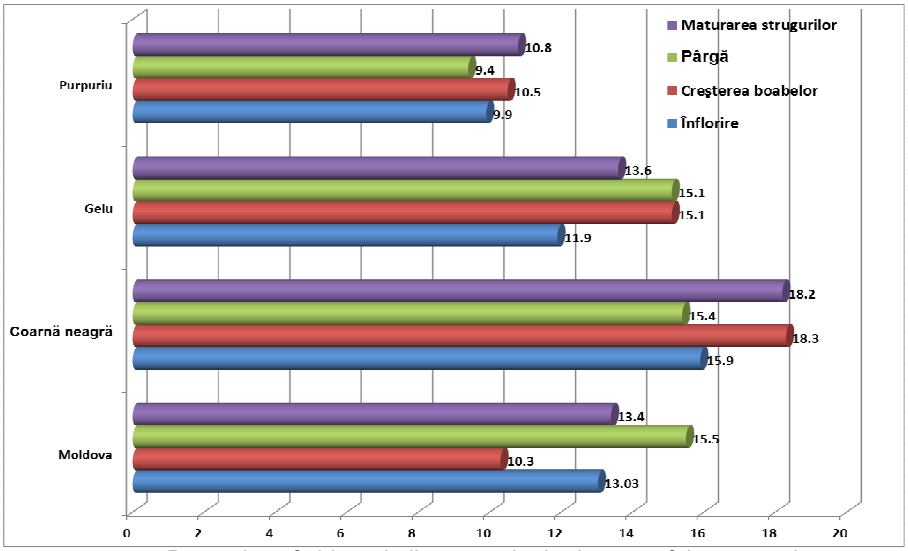

Fig. 3 - Dynamics of chlorophyll content in the leaves of the grapevine

At the variety Moldova the highest chlorophyll content was obtained in phenophase of firstfruits, similar values at flowering and ripening grapes and a much lower at the increase of the grains.

Of all the varieties analyzed, the lowest chlorophyll content was measured at Purpuriu in all phenophases analyzed. The climatic conditions of 2012 in terms of the variety Purpuriu chlorophyll content was found to be the most sensitive to water stress increased, behavior evidenced by decreased chlorophyll content.

In 2012, the content of chlorophyll in leaves of vine growing season varied for nearly the flowering phenophase a higher content of chlorophyll (CCI) had late period of ripening varieties: Moldova and Coarnă neagră.

A high content of chlorophyll was observed in the growth phenophase of grain varieties Gelu and Coarnă, which shows an intense photosynthetic activity of these varieties.

Totally different behaviors of varieties of vine were a result of the interaction between the characters of varieties ampelographic degree of precocity and climatic conditions of the growing season, characterized by soil and atmospheric drought stressed.

CONCLUSIONS

1. Temperature and water regime of 2012 was characterized by soil and air drought. From the thermal point of view it was found that 2012 was a warmer year than normal, average air temperatures were 0.6 to 5.1 °C higher than normal

climatological values. Rainfall was unevenly distributed, it notes in particular the summer months with a deficit of between 72.4 mm and 24.8 mm in June to August.

2. The leaf area at the analyzed varieties varied between phenophase, varietal characteristics and conditions of climatic stress. We noted in particular varieties of Moldova and Coarnă neagră by elevated surfaces on both shoot and per vine in all phenophases and lowest in Purpuriu.

3. Dynamic analysis of the studied varieties showed the highest content of chlorophyll (CCI) in Coarnă neagră variety, throughout the growing season, with a maximum growth phenophases grain and grape maturation (18.3 18.2) and lowest in Purpuriu, the totally different behaviors of the vine varieties were a result of the interaction between the characters of varieties ampelographic degree of precocity and climatic conditions of the growing season.

***Acknowledgments**: "This work was cofinanced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/I.89/1.5/S62371 ,,Postdoctoral Schole in Agriculture and Veterinary Medicine area"*

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