EFFECT OF KITCHEN WASTE AND BAMBOO BIOCHAR ON GROWTH AND YIELD OF *Cucumis sativus* L.

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Abstract

The intensification of global agriculture has led to a heavy dependence on synthetic fertilizers, contributing to soil degradation, nutrient imbalance, and declining soil health, particularly in tropical regions such as Malaysia. To address these challenges, sustainable nutrient management strategies are increasingly being explored. This study investigated the synergistic effects of kitchen waste (KW) and bamboo biochar (BB) as alternative soil amendments to improve the growth, yield, and quality of Cucumis sativus L. The experiment was conducted using a randomized complete block design with two factors: types of KW (unfertilized, NPK fertilizer, fish waste, fruit waste, and leafy vegetable waste) and BB application rates (0 t/ha and 10 t/ha). The results showed significant differences in plant performance across treatments. Among the organic amendments, fish waste (FW) was the most effective, producing a total yield of 180 t/ha and fruit number comparable to inorganic NPK fertilizer. This superior performance is attributed to its high protein content and low C:N ratio, which enhances rapid nutrient mineralization and availability for plant uptake. In contrast, fruit waste (FRW) and leafy vegetable waste (VW) resulted in significantly lower yields (87–89 t/ha), mainly due to nitrogen immobilization associated with their higher C:N ratios. Although BB application did not significantly influence yield components such as fruit weight and length, it played an important role in improving fruit quality. The application of 10 t/ha BB significantly increased soluble solids content, indicating enhanced sweetness, and improved the uptake of essential nutrients, including potassium, calcium, and magnesium. In conclusion, FW is an effective organic nutrient source for maximizing cucumber growth and yield, while BB serves as a complementary amendment that enhances fruit quality and nutrient uptake. The combined application of these materials offers a sustainable strategy for improving crop productivity and promoting organic waste valorization in agriculture.

Keywords: Soil amendment efficiency, Agro-waste recycling, Fruit quality