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**THE INFLUENCE OF THE HYDRIC
DEFICIT REGIME ON THE
BIOPRODUCTIVE PARAMETERS OF
GRAPEVINE**

(abstract)

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ABSTRACT

Grapevine cultivation on certain area with superior productive results requires the continuous appreciation of the ecological favourableness of the space used for this purpose, as well as the identification and application of the most appropriate counter measures against variable factors within the system.

Given the fact that counterattack possibilities against climatic changes and against the effect of hydric deficient periods are limited, in order to reduce the major negative result on viticultural production, research studies monitoring grapevine reactions to water deficit are required, with view to finding methods to stimulate the physiologo-biochemical mechanism increasing the tolerance of plants to water deficit.

Under this context, in accordance with the research topic proposed, the **observations and determinations** were focused on:

- ⇒ Monitoring climatic factors (mostly hydric supply) for the evaluation of the favourableness of the study years (by using individual, binary and trinary climatic indicators) and the classification of the years according to this criterion.
- ⇒ Studying the influence of the varied hydric supply regime characteristic to the study years on bioproductive parameters.
- ⇒ The effect of watering on bioproductive parameters during years with suboptimal hydric regime.

The effect of suboptimal humidity conditions on the studied varieties was evaluated through the analysis of the following indicators:

- ⇒ Biological (leaf and shoot growing, bud fertility, grape growing).
- ⇒ Physiological (the intensity of transpiration and photosynthesis, stomatal conductance, sapflow velocity).
- ⇒ Biochemical (change of the content of sugar, organic acids, anthocyanins).

In order to reach the targets, two experiences were organised, as follows:

Experience 1 was focused on the influence of the hydric deficit regime on bioproductive parameters and determinations were made for Feteasca alba, Riesling italian, Sauvignon, Fetească neagră, Cabernet Sauvignon and Merlot varieties, during 1997-2003.

Experience 2 was concentrated on the influence of completing the hydric deficit regime by localised watering on bioproductive parameters. The experience was organised during the year 2000, which was a year with high water deficit during the vegetation period, in case of Riesling italian and Merlot varieties.

The classification of the study years by using climatic indicators places Banu Mărăcine viticultural centre in the category of the areas benefiting from wet climate with very low water deficit during active vegetation. During the years of experiments, one should point out the year 2003, a sub-wet year, with moderate hydric deficit over summer and the year 2000, semi-arid, with high water deficit during vegetation period.

Every variety interacted with the environment conditions, expressing their productive potential in a specific way. The diversity of the hydric supply water regime during the research period was found in the variations of the biochemical and productive indexes studied, as follows:

- During the years 2000, 2002 and 2003, the hydric deficit regime determined strongly and distinguishably significant reductions of the leaf surface; more severe reductions of the foliar surface were recorded in case of Riesling italian, Cabernet Sauvignon and Merlot varieties, fact that may indicate their higher sensitivity to water suboptimal conditions.
- The severe hydric deficit determined in 2000 the reduction of the shoot length compared to the years with normal hydric regime by 37.7% in Riesling italian, 42.4 % in Sauvignon, 40.8 % in Fetească albă, 38.8 % in Fetească neagră, 45.7 % in Merlot and 41.8 % in Cabernet Sauvignon. The reduction of the shoot size as result of the hydric deficit during the intense shoot growth could not be compensated by further increases following the favourable hydric regime of July and August.
- The suboptimal hydric regime specific to the year 2000 determined a significant fertility reduction reflected in the low values of the relative fertility coefficient recorded in 2001, namely 0.67 in Riesling Italian, 0.94 in Sauvignon, 0.48 in Fetească albă, 0.42 in Fetească neagră; 0.65 in Merlot and 1.2 in Cabernet Sauvignon;
- As result of the varied conditions of hydric supply, the weight of grapes during harvesting time showed higher variations in case of Riesling italian (44.8 %), Cabernet Sauvignon (34.29%) and Merlot (31.8%).
- Amongst the studied white wine varieties, in case of Sauvignon, higher values of transpiration were recorded in all phenophases under study, followed by Feteasca albă and Riesling italian varieties. The small differences existing between the intensity of transpiration of red wine varieties do not allow a certain classification of varieties ; nevertheless, higher values of transpiration were noticed in case of Merlot and Cabernet Sauvignon under conditions of water deficit,

while Fetească neagră variety showed higher values during several determinations under favourable conditions.

- The photosynthesis process is less intense during blooming time, it then passes to the intense growth phenophase, it slightly goes down during grape ripening and then significantly drops at maturity. In case of white grape varieties, higher values of photosynthesis, both under conditions of optimal hydric supply and suboptimal humidity, were recorded in Sauvignon, followed by Fetească albă and Riesling italian. In case of black grape varieties, under conditions of favourable vegetation, photosynthesis was stronger in Fetească neagră, and under suboptimal humidity conditions, in Merlot and Cabernet Sauvignon.
- The regressions between the transpiration intensity and the stomatal conductance shows a good correlation between the two factors to the limit of approximately 34 °C, up to which, besides the reduction of the stomatal conductance, a proportional drop of the photosynthesis intensity also takes place. Between 34 - 38 °C, the conductance drops more than transpiration, which maintains itself at higher levels. For temperatures between 38 to 41 °C, the variation of the two factors under study goes in tandem, big differences being noticed between determinations (significant ups and downs).
- The moderate hydric deficit (2003) has positive effects on the quality of red wine grapes, as it determines the accumulation of a large quantity of anthocyanins; under conditions of high water deficit, characteristic to the year 2000, the content of anthocyanins dropped, as result of the inhibition of the biosynthesis process due to conditions of suboptimal humidity.
- The variation amplitude of the production level determined by different levels of hydric supply, specific to experimenting years, was 32.5% in Riesling italian, 34.5 % in Fetească albă, 39.65 % in

Sauvignon, 30.3 % in Cabernet Sauvignon, 37.10% in Merlot and 32.8 % in Fetească neagră.

- By analysing the variation amplitude of the sugar content in the six varieties under study, higher values were recorded in Riesling and Sauvignon, some of the quality white wine varieties, and in case of Merlot, one of the quality red wine varieties.
- In what concerns the acidity variation as result of the suboptimal humidity conditions, higher values and lower amplitude were noticed in case of quality red wine varieties, compared to quality white wine varieties. Amongst red wine varieties, Feteasca neagră was the only variety to have known a more significant drop of acidity during years with water deficit, fact which once again confirms the favourableness of the viticultural area where experiments were conducted for producing superior red wines.

The determinations made during the experience in Riesling italian and Merlot varieties showed the favourable effect of watering on vegetative growths during years with high water deficit. The analysis of the differences recorded in the variants where watering was applied, compared to the witness variant, indicates significant increases of the leaf surface and shoot length in case of variant R_{i1} and M_{i1} respectively, and distinctively significant increases in case of the others. The diameter of the grapes went up significantly in case of two-watering variants and it increased distinctively significant in case of three-watering variants.

A better hydric supply as result of watering determined stronger intensity of photosynthesis and transpiration processes. Yet, in case of variant R_{i1} with only one watering applied, it was noticed that, after the first determination, values were lower compared to the witness variant. The higher intensity of photosynthesis and transpiration in case of witness variant may be explained by the fact that, being subject to continuous water

deficit, the plants better adjusted to suboptimal humidity conditions compared to variant M_{i1} .

In case suboptimal water conditions affected the entire vegetation period (variants R_m and M_m), the result was a significant decrease of the grape weight, acidity and content of sugars and anthocyanins.

Under conditions of hydric deficit occurring at the end of the vegetation period, after getting mellowed (variants R_{i2} and M_{i2}), the weight of grapes was lower compared to variants R_{i3} and M_{i3} benefiting from hydric supply, only the differences between the respective variants are insignificant, as they had no statistical support.

The hydric deficit between mellowness and maturation determined the increase of the content of glucids (in case of variants R_{i2} and M_{i2}), while the long-term hydric deficit (R_m and R_{i1} , and M_m and M_{i1} respectively) resulted in low contents of sugars, due to the assimilation drop.