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Changes in Soil Properties and Vegetable Growth in Preparation for Organic Farming in Hawaii

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*Changes in soil properties and vegetable growth were quantified on a low-fertility tropical soil. Four treatments (two composts, urea, and control) were applied to an Oxisol (Rhodic Haplustox, Wahiawa series) in a field on Oahu, Hawaii. Chinese cabbage (*Brassica rapa*, Chinensis group) and eggplant (*Solanum melongena*) were grown sequentially as test crops. Soil quality as measured by hot-water-soluble carbon, dehydrogenase activity, and cation exchange capacity (CEC) increased by compost amendments. Total organic carbon or carbon dioxide (CO_2) respiration rate did not correlate with the soil amendments. Nitrogen (N) nutrition was the main factor that improved growth and carotenoid content in cabbage. The urea treatment promoted better growth in cabbage, whereas good-quality compost, made of grass clippings/tree trimmings, lime, and rock phosphate yielded better growth in eggplant, suggesting organic N requires time to mineralize and to be available to crops.*

Keywords Cabbage, compost, eggplant, hot-water soluble C, organic farming, soil quality

Introduction

Organic farming has expanded rapidly in recent years and is seen as a good alternative to chemical-based conventional farming systems (Avery 2007; Ortiz-Escobar and Hue 2007). Before being qualified as organic, a farm must go at least 3 years without chemical fertilizers and synthetic pesticides (USDA 2010). Thus, nutrient management in organic farming systems has to build soil fertility via nitrogen (N) fixation, crop rotation, and nutrient recycling from organic materials, such as farmyard manure and crop residues (Gosling and Shepherd 2005; Flieβbach et al. 2006). During the transition from conventional to organic farming, N availability may decrease because a shift in biological activities may mean that N sources are not immediately available for plant use (Petersen, Drinkwater, and Wagoner 1999). Consequently, crop yields may be less than those under conventional practices (Mäder et al. 2002). Despite a short-term decrease in crop production, the applications of organic soil amendments usually improve soil quality over time (Clark et al. 1998; Petersen, Drinkwater, and Wagoner 1999; Mäder et al. 2002; Flieβbach et al. 2006). The benefits include (1) an increase in soil microbial activity (Wander et al. 1994;

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