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Entitled

*ORGANIC-BASED NUTRIENT SOLUTIONS FOR SUSTAINABLE VEGETABLE PRODUCTION IN A
ZERO-RUNOFF SOILLESS GROWING SYSTEM*

by

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Abstract

As the adoption of soilless production systems escalates to meet the rising demand for safe and healthy fresh produce, the growing environmental awareness and consumer's preference for sustainable production systems are stimulating the reduction of synthetic inputs. A greenhouse study using an auto-pot zero-runoff hydroponic system and lettuce (*Lactuca sativa* L.) as a model vegetable crop was conducted to evaluate the potential of substituting synthetic fertilizer nutrient solutions (NS) with organic-based NS. The use of organic NS resulted in lettuce plants with fewer leaves and a smaller leaf area, plant height, stem diameter, and fresh biomass compared to those grown with inorganic fertilizer. Among the organic NS used, NS B from fish farm waste (159.8 g) and E from plant sources (157.9 g) ensured crop yield performance slightly lower than the inorganic fertilizer NS (175.1 g), but higher than the other humic acid based-organic NS C and D. However, total chlorophyll (0.81 and 0.93 mg/g, respectively) and carotene (0.23 and 0.26 mg/g, respectively) levels were higher in organically grown lettuce compared to the control (0.95 0.17 mg/g, respectively). Furthermore, plants grown organically in NS C and D had greater phenolic levels (3.36 and 3.22 g/100 g, respectively) as compared to those nourished with inorganic fertilizer (2.28 g/100g). All organically grown lettuce plants had lower levels of Ca, K, and Mg, and higher P compared to the control. Moreover, all organic NS resulted in lower leaf nitrate levels (ranging from 3.2 to 8.7 mg/kg) compared to the inorganic NS (259.8 mg/ kg) based on dry weight. Our findings suggest that organic liquid fertilizers may enable the sustainable production of safe, nutritious, and healthy vegetable crops. However, further study is required to improve and overcome the limitations of such systems.

Keywords: Organic fertilizer; animal source; plant source; organic hydroponic; lettuce