Effects of selected biostimulants on yield and quality of strawberry plants growing under water limitation

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Biostimulants are a new class of products recently introduced on the market for their capacity to help crops to overcome stressful conditions and to enhance plant productivity and quality of the harvested products. Their use has been constantly increasing during the last years, even though scientific evidences about their efficacy are still scarce and sometimes contrasting. We therefore investigated the effects of repeated biostimulant applications on yield and quality of strawberry plants exposed to increasing levels of water stress under greenhouse conditions. Ninety cold stored strawberry plants (cv. Elsanta) were transplanted in 2 L pots filled with coconut fiber as substrate. Foliar applications of seaweed extracts, silicon and protein hydrolysates started 9 days after transplant and were repeated at weekly interval for 5 times. A product containing arbuscular mycorrhizal fungi (AMF) was also applied by drenching at transplantation and 24 days after. Drought stress was imposed by providing plants with a volume of water corresponding to the 100, 50 and 25% of the daily weight loss due to evapotranspiration (ET). Plants were exposed to 2 cycles of water stress starting 4 and 5 weeks after transplantation and lasting 5 days each. Before and during water stress cycles, plant water status was monitored by measuring stem water potential (Ψ_{stem}), leaf gas exchanges, chlorophyll fluorescence and chlorophyll concentration. Strawberry fruits were harvested 4 times at full maturation stage and primary quality parameters were determined. At the end of the trial, biomass of the plant's organs (root, stalk, runner, leaf and petiole) was also determined. Plants subjected to water limitation showed severe symptoms of water stress especially at the end of the 2nd drought cycle when strawberry plants irrigated at 25% of ET reached low values of Ψ_{stem} (-1.6 MPa). Leaf gas exchanges were reduced by approximately 60% when ET-25 and ET-100 plants were compared. None of the tested biostimulants were able to improve plant water status during the drought stress application. Cumulative fruit yield ranged between 85 and 100 g per plant with no significant differences between treatments. Average berry weight was significantly lower (-15%) in ET-25 as compared to ET-100 plants. All the tested biostimulants hastened maturation, with treated fruits collected at the 1st pick showing higher sugar contents and lower pulp firmness than the control ones, independently from the irrigation level. Overall, under the described experimental conditions, biostimulants were ineffective in changing the physiological status imposed by water stress, whereas they were found able to speed up the fruit maturation process. This effect could be considered interesting when an earlier and synchronized fruit ripening could lead to market advantages.

Keywords: drought, seaweeds, silicon, AMF, protein hydrolysates.