

Innovative biostimulants improve yield of cucumber grown in date palm waste as a sustainable soilless substrate

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Background

Biostimulants are generally used for high-profit horticultural crops such as greenhouse grown vegetables and ornamental plants, are often cultivated in soilless systems. In soilless culture, greenhouse growers commonly use different types of substrates such as rockwool, perlite, peatmoss and coir. In terms of sustainability, using of local resources became a global trend aims to replace high-cost substrates with cheap and local growing media that has a renewable and environmental potential.

Objective

The scope of the study was to determine the influence of two different innovative endophytic bacteria on growth and production of soilless cucumber grown in date palm waste and sand substrates at the national research and development center for sustainable agriculture (Estidamah), KSA.

Methods

Seeds of cucumber (*Cucumis sativus*) cv. Zahran were sown in trays filled with peatmoss. Two weeks later, seedlings were transferred to a Venlo-type glasshouse, with 6 m gutter height, equipped with cooling (pad and fan system), with computer-controlled. Plants were set in Dutch bucket filled with sand or date palm waste (DPW) as growing media, with plant density 2.5 plants per m². DPW with a fractions size 12-8 mm was washed by desalinated water then autoclaved at °100C and left to dry. The treatments were conducted in a randomized block-design with three replicates.

Inoculation protocol

Two different innovative endophytic bacteria "GrowBioM_Delta" and "GrowBioM_Sigma" were isolated from KSA desert and provided by King Abdulla University for science and technology (Kaust). According to inoculation protocol, seeds were immersed in rinsed under tap water for 30 min then immersed in each bacterial suspension for 1 hour. At transplanting, each seedling was supplied with 50 ml of the biostimulants suspension, repeated 4 times, 3 weeks interval. Blank treatments were supplied with tap water as a control.



Results

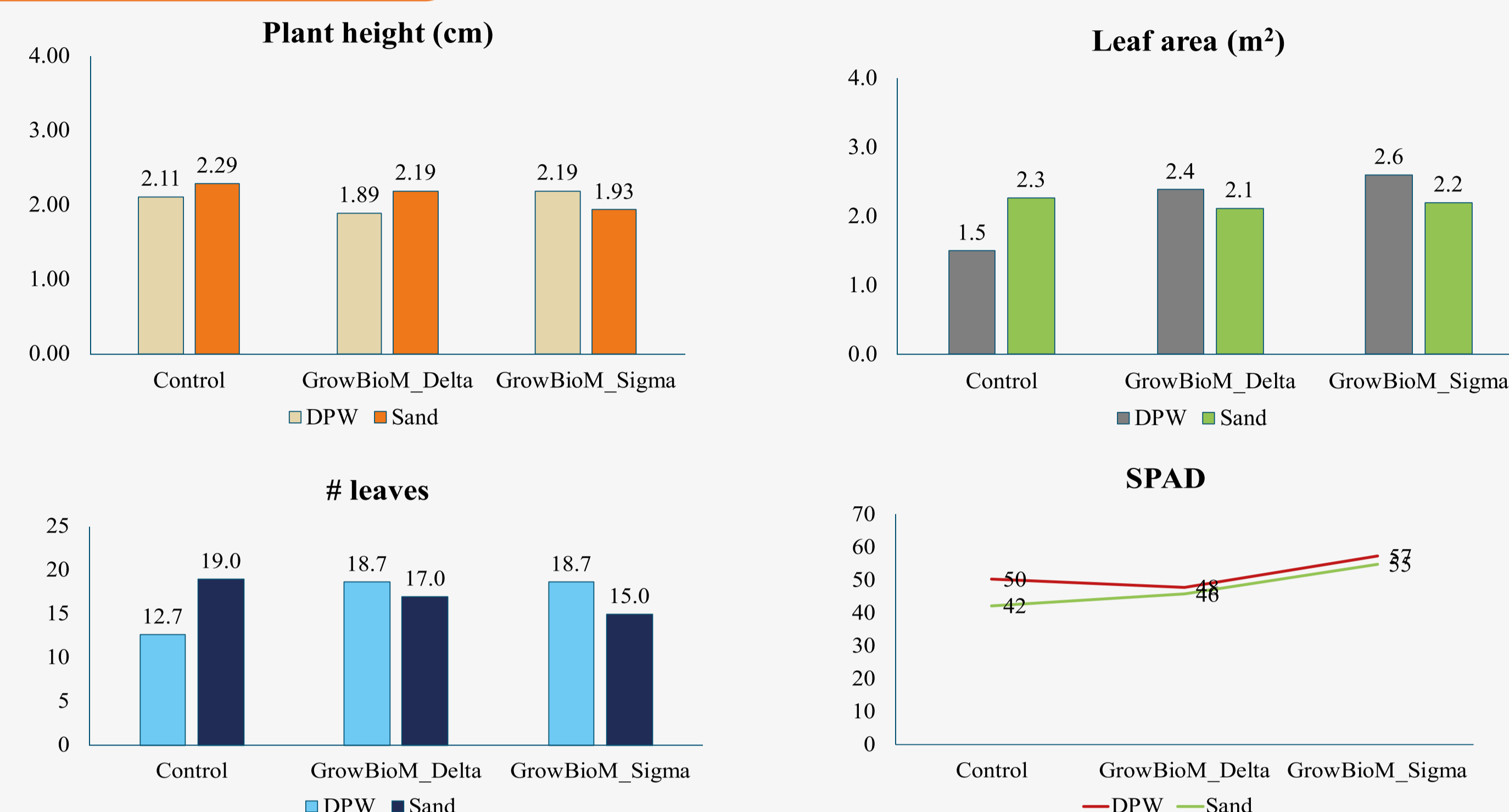


Figure 1. Effect of biostimulants on growth and chlorophyll content (SPAD) of cucumber grown in DPW and sand substrates .

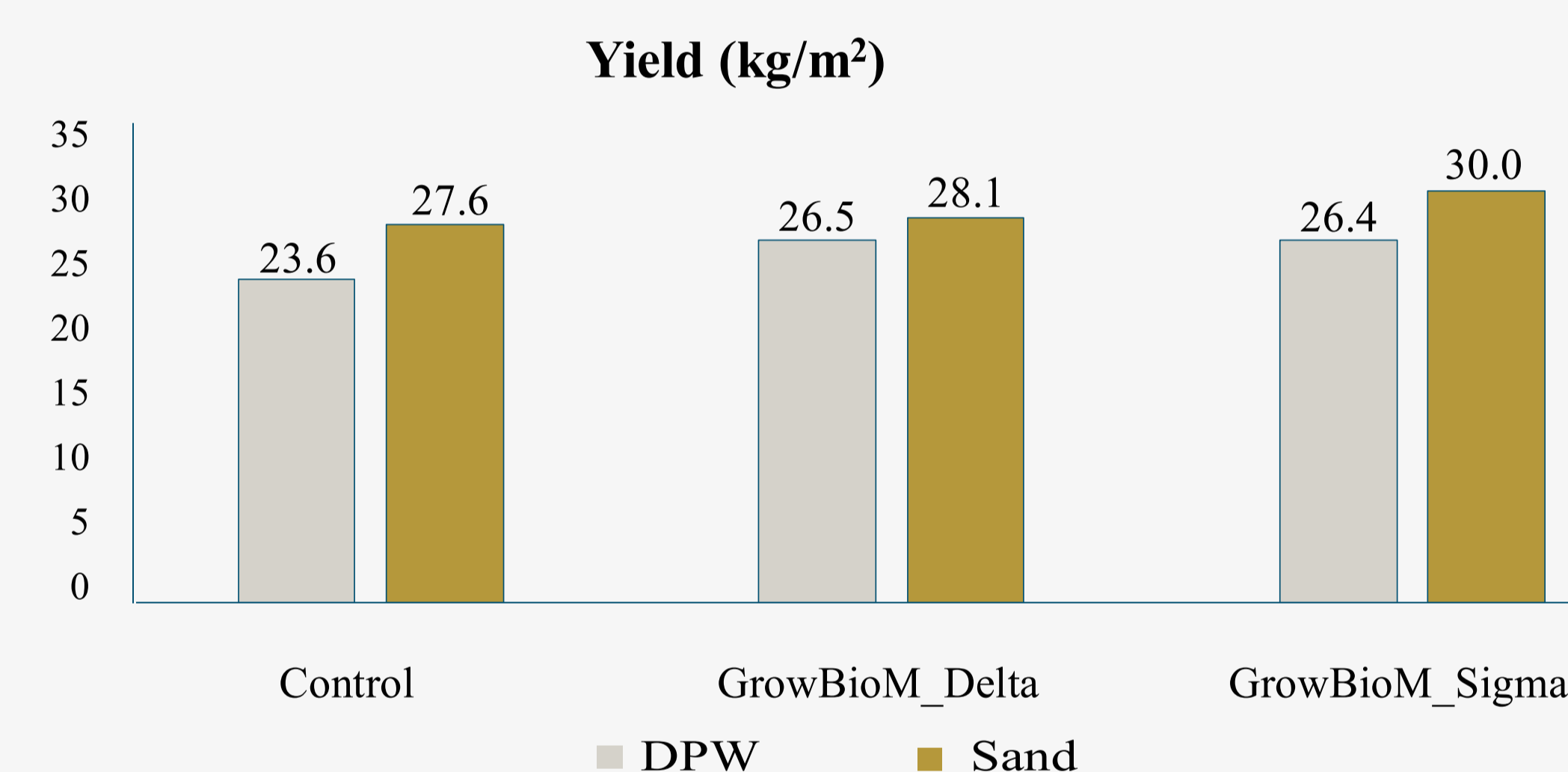


Figure 2. Effect of biostimulants on total yield of cucumber grown in DPW and sand substrates .

Discussion

- The application of plant biostimulants is an innovative, environmental, friendly approach towards sustainable crop production which faces several limitations such as water scarcity, depletion of natural resources, environmental stressors and climate change.
- Plant height did not differ with biostimulants inoculation in comparison to control either plants grown in sand or DPW, both biostimulants resulted better number of leaves, chlorophyll content and leaf area than control.
- Colonized plants produced %11 yield increase when grown in DPW than control, while cucumber grown in sand produced %10.1 and %10.8 yield increase with GrowBioM_Delta and GrowBioM_Sigma, respectively.

Conclusion

Application of the biostimulants to DPW substrate, as a novel practice, might improve production of controlled greenhouses and increase the sustainability of local available substrates in KSA.



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