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Development of a liquid fertilizer system from bio-slurry waste and natural resources: A case study on early growth of chili (*Capsicum annum* L.)

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Hydroponics or soil-less culture is a technology for growing plants in nutrient solutions that supply elements needed for optimum plant growth with or without use of an inert medium to provide mechanical support. Hydroponics offer opportunities to provide optimal conditions for plant growth and therefore, higher yields can be obtained as compared to open field agriculture. Here we aim to develop a liquid fertilizer system using a bio-slurry waste obtained from biogas reactor, selected animal waste, wood ash and dolomite. Five liquid biofertilizer systems (M_1, M_2, M_3, M_4 and M_5) were developed by mixing different ratios of bio-slurry waste obtained from biogas reactor, cow dung, poultry waste, wood ash and dolomite. A control experiment was carried out with Albert solution, a commercial chemical liquid fertilizer. The liquid fertilizer systems were tested using 12 Chili (*Capsicum annum* L.) plants in each treatment and treated with a continuous hydroponic cultivation system for 12 weeks in triplicate. The pH in hydroponic systems varied from 6 to 8. At the end of the 12 weeks' plant growth was monitored by measuring the height of the plant. Chili plants grown in fertilizer mixture M_4 (bio slurry waste: 36.0 L, cow dung: 600.0 g, poultry waste: 600.0 g, wood ash: 75.0 g, dolomite: 75.0 g) gave the highest growth rate (50.3±3.0 cm) and the highest harvest (28.8±1.2 g) among the five developed biofertilizer systems. This M_4 fertilizer system has the highest N (49.0±0.2 ppm), P (9.9±0.1 ppm) and K (434.2±0.8 ppm) content. Fertilizer system M_1 which has only bio-slurry waste showed the lowest growth rate (37.4±1.6 cm) and the lowest harvest (16.1±0.6 g). M1 has the lowest nutrients content (N: 28.3±0.1 ppm, K: 349.0±0.7 ppm, P: 4.5±0.1 ppm) among the five liquid fertilizers. The control, Albert solution which has N (10.6%), K (16.3%) and P (9.3%) showed a growth rate of 46.0±5.4 cm and a harvest of 30.1±1.6 g. Therefore, it can be concluded that added natural ingredients improve the effectiveness and quality of the liquid fertilizer with high content of nutrients. Therefore, M_4 liquid fertilizer system has the potential to be developed as an economical, effective, eco-friendly fertilizer system for the hydroponic cultivation of chili plants compared to commercial chemical liquid fertilizers.

Keywords: liquid biofertilizer, natural resources, bio slurry, dolomite, hydroponic culture system