

# **Compost Application Effects on Weed Populations and Crop Yield and Quality in Three Early-Maturing, Organically-Managed Potato (*Solanum Tuberosum*) Cultivars**

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Nutrient and weed management are leading organic production-related challenges. The success of organic production systems depends partly on the farmer's ability to synchronize natural soil and plant processes with management interventions -- an obvious challenge in areas with variable weather. Matching soil nutrient availability with crop demand is important since nutrient supplies influence vegetable crop yield and quality. It is also important to foster a favorable competitive imbalance between crop and weed growth, especially early in crop development, to maximize crop performance.

Conventionally-grown, main-season potato crops tend to be heavily fertilized. Total seasonal nutrient demands may be similar in organically-grown potato crops, although nutrient sources differ from conventional systems. Organic potato growers often ask if amendments (in addition to leguminous rotation crops) are required to meet crop fertility requirements. Answers to this question are likely to depend on genotype-environment interactions. Intrageneric and intraspecific differences in nutrient uptake, utilization or sap levels are well documented in vegetable crops, including potato. Also, generalizations regarding the effects of soil amendment or rotation on crop and soil are unreliable as effects may change with amendment makeup, rotation length and sequence, or methods.

Much of what is reported regarding strategies to overcome nutrient and weed management challenges and the mechanisms underlying their success or failure in sustainable-organic potato cropping systems is based on studies involving full-season crops grown in climates different from the Midwest U.S. Here, we chose to employ short-season cultivars varying in mature canopy size and structure and late-spring planting dates in a test of compost application effects on crop performance and weed populations.

Land and methods used met local organic certification requirements. In 2000 and 2001, 89-111 m<sup>2</sup> subplots of 'Dark Red Norland', 'Red LaSoda', and 'Red Viking' red-skinned cultivars were planted in 267-334 m<sup>2</sup> main plots. Half of the subplots were previously amended with composted dairy manure (6.5 Mg ha<sup>-1</sup>) to deliver approximately 62 kg N ha<sup>-1</sup>. Potatoes were planted on 5 and 8 June, 2000 and 14 June, 2001. Rows were machine cultivated two-three times annually before canopy closure and hills were re-shaped each year 28 d after planting. Vines were killed by mowing 60-65 d after planting when the majority of tubers had reached 4-7 cm in diameter. Tubers were field-cured for three weeks, machine harvested with a one-row digger, placed in darkened storage at 9 C for two weeks, and graded for size and external quality. In 2001, nine plants per subplot were removed at 40 d after planting to assess treatment effects on leaf area and shoot, root, and tuber mass. Weed density and biomass were estimated before harvest. In 2000 and 2001, none of the six yield variables measured were affected by year- or cultivar-x-compost application interactions. On average, compost application increased the yield of U.S. #1 and B-size tubers 13-14%. Total and cull yield and the percent by weight in the

U.S.#1 and B-size classes were unaffected by compost application. Weed densities and biomass were very low in both years, and were not influenced by compost treatments or cultivars. The results suggest that organic amendments may be required for high N-demanding crops in post-transitional organic systems including leguminous rotation crops. They also suggest that the relatively late planting date avoided the period when most annual weeds emerge, leading to low weed populations in all plots. Vine killing in mid-late August limited seed production by the few surviving weeds.

### **Publications Resulting From This Work**

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