PHOTOSINTESYS AND RESPIRATION INTENSITY VARIATION OF FETEASCA NEAGRA VARIETY UNDER THE INFLUENCE OF APPLYING A SET OF AGROPHYTOTECHNICAL MEASURES

VARIAȚIA INTENSITĂȚII FOTOSINTEZEI ŞI A RESPIRAȚIEI LA SOIUL FETEASCĂ NEAGRĂ, SUB INFLUENȚA APLICĂRII UNUI COMPLEX DE MĂSURI AGROFITOTEHNICE

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Abstract. *The introduction of a new variety in a vineyard requires detailed studies regarding its physiological behavior to vineyard conditions. Through photosynthesis, carbon dioxide from the atmosphere is fixed by green plants (with chlorophyll) in the presence of sunlight, with the elimination of oxygen and formation of organic compounds (carbohydrates, lipids, proteins) which are very varied, hence the importance of tracking the parameters registerered by it. Measurements were made on respiration and photosynthesis intensity for each variant of experience mounted in the field.The interpretation of the values found, indicates the best solution recommended to the application of agrophytotechnical measures.*
Key words: intensity, respiration, photosynthesis

Rezumat. *Introducerea unui soi nou intr-o podgorie, necesită studii amănuntite in ceea ce priveste comportarea acestuia din punct de vedere fiziologic la conditiile podgoriei. Prin fotosinteză, se fixează dioxidul de carbon din atmosferă de către plantele verzi (cu clorofilă), în prezența radiațiilor solare, cu eliminare de oxigen şi formare de compuşi organici (glucide, lipide, proteine) foarte variați, de unde si importanta urmăririi parametrilor inregistrați de aceasta. S-au efectuat măsurători ale intensitatii respirației şi a fotosintezei pentru fiecare variantă din experiența montata in câmp. Interpretarea valorilor găsite, indică varianta optimă care se recomandă la aplicarea măsurilor agrofitotehnice.*
Cuvinte cheie: intensitate, respirație, fotosinteză

INTRODUCTION

It is known that the final productivity of plants is largely determined by the overall activity of all processes, including a role which belongs to photosynthesis and growth (Seiculescu, 1996).

Growth and photosynthesis determine processes of adaptation to the conditions of the external environment during their various stages. With the end of intensive growth of shoots and the crossing of plants in profoun sleep, some organic compounds produced as a result of the photosynthetic apparatus activity is deposited in tissues of the outgrowth string, the process becoming

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even more pronounced after the end of the growth and of the harvest of the grapes during the intensive preparation and training of the plants to tolerante winter cold (Dobrei et al., 2005).

The vineyards main products of photosynthesis are sugars (sucrose, glucose, fructose and raffinose). In smaller quantities of organic acids are formed (oxalic acid, tartaric acid, citric acid, malic acid, succinic acid) and amino acids (cystine, histidine, alanine, asparagic acid, proline, methionine, valine, lysine etc.), (Milică et al., 1982).

The quality of the grapes at harvest is influenced by the number of days with heatstroke, the foliage surface, and thus the intensity of respiration and photosynthesis (IOlteanu et al., 2004).

This paper aims to clarify the relationship between the differential application of the works and operations in green and the intensity of the respiration and photosynthesis.

MATERIAL AND METHOD

The research was conducted on the farm No.4 belonging to SC Cotnari SA, on a plantation of Feteasca neagra grafted on the SO4 rootstock.

The installation of the experiment in the field took place between 24 rows in 8 versions including a witness version, arranged in three repetitions (fig. 1). Each variant comprises a number of 25 stocks that are set depending on the type of cutting and loading the outgrowth, watching both versions in parallel at the drill cutting, variants denoted by "a" and the ”Guyot” cutting, noted in this case with "b".

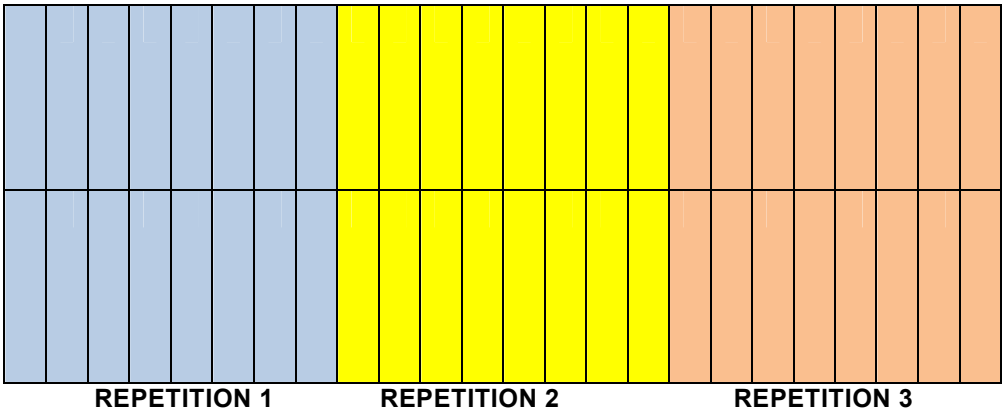

Fig.1 - The placement of the experiment in the field

Variants denoted by V0 are witness variants that in addition to outgrowing cuts fruition on these occasions had never been interfered with any operation on the entire growing season.

At variants denoted by V 1 has been occurred only with weeding of the shoots in a 30%, the variants V 2 and V 3 intervening with shoots pinched works, that leafless.

At variants V 4, V 5 and V 6 were have been combined works such as: weeding and pinching, weeding and defoliation, that pinched and defoliation.

At the latter, V 7 there was, they applied all the work, namely besides outgrowing cuts were made following works and operations: weeding, pinching and leafless.

The method used to determine the intensity of photosynthesis and respiration is non destructive (the leaves are not detached from the plant).

For this we used a foliar gas analyzer CIRAS-2 which allowed the simultaneous determination of multiple physiological and environmental indicators:

- the rate of photosynthesis expressed in μmolm-2s-1;
- stomatitis conductance and transpiration rate expressed in mmolm-2s-1;
- the concentration of substomatal ppm CO_2;
- water vapor pressure deficit in millibars;
- photosynthetic active radiation;
- expressed also in μmolm-2s-1;
- ambient temperature and leaf temperature in °C;
- evapotranspiration in mmolm-2s-1, etc.

RESULTS AND DISCUSSION

At the basis of the elaboration of the synthesis products from vineyard, there is photosynthesis, the largest share of reserve substances being owned by sugars (in the grape dominates the glucose and fructose, and in the string the starch).

Under normal conditions, the metabolic processes of vines take place in favor for the accumulation of vegetable matter, which represents synthesized biomass, of which only a certain part of the product is a useful viticultural production (the grapes or the vines for propagation).

The results were complex, depending on the operation in vegetation applied to the Feteasca neagra variety.

From the analysis of tabel 1 is shown that the highest values of photosynthesis rates were recorded in variants 1 or 2, where it has been occurred with only 30% of shoots weeding and picking sprouts.

Therefore, the leaf area not being allowed to be reduced allowed the plant to achieve a much higher value of photosynthesis rate than in versions 5 or 7. The ones being applied with the whole complex of works applied in green (variant 7), also had the lowest rate of photosynthesis recorded.

Regarding to the transpiration rate, the lowest values were recorded also in version 7, where due to repeated interventions over the foliar apparatus resulted the greatest reduction on the surface.

From there it can be concluded that there is a positive correlation between leaf area and the high rates of photosynthesis, recorded and the low transpiration rates.

Table 1

The main physiological parameters registered for Feteasca neagra variety, after the application works and operations in green

	PAR	A/E	ci	E	gs	A
V0	9.21	0.47	3.39	0.17	0.02	0.08
V1	8.549585	0.467682	3.132655	0.158186	0.021328856	0.073981
V2	8.766344	0.468592	3.203571	0.161797	0.021887852	0.075817
V3	8.144009	0.467461	2.963697	0.149816	0.020346418	0.070033
V4	8.347145	0.467974	3.028194	0.15313	0.020870985	0.071661
V5	7.880643	0.467588	2.870396	0.145442	0.019683507	0.068007
V6	8.216021	0.469771	3.010483	0.151927	0.020509146	0.071371
V7	7.912541	0.470323	2.894324	0.146077	0.019762182	0.068701

Legend:

PAR = photosynthetic active radiation

A / E = rate of photosynthesis (micromol m-2 s-1) / transpiration rate (mmol m-2 s-1)

ci = substomatal CO2 (vol / mass)

E = transpiration rate (mmol m-2 s-1)

gs = stomatitis conductivity of water (mol-2 s-1)

A = photosynthesis rate (micromol m-2 s-1)

Regarding the photosynthesis rate, as it is shown in Figure 2, the large leaf surface favors the photosynthesis rate, which implicitly leads to increased accumulation of organic matter in the plant. These accumulations can be in the form of carbohydrates, which have importance for the quality of the grapes, by increasing the sugar content, or starch content in string, which improves the resistance of the varieties to freezing in winter.

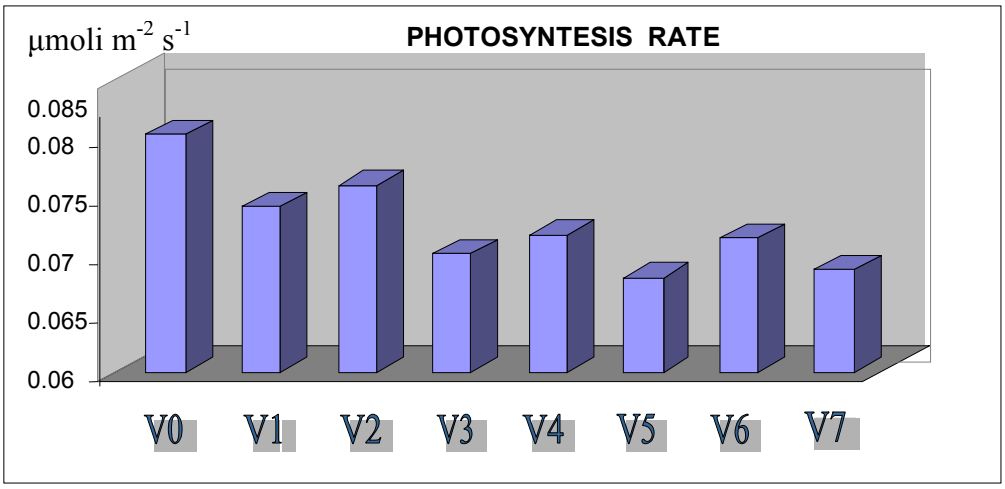

Fig. 2 - The rate of photosynthesis

The interpretation of results must take into account the relationship between photosynthetic rate and transpiration rate, shown in Figure 3, because here you can see the maximum efficiency of the works in vegetation period and the operations carried out.

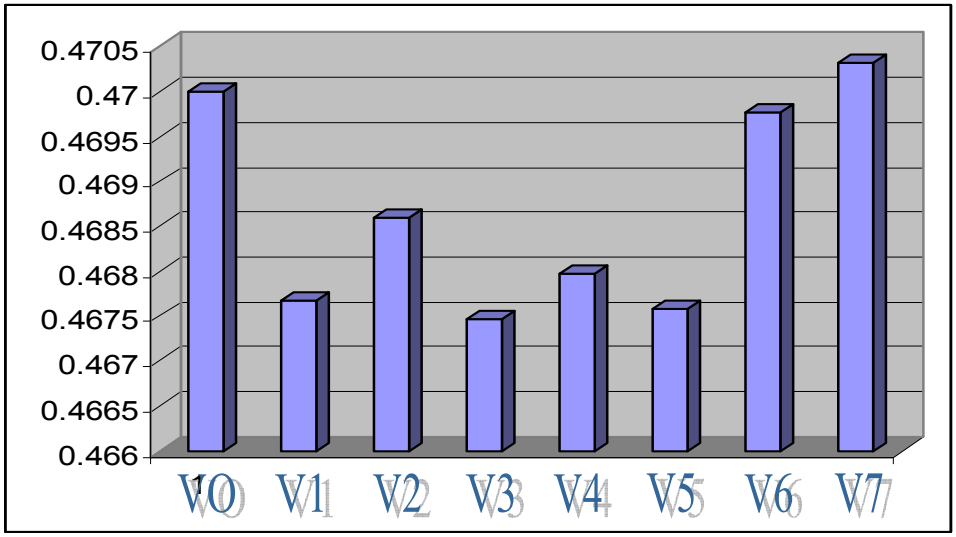

Fig. 3 - Photosynthesis rate (micromol m-2 s-1) / transpiration rate (mmol m-2 s-1)

Here you can see, that although on the variant V7 were applied works of weeding, pinching and defoliation, in the consequence, the foliar surface was drastically reduced, the ratio between photosynthesis and the transpiration rate is in favor of the firstone. This probably explains the fact that with the decreasing of the leaf device, there is a strongly reduced transpiration rate, which is favorable to the accumulation of nutrients.

CONCLUSIONS

1.There are being revealed correlations between the existing leaf area on the block and the intensity of the photosynthesis and of the respiration after the application of the works and operations in the vegetation period.

2. The highest photosynthesis rate was recorded for the V2 variant, the vegetation operations were confined only to pinching.

3.The lowest transpiration rate was recorded for the V7 variant, which had the smallest leaf surfaces, due to the application of weeding, picking and defoliation.

4.The best choices proved to be V6 and V7, as they have the highest values of the ratio of photosynthesis and transpiration rates.

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