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Proceedings

Application of anti-transpirant based on di-1-p-menthene improves the growth of young olive trees

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Abstract: The olive tree undergoes significant stress with high temperatures and irradiance levels that occur during the growing season. Various products are used to mitigate the negative effects of abiotic stress in plants, aiming at different physiological, biochemical and morphological functions, such as the use of plant products that attract considerable interest from the scientific community and commercial enterprises. The aim of the research was to examine the effects of a plant-derived anti-transpirant (Vapor Gard®, V) product on the growth of two year-old olive trees subjected to high temperature in a nursery . (V) is a water emulsifiable organic concentrate of di-1-p-menthene ($C_{20}H_{34}$), a terpenic polymer also known as pinolene. The study was carried out in a greenhouse on trees of a native cultivar of Campania (cv. *Salella*) grown in pot, during the growing season from May to September 2020. The experimental design included an anti-transpirant product (V) applied 5 times at 20 days intervals compared with a Control (C). The following physiological and biometric parameters were evaluated: stomatal conductance, chlorophyll ***a*** fluorescence, SPAD index, RWC, shoots growth, total leaf area per plant, trunk cross-sectional area and dry matter partitioning. The results obtained showed that the application of di-1-p-menthene was able to induce a significant improvement of the shoots growth (+46.6 %) and trunk cross-sectional area (36.54 vs 43.49 mm^2). At same time a significant reduction of the stomatal conductance and an increase of leaf RWC values were recorded. The treatment with the anti-transpirant also favored the increase of SPAD values of leaves (+5.7 %). At the end of the experiment the treated trees had greater total dry matter than the control (+12.1 %).

Keywords: stomatal conductance, chlorophyll ***a*** fluorescence, RWC, growth, dry matter partitioning.

Results and discussions

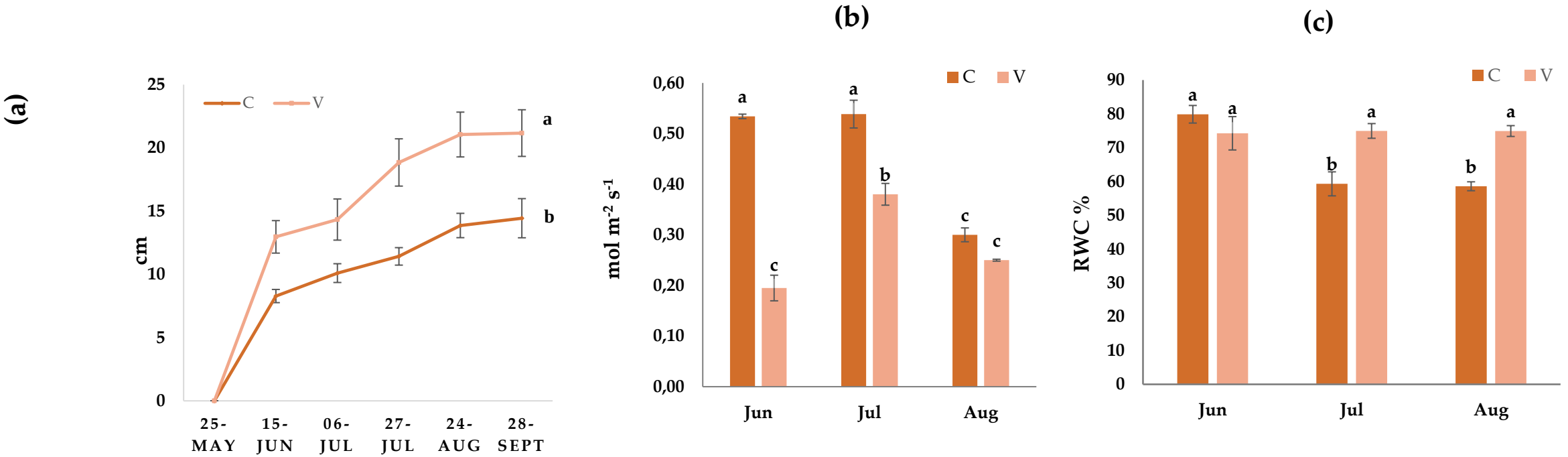

Figure 1. . Effects of di-1-p-menthene (V) applications respect to the control (C) **on shoots growth (a)**, **stomatal conductance (b)** and **RWC (c)** during vegetative season (June, July and August) **.** Values are mean ± SE. Different letters indicate significant differences based on Student–Newman–Keuls test (p = 0.05).

Di-1-p-menthene (V) application has shown positive effects on the shoots growth already 20 days after the first application, showing a significant increase at the end of the growing season compared to the control (C) (+46.6 %) **(Figure 1a)**, the stomatal conductance showed a significant reduction of 20% following the application of the product at the end of growth season **(Figure 1b)** , the relative water content index (RWC) showed a 21.8% higher values with V treatments compared to C **(Figure 1c)**. The anti-transpirants products form a film on the surface of the plants, increasing the relative water content in leaves.

Results and discussions 2

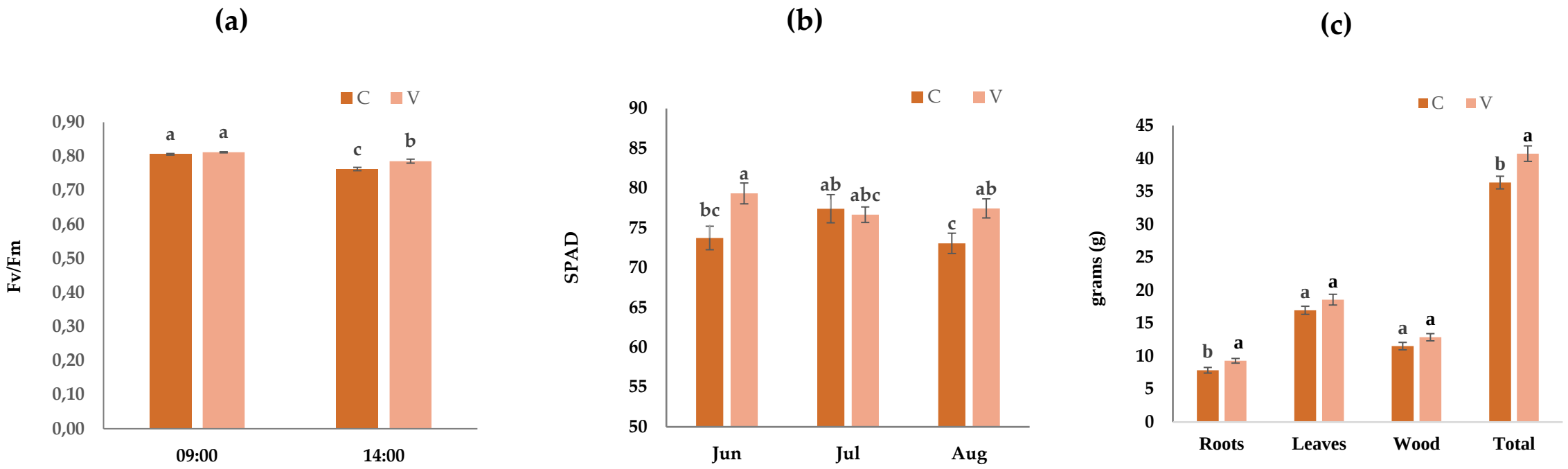

Figure 2.Effects of di-1-p-menthene (V) application respect to the control (TS) on **fluorescence (Fv/Fm)** measured at different temperature condition at 9:00 h and at 14:00 h **(a) SPAD (measurement of chlorophyll content) (b)** during vegetative season (June, July and August) and on dry matter of roots, leaves, wood and total dry matter **(c).** Values are mean ± SE. Different letters indicate significant differences based on Student–Newman–Keuls test (p = 0.05).

The Fv/Fm **(Figure 2a)** decreased during the morning and at the mid-day measurement it was significantly lower than at 09:00 a.m., thus evidencing the daily fluctuation in the maximum quantum yield of PSII photochemistry. At 02:00 p.m. significant differences emerged between C (Fv/Fm = 0.76) and V (Fv/Fm = 0.79) plants. Therefore, the V treatment reduced the mid-day depression in photosynthetic efficiency by narrowing the daily fluctuation in Fv/Fm. At the end of test, positive effects of V product in maintaining higher levels of leaf SPAD **(Figure 2b)** showed; V reported an increase in SPAD equal to 5.7% compared to C. The dry matter highlighting an increase both in the roots and in the total dry matter with V application respectively equal to 15.4% and 10.8% **(Figure2c)**.

Conclusions

Foliar application of the Vapor Gard anti-transpirant decreased the transpiration intensity of young olive trees. Plants sprayed with the tested preparation were characterized by a higher relative water content (RWC) in leaves and a higher value of efficiency of photosystem II (PSII) and leaf chlorophyll concentrations (SPAD) at the end of the vegetative season. This positive effect of the product based on 1-p-menthene on vegetative growth and development could be due to improved plant water status related to lower transpiration. This is a preliminary test carried out under greenhouses, therefore further studies are necessary to determine the effect of this product on the physiological and biometric parameters, on the olives and oil quality of mature trees cultivated in open field conditions.