FUTURECO BIOSCIENCE

ECOLETTER

HYDROMAAT REDUCES DROUGHT STRESS IMPACT ON TOMATO PLANTS

#31 Periodical publication on the efficacy and characteristics of Futureco Bioscience products.

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INTRODUCTION

Climate change is leading to temperature increases and variation in rainfall patterns, resulting in the intensification and extension of drought periods and therefore affecting agricultural production. In addition, 70% of the world's water resources are used for agricultural purposes [1], so there is a need for new strategies to optimise water use.
In constant research to improve the efficiency of plant growth and development in agricultural crops, the R&D team from Futureco Bioscience has developed a new microbial product able to reduce the negative impact of drought.

MATERIAL AND METHODS

Five-week-old tomato plants were transplanted to 3L pots filled with sand and perlite with the addition of a slow-release fertilizer (Omocote PRO 3-4M, ICL) applied by drip irrigation. Drought stress was induced two weeks after transplanting and was maintained throughout the trial, reducing volumes by 80%. HydroMaat at 1% was applied 3 times by irrigation. The first application was performed 7 days before drought induction (preventively), whereas the other two were applied at 3 and 9 days after drought onset (respectively).

Plant responses to drought and treatments were assessed two weeks after 3rd treatment. Photosynthetic parameters were determined by using the portable gas-exchange and fluorescence system GFS-3000 FL (Walz).

RESULTS

Drought stress clearly affected growth and appearance in the control plants, whereas HydroMaat treated plants appeared more resistant to drought and with a better physiology (Figure. 1).

WELL WATERED CONTROL

DROUGHT CONTROL
80% WATER REDUCTION

HYDROMAAT
80% WATER REDUCTION

Figure. 1 Tomato plants at the end of the study (24 days of under drought stress)

ECOLETTER #31

Growth assessment showed significant reductions in height and weight of both shoot and root system (Figure 2). HydroMaat allowed to mitigate the effect of drought on plant height. It also has had a slight effect on biomass production, causing an increase of 7% of plant dry weigh (Fig. 2).

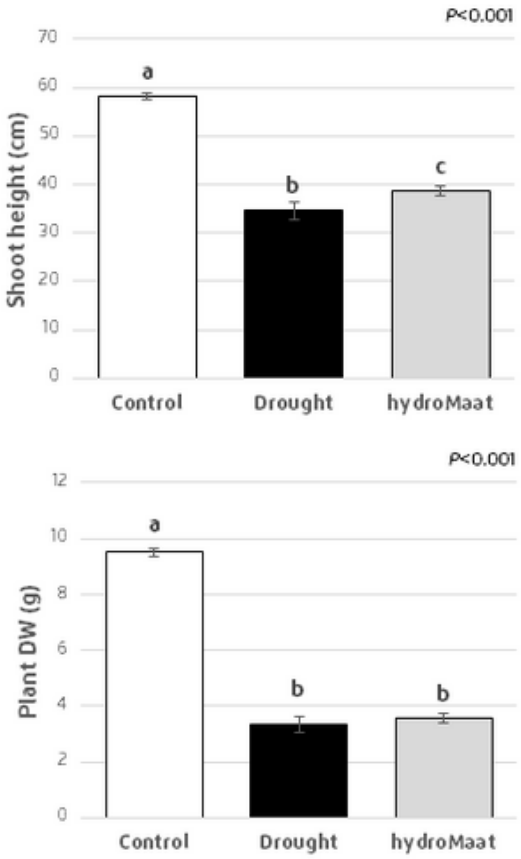


Figure. 2 Shoot height and plant biomass (DW, dry weight) in well-watered plants (positive control), drought plants (negative control) and HydroMaat-treated plants after 24 days of under hydric stress.

Several physiological parameters, such as leaf mass area (LMA) and proline content, were also significantly altered in response to drought stress, whereas plants treated with HydroMaat showed a physiological response similar than the well-watered plants (Figure 3). Relative water content (RWC) and leaf mass area (LMA) were 25% and 37% higher (respectively) in Hydromaat than in the negative control, whereas proline (typical peak generated in response to drought) was significantly reduced in hydroMaat treated plants (Figure 3).

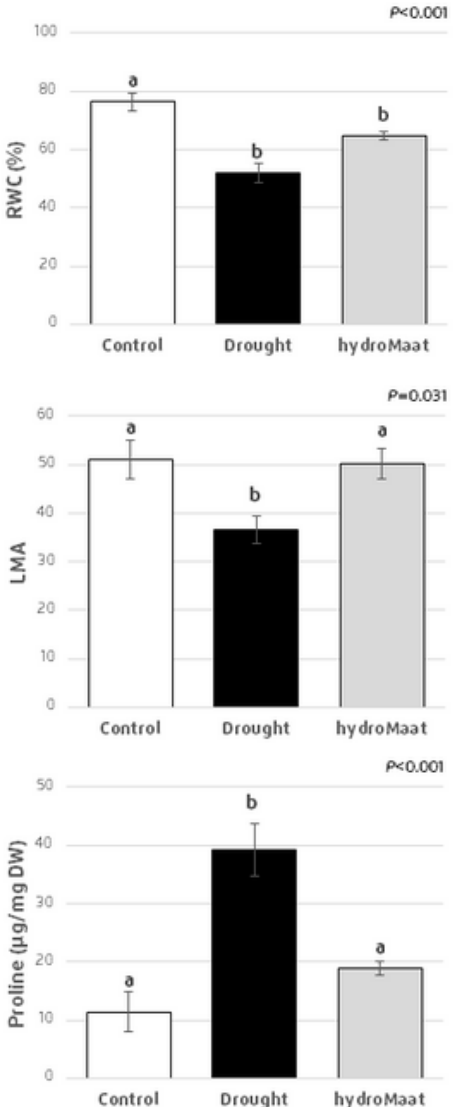
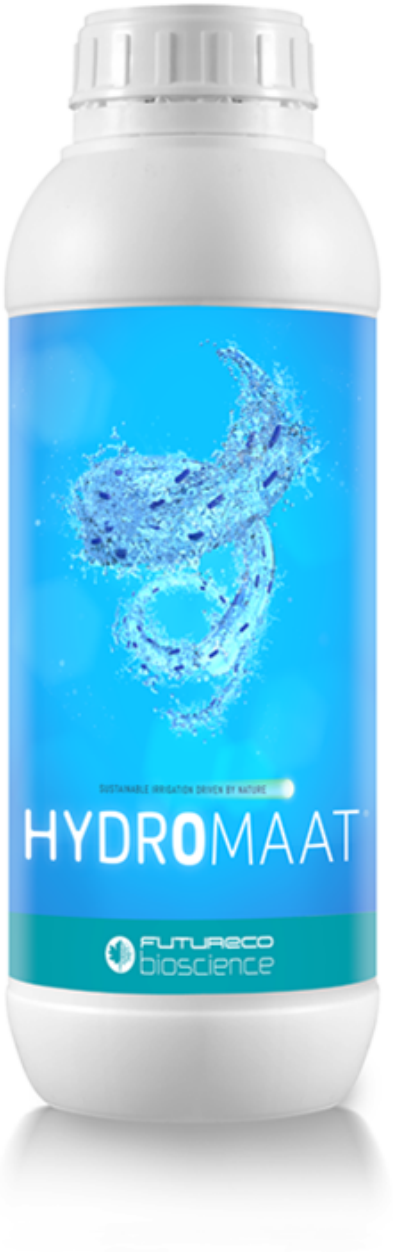


Figure 3. Relative water content (RWC), leaf mass area (LMA) and foliar proline content in tomato plants grown under drought for 24 days.

Drought stress also affected gas exchange parameters, showing significant reductions in stomatal conductance (gs), transpiration (E) and photosynthetic (A) rates.
However, HydroMaat mitigated the fall of gas-exchange parameters by slightly increasing the three parameters.

CONCLUSIONS

HydroMaat can effectively ameliorate drought stress in tomato. Treatments did significantly reverse drought-responses in terms of growth (shoot height, LMA), water status and osmotic response (RWC and proline) as well as reduced the effect of drought on photosynthesis.



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1.Christiansen, J. The Economics of Water. 2013; Available from: https://economicsofwater.weebly.com/water-and-agriculture.html.

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