Physiological and vegetative changes in grapevines (cv. Alvarinho) promoted by biological control agents (BCAs): preliminary results

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INTRODUCTION

In recent years much research has focused on developing alternative control methods against pre and post harvest decay in grapes (Zahavi *et al.*, 2000). The induction of a natural resistance in grape using several biological and/or chemical elicitors, known as Biological Control Agents (BCAs), has received increasing attention over the last years, and is now considered the elected strategy for disease management (Leon & Joyce, 2004). In this work we evaluate vegetative and physiological changes promoted by BCAs *versus* conventional chemical products (CQs) in potted grapevines (cv. Alvarinho).

MATERIALS AND METHODS

Plant material – Several grapevine plants (cv. Alvarinho) were established during the spring of 2007. Nine groups of twelve plants were defined for each condition tested: ***BCAs –*** Best Cure (BC) [FuturEco]; Mycotric (My) [FuturEco]; FitoAlgas (Fito) [SAPEC]; Bio Clean [NutriField]; ***QCs –*** Flint (Flt) [Bayer]; Aliette (Ali) [Bayer]; Horizon (Hrz) [Bayer]; Maestro M (MM) [SAPEC]. Each compound was applied, independently, every fifteen days, during July and August of 2007.

Photosynthetic pigments quantification – For five leaves, of each group of twelve plants, photosynthetic pigments were extracted with methanol 90%. Chlorophyll *a* (clor a), chlorophyll *b* (clor b), and carotenoids (carot) were quantified based on the specific absorption coefficients: [Clor a = 16,82A665,2 – 9,28A652,4]; [Clor b = 36,92A652,4 – 16,54A665,2]; [Carot = (1000A470 – 1,91Clor a – Clor b)/225] (Lichtenthaler, 1987). All the results obtained underwent a *t*-test analysis.

Gas exchange measurements – Leaf gas exchange measurements were made, by a portable gas exchange system (LCA-4, Analytical Development Co. Ltd., Hoddesdon, U.K.). Parameters studied were: net photosynthesis – A; transpiration – E; stomatal conductance – g_s; intercellular concentration of CO_2 – ci, and were calculated according to the approach proposed by Flexas *et al.* (1998). All the results obtained underwent a *t*-test analysis.

RESULTS

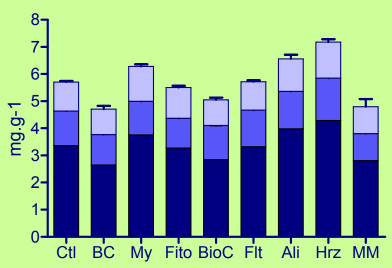

FIGURE 1: Concentration of chlorophyll *a* (Chl *a*), chlorophyll *b* (Chl *b*) and carotenoids, (Carot). The means are not significantly different.

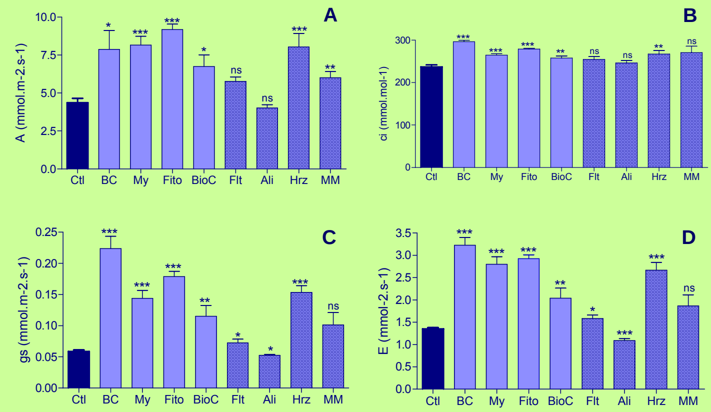

FIGURE 2 – A: Net photosynthesis (A); **B**: Intercellular concentration of CO_2 (ci); **C**: Stomatal conductance (gs); D: Transpiration (E). Significant differences between Ctl and all the treatments at $P < 0.05$ are marked by asterisk (ns - not significant; * - significant, ** - very significant, *** - extremely significant). Values are means ± standard errors (n=5).

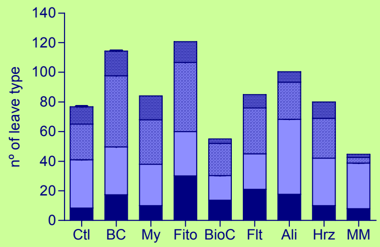

FIGURE 3 – Total number of leaves and leaf type - green leaves (GL); chlorotic leaves (CL); chlorotic+necrotic leaves (CNL); necrotic leaves (NC). Values are means ± standard errors (n=12).

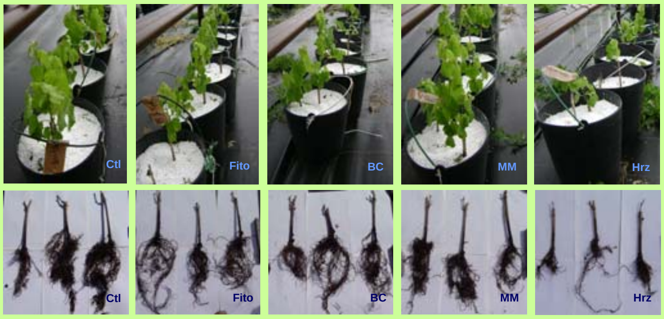

FIGURE 4 – One year old potted grapevines (stems and correspondent roots).

MAIN CONCLUSIONS

► The results of photosynthetic pigments together with the ones of gas exchange suggest a positive effect of BCAs comparatively to CQs. That is particularly noticed for the *A* values, which were significantly higher in all grapevines treated with BCAs. However the results are not statistically significative.

► In respect to vegetative parameters, the results suggest that in grapevines treated with BCAs, there is an increase in the total number of leaves, as well as an increase in stem and roots length, comparatively to CQs treated plants. Still, the means are not significantly different.

► In spite of the erratic results from the first year of experiments (eventually due to the fact that the plants had just been established) the trials will proceed for a 2nd and a 3rd year (with more grown plants) in order to have conclusive results.

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