The effect of chicken manure, phosphate-solubilizing bacteria, and spent mushroom compost on the growth of cucumber (*Cucumis sativus* L) under solar panels

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Abstract

Solar-powered greenhouses are an efficient tool for achieving energy efficiency for facility agriculture. Integration of practices such as the application of biofertilizers, recycled manure, and regionally sourced ingredients in culture media could further improve sustainability of food production. A study was conducted to test the effects of chicken manure (CM) and phosphate-solubilizing bacteria (PSB) on cucumber grown in different proportions of fermented spent mushroom compost (SMC, Mix 1, 2, and 3) in a solar panel greenhouse. The experiment was laid out in a randomized complete block design (RCBD) with three replicates and six treatments as follows: (i) Control+Mix1; (ii) PSB+Mix1; (iii) CM+Mix1; (iv) PSB+CM+Mix1; (v) PSB+CM+Mix2; and (vi) PSB+CM+Mix3. Mixes 1, 2, and 3 contain SMC ratios of 62, 0, and 90 %, respectively. Results showed that the PSB+CM+Mix2 and PSB+CM+Mix3 exhibited better crop growth, above-ground biomass, and fruit yield. Total soluble solids of fruits did not show significant differences among the various treatments. Higher nitrogen, phosphorus, and potassium concentrations, and chlorophyll content were observed higher in all treatments with Mix 1 but did not lead to higher fruit production than PSB+CM+Mix2 and PSB+CM+Mix3, which gave rise to the highest fruit yields. Hence, it is evident that fermented SMC showed great potential to replace peat moss for cucumber cultivation in solar panel greenhouses. When combined use of CM and PSB, the crop yield was further enhanced, allowing for both green energy generation and agricultural production to be achieved simultaneously.

Keywords: greenhouse, solar panel, biofertilizer, spent mushroom compost, cucumber