

# RESEARCHES ON THE ECO-PHYSIOLOGICAL REACTION IN GRAPE VINE IN THE 2007 SUMMER

## CERCETĂRI PRIVIND REACȚIA ECO-FIZIOLOGICĂ A VIȚEI DE VIE ÎN VARA ANULUI 2007

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**Abstract.** *The 2007 summer was characterized by very high temperatures in Iassy county, that can modify the eco-physiological reaction in grape vine. The work studies the dynamics of the photosynthetic and flavonoid pigment content in leaves in some vine grape cvs: Feteasca neagra, Feteasca alba, Feteasca regala and Cabernet Sauvignon in order to adapt them to the global warming.*

**Rezumat.** *Vara anului 2007 a fost caracterizată prin temperaturi foarte înalte în zona Iași, care pot modifica reacția eco-fiziologică la vița de vie. Lucrarea studiază dinamica pigmentilor fotosintetici și flavonoizi în frunze la unele soiuri de viță de vie: Fetească neagră, Fetească albă, Fetească regală și Cabernet Sauvignon, în scopul adaptării acestora la încălzirea globală.*

At present, the Earth planet is confronted with the global warming phenomenon, that determines the appearance of extreme climatic conditions (2). The variability of the climatic conditions produces catastrophal ecological consequences, but negatively influences the normal vegetation cycle of cultivated plants (1). Different specialists show that extreme climatic conditions affect grape-vine, determining the movement of this culture to the colder zones, but the decrease of the wine quality, too (3,4). There have been elaborated principles and technological procedures for the consequence decreasing the climatic modifications on the grape-vine plantations (7). Cultivar choice and acclimation have an important role in the war against the dryness (5).

The work studied eco-physiological reaction of some grape-vine cvs. against the climatic conditions induced by global warming in the Viticol Center Iassy, appreciated by the dynamics of the pigment content in leaves, like indicators of the photosynthesis and plant resistance against stress conditions.

### MATERIAL AND METHODS

The experiences were made with four grape-vine cvs.: Feteasca neagra, Feteasca alba, Feteasca regala - autochtone cvs. and Cabernet Sauvignon - alochtone cv., cultivated in the Viticol Center Iassy, in the Didactical - Experimental Farm of the University of Agriculture and Veterinary Medicine Iassy, in climatic conditions of 2007 spring-summer seasons. The temperature and precipitations were registered

decadally, but the mean values were referred to the mean values of many years. The pigment analysis in leaves were made in June and July - during grape growth and at the beginning of September - during grape ripening, on the leave under cluster in fertile shoot and on the leave of the same level in sterile shoot. The pigment content in leaves was analysed spectrophotometrically, being appreciated by the capacity of light absorption in acetone pigment extract (1%) in visible (400-700 nm) and UV-A spectrum (370 nm).

## RESULTS AND DISCUSSIONS

The analysis of the climatic conditions of temperature and precipitations (tab. 1 and 2) reveals that the 2007 spring and summer had temperatures progressively increasing from March to August, with values higher than the mean value for many years with +4,6<sup>0</sup>C in July. The monthly precipitations registered a deficit in comparison with the mean value for many years, of - 44,2 mm in July and - 63,4 mm in June. These values created conditions of thermic and hydric stress for grape-vine plants.

**Table 1**

**Values of temperature in 2007 (°C)**

	March	April	May	June	July	August
Minimum	-2.4	1.0	2.8	12.6	11.5	11.0
Maximum	21.8	25.2	33.6	37.4	40.1	38.1
Mean monthly temperature	7.5	11.0	18.6	23.2	25.4	22.4
Mean of 1971-2000 temperature	3.5	10.3	16.1	19.5	20.8	20.0
<b>Difference</b>	<b>+4.0</b>	<b>+0.7</b>	<b>+2.5</b>	<b>+3.7</b>	<b>+4.6</b>	<b>+2.4</b>

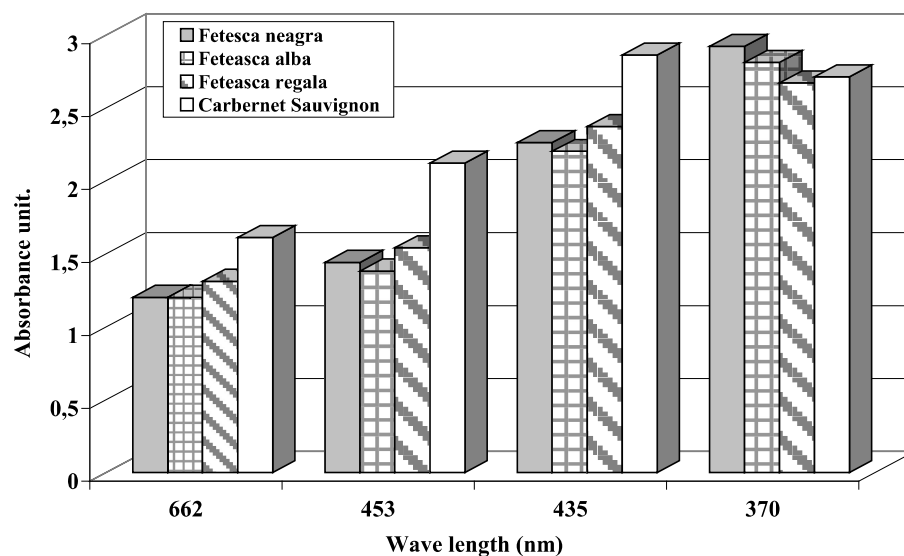
**Table 2**

**Values of precipitations in 2007 (mm)**

	March	April	May	June	July	August
Monthly precipitations	33.4	30.6	35.5	34.2	37.6	79.6
Mean precipitations for many years	30.7	50.7	62.7	97.6	81.8	58.0
<b>Difference</b>	<b>+2.7</b>	<b>-20.1</b>	<b>-27.2</b>	<b>-64.3</b>	<b>-44.2</b>	<b>+21.6</b>

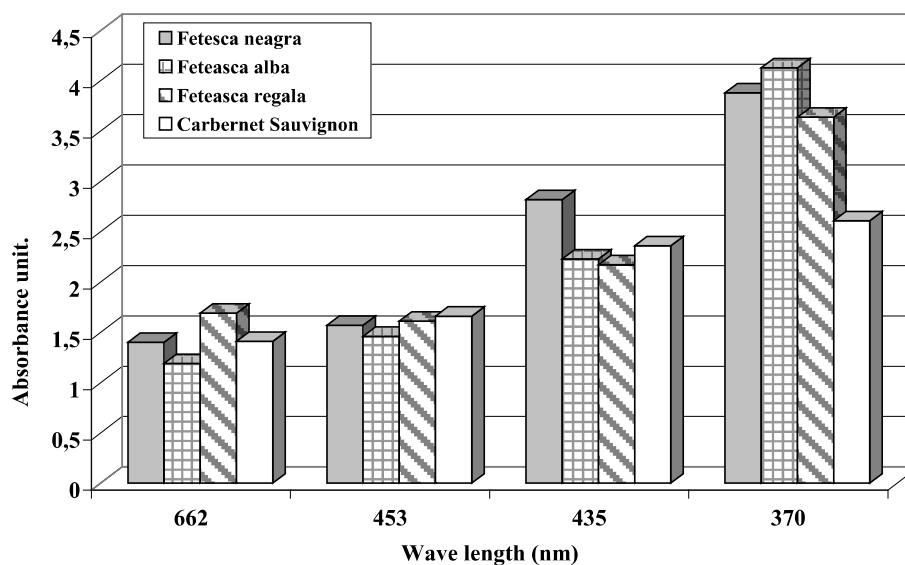
The eco-physiological reaction of the four grape-vine cvs was appreciated by pigment content (photosynthetic and flavonoid) in leaves. Chlorophyll *a* 683 can express photosynthesis intensity in reaction center, but chlorophyll *a* 435 and chlorophyll *b* 453 can express light absorption capacity in photosynthetic systems; flavonoid pigments that absorb in UV-A (370 nm) can express plant reaction against different stress factors (6).

Mean pigment content analysis in leaves, appreciated by the capacity of light absorption of acetone extract (1%) in visible and UV-A spectrums reveals that in June, the allochthon cv. Cabernet Sauvignon has a photosynthesis intensity and a light absorption capacity higher than the studied autochthon cvs. (fig. 1).

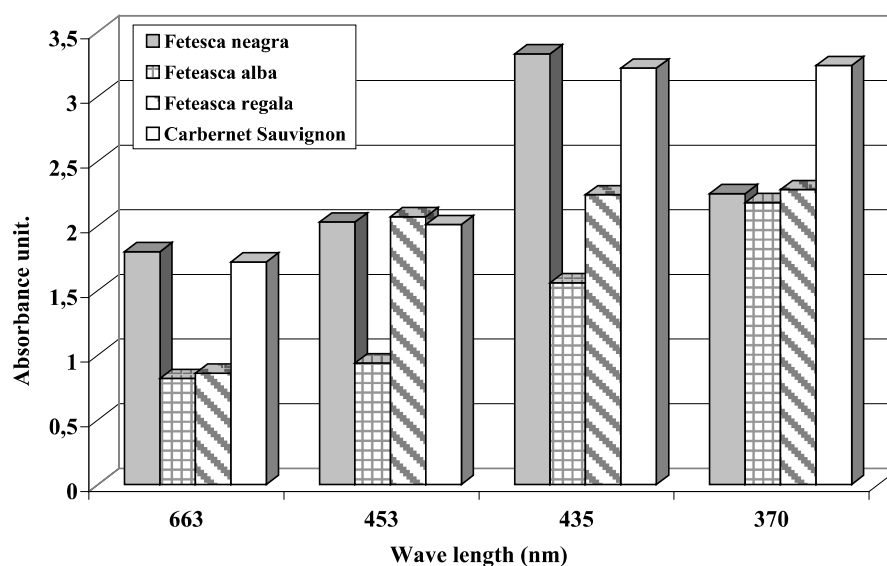


**Fig. 1** - Mean pigment content in leaves, appreciated by light absorbtion capacity of acetone extract (1%) in visible and UV-A spectrums, in June

In July it is revealed the increasing capacity of the autochtone cvs. to react against climatic stress conditions, expressed by the very high content of the flavonoid pigments (fig. 2). In September, the very high values of photosynthesis intensity and light absorption in Cabernet Sauvignon cv. and autochtone Feteasca neagra cv. are expressed (fig. 3).

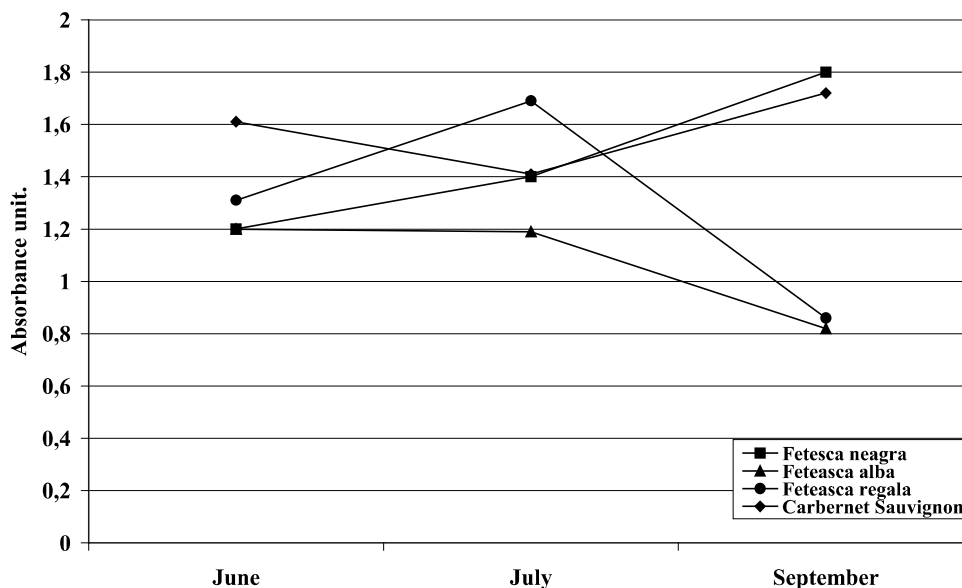


**Fig. 2** - Mean pigment content in leaves, appreciated by light absorbtion capacity of acetone extract (1%) in visible and UV-A spectrums, in July



**Fig. 3** - Mean pigment content in leaves, appreciated by light absorption capacity of acetone extract (1%) in visible and UV-A spectrums, in September

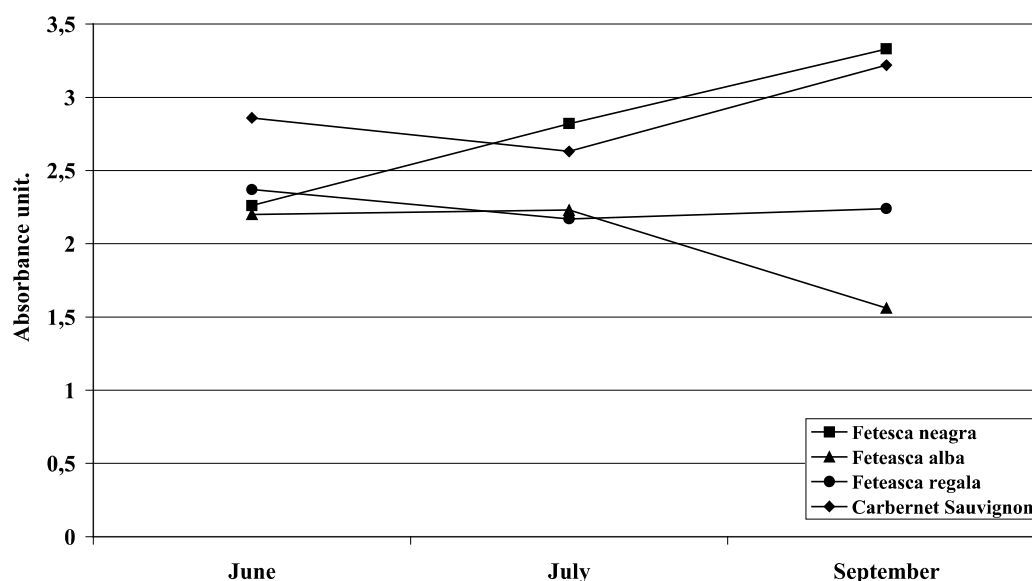
The dynamics of the chlorophyll content in the four cvs. ones presents high values in Cabernet Sauvignon and Feteasca neagra cvs. during grape ripening (fig. 4 and 5), but the flavonoid pigment content presents high values in July in autochtone cvs. and in September in Cabernet Sauvignon cv. (fig. 6).



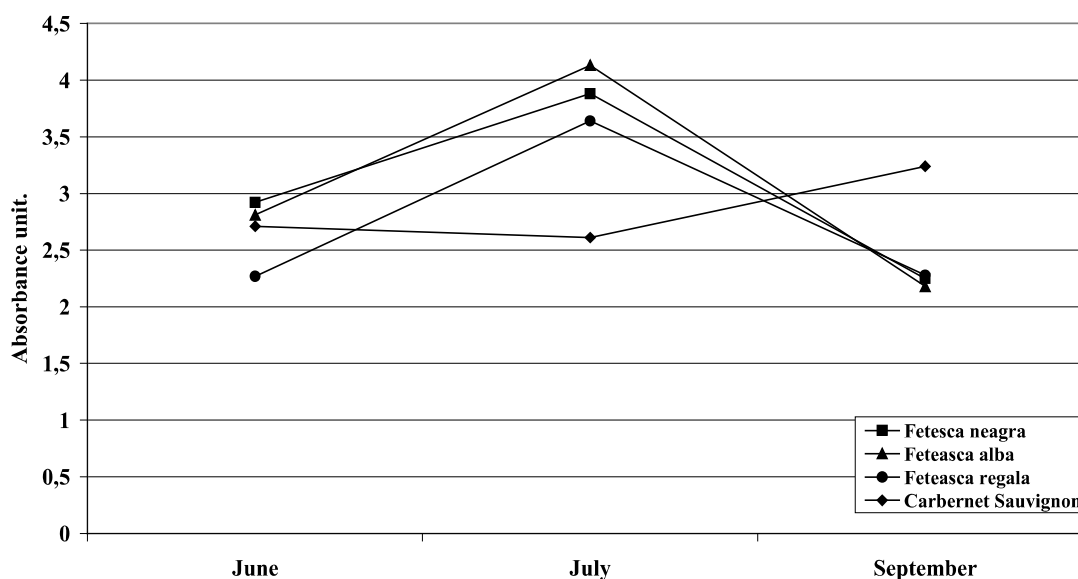
**Fig. 4** - Dynamics of the chlorophyll a 663 in leaves of the grape-vine cvs.

The results reveal that the four grape-vine cvs. present complex physiological mechanisms that assure the reaction to the environmental climatic conditions. The changes of the climatic conditions, induced by global warming need to study these mechanisms in order to cultivation the most adapted cvs. The

Feteasca Neagra cv. present the best photosynthesis and resistance characteristics in the conditions of climate warming in Iassy zone.



**Fig. 5** - Dynamics of the chlorophyll a 435 in leaves of the grape-vine cvs.



**Fig. 6** - Dynamics of the flavonoid pigments in leaves of the grape-vine cvs.

Comparative analysis of the pigment content in leaves of the sterile and fertile shoots reveals that in June and July, photosynthetic pigment content in the autochtone cvs. generally, is higher in fertile shoot leaves than in sterile ones, but Cabernet Sauvignon cv. has an inverse behaviour. These results confirm the role of the under cluster leaf, analysed in our study, in the grape and cluster growth in grape-vine, a behaviour manifested in the autochtone cvs., but also reveals other mechanisms, dictated by the different climatic conditions, in Cabernet

Sauvignon cv. In September, the higher pigment content in fertile shoot leaves is maintained only in Feteasca neagra cv., but in all other cvs. the pigment content generally, is higher in the sterile shoot leaves .

## CONCLUSIONS

1. Climatic condition in the 2007 spring and summer are characterized by a thermic and hydric stress for grape-vine plant.

2. The physiological reaction in different cvs. is dictated by the ecological conditions from the origine zone.

3. Between autochtone cvs., Feteasca neagra cv. is the most adapted in stress conditions induced by the global warming.

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