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The effect of different ratios of vermicast and 2-3mm biochar on ammonium mineralization rates and plant growth

Food production is a pertinent environmental problem. Vertical gardening provides the opportunity to grow food in urban environments, year-round. Biochar and vermicast are both byproducts of waste management strategies and, together, have the potential to be a growth media for vertical gardening. The objective of this work is to investigate the impacts of different ratios of biochar and vermicast on nitrogen mineralization rates and plant growth. Ammonium mineralization, along with plant health, pH, electrical conductivity and water holding capacity were measured to determine which ratio had the greatest plant growth capabilities. The biochar and vermicast used in this study were donated by Innovative Reduction Strategies Inc. and Annelida respectively. The 14-day ammonia mineralization test yielded a positive exponential regression with an R^2 value of 0.9996, indicating that vermicast is the main driver of ammonium mineralization in soils. The plants grown

over a period of 45 days in the 100% vermicast substrate were taller and had greater overall biomass, however, the structural integrity was superior in the plants grown in 75% vermicast and 25% biochar. This may be due to the immense water holding capabilities of biochar that can benefit plants long term. The increasingly greater rates of ammonium mineralization and plant growth in the higher % vermicast media can possibly be attributed to vermicast's low carbon to nitrogen ratio. This promotes more nitrogen mineralization and, thus, more plant-available nutrients. For a short duration, the 100% vermicast showed the greatest plant nutrient availability, however, longer studies are needed to fully explore if plant growth and mineralization rates continue to follow these trends.

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