



ECO LETTER

FITOMAAT® BOOSTS GROWTH
UNDER WATER STRESS CONDITIONS

#17 Periodic publication on the efficacy and characteristics of
Futureco Bioscience products.

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FITOMAAT® BOOSTS GROWTH UNDER WATER STRESS CONDITIONS

INTRODUCTION

Plant growth and development can be limited by climatic factors and reduced when water, light or temperature conditions are unfavourable. One of the abiotic stresses that most limit plant growth is water stress, which can be due to both excess or lack of water (or excess transpiration). In most cases this stress is associated with water deficit or drought. Depending on the severity of the situation and the degree of resistance of the crop to water shortage, the organism's water balance is affected, compromising to a greater or lesser extent its physiology (growth, reproduction, flowering, fruit set, etc.) and ultimately affecting the crop's yield.

The lack of available water reduces water potential and cell turgor, and increases the generation of Reactive Oxygen Species (ROS), forcing the plant to produce neutralising compounds to avoid oxidative stress. With this defence, the plant devotes its resources to survival, but not to production, reducing crop yields.

FitoMaat® is a biostimulant designed, produced and formulated by Futureco Bioscience to overcome water stress situations. This publication collects some efficacy trials carried out with FitoMaat® on tomato plants subjected to water stress showing that the product is highly effective to overcome adverse situations and not only not compromise crop yield, but even increase it.

MATERIALS AND METHODS

Disinfected Marmande tomato seeds were sown in pots with standard substrate (sand : peat : perlite, 4:2:1) maintained under an

optimal irrigation pattern for germination and growth (80% field capacity, CC) and conditions of constant temperature ($20\pm 2^{\circ}\text{C}$), relative humidity ($60\pm 10\%$) and light: dark cycles (16/8h, $165\mu\text{mol}/\text{m}^2\text{-sec}$) throughout the trial.

After 3-4 weeks from sowing, water stress (40-50% CC) was induced in the individuals, excluding the control plants ($n=5$), which were maintained with optimal irrigation throughout the trial. Two treatments were applied with two different doses of FitoMaat; the first one 15 days after stress induction (A) and the second one 15 days after the first one (15DDA, Table 1).

Treatment	Application A (15d stress)	Application B (15DAA)
Absolute control	Running water (30mL)	Running water (30mL)
Stress management	Running water (10mL)	Running water (10mL)
Stress + FM 1%	FitoMaat 1% (10mL)	FitoMaat 1% (10mL)
Stress + FM 2%	FitoMaat 2% (10mL)	FitoMaat 2% (10mL)

Table 1. Treatments carried out on Marmande Cuarenteno tomatoes irrigated with an optimal irrigation pattern (absolute control) or water stress (stress control and treatments with FitoMaat®).

After the second treatment, the irrigation pattern was varied to promote stress recovery and to determine the effects of FitoMaat® on the crop. In the case of the absolute control, the plants were irrigated with 80mL of tap water per week, while in

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the batches of stressed plants, the volume of water applied was reduced to 30mL per week per plant. Fifteen days later (15DAB), shoot and root height and length were assessed.

RESULTS AND DISCUSSION

After 45 days of stress, the Ctrl-WS plants showed a marked reduction in growth (Fig. 1). On the other hand, differences between Ctrl WS plants and FitoMaat® treated batches were not as evident (Fig. 2).

On the other hand, the evaluation of shoot height growth and root system length revealed differences between the drought treatments. In this respect, the results show how the application of FitoMaat® can counteract the negative effect of stress (Figs. 1 and 2).

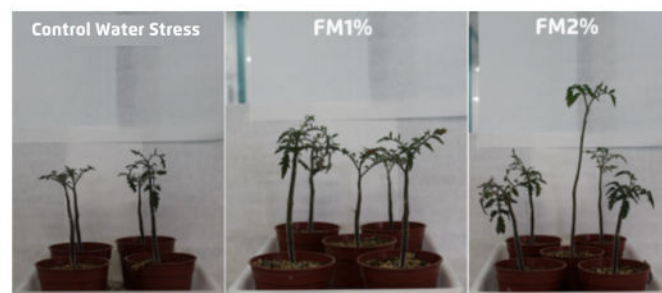
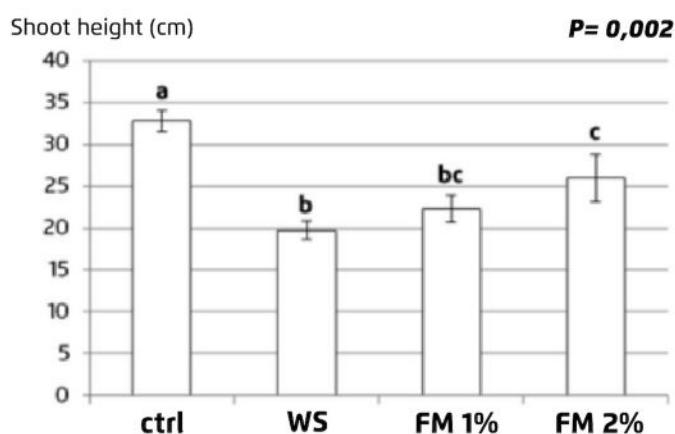


Figure 2. Appearance of drought stressed tomato plants treated (15DAB) with two applications of different doses of FitoMaat (FM) vs. water stressed control plants (Ctrl WS).



Graph 1. Shoot height of tomato plants grown under optimal irrigation conditions (Ctrl) or under water stress (WS) and treated with FitoMaat® (FM) at different doses. Data are shown as median \pm SE of $n=5$ plants (ANOVA, $P<0.05$; LSD, $P<0.05$).

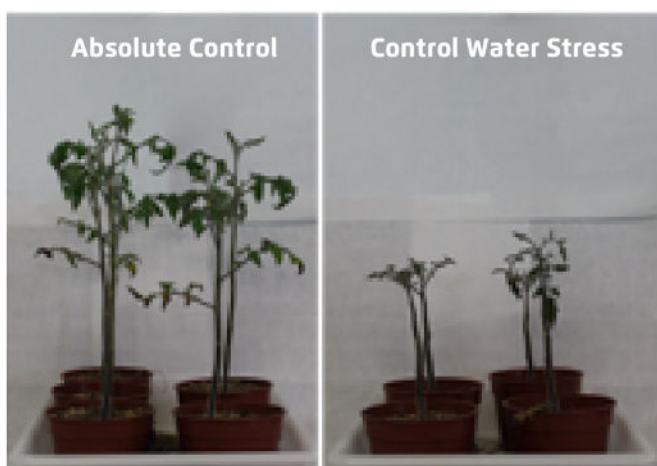
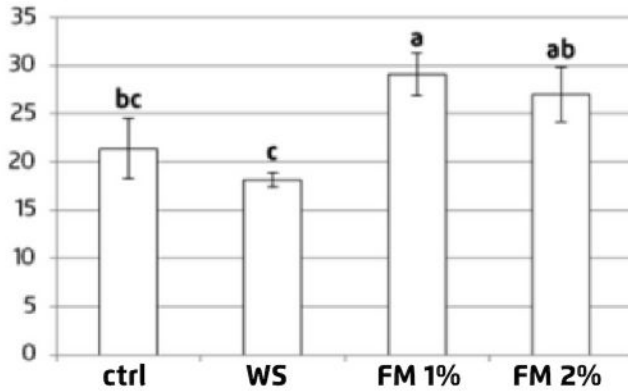


Figure 1. Appearance of tomato plants maintained (45 days) under optimal irrigation pattern for growth (left) versus water stress conditions (right). Ctrl abs, absolute control: Ctrl WS, stress control.

Root length (cm)

$P = 0,034$



Graph 2. Root length (in cm) of tomato plants grown under optimal irrigation conditions (Ctrl) or under water stress (WS) and treated with FitoMaat® (FM) at different doses (ANOVA, $P < 0.05$; LSD, $P < 0.05$).

CONCLUSION

The application of FitoMaat® at 1 or 2% improves the growth of tomato plants subjected to severe water stress. For this reason, it is concluded that FitoMaat® is a good solution to prevent and treat water stress in tomato plants.



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