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ABSTRACTS OF THE NORTHEAST POTATO TECHNOLOGY FORUM

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Compost and Manure Effects of Potato Yield and Nutrient Uptake

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Recently developed techniques allow cull potatoes to be stabilized and disposed of through composting. Little information is available on the effects of applying this compost to soils used for potato culture. We began soil applications of waste potato compost to small-plot, field studies at Aroostook Farm, Presque Isle, Maine during 1991. Experiments have been carried out on this site since 1991 to: 1) Determine if compost application would affect yield, quality, nutrient uptake when a potato crop is receiving commercial fertilizer; and 2) Determine if a combination of compost and manure could partially replace commercial fertilizer in a potato cropping system without creating yield or quality losses. The experiments conducted consisted of 12 treatments per experiment in a randomized complete block design with four replications. Barley was grown in rotation with the potato crop, so that one experiment was cropped to barley and one to potatoes in each cropping season.

To address objective #1, fertilizer rates were held steady (146 or 190 kg/ha of N, 112 kg/ha phosphate, and 112 kg/ha of potash) in eight of the experiment's twelve treatments while compost was applied at varying rates (0, 11.2, 22.4 or 33.6 t/ha, f.w. basis) just prior to tillage in the spring of each year. Response variables under study included: plant stands, foliage vigor ratings, tuber yields and quality, tissue nutrient concentrations, and plant nutrient uptake. Soil measurements have included: pH, cation exchange capacity, nutrient concentrations, organic carbon, moisture content, water stable aggregates, bulk density, and moisture retention characteristics. Tuber yields have increased in response to compost application in each of the three years of this study. The average total yield increase was 5.4 t/ha (18%) for the three years. Tuber size has also generally increased in response to compost, while specific gravity has not been affected. Compost application has increased K, P, and B uptake relative to unamended plots. Compost decreased leaf magnesium concentrations, but did not affect uptake in haulms and tubers. Uptake of other nutrients was not strongly affected. Soil mineral nutrient concentrations were only slightly affected after the first cropping year. Results from samples taken during spring 1993 are not yet available. Compost application has slightly increased readily oxidizable organic matter in the soil, but has not affected water stable aggregate content or gravimetric moisture content.

Objective #2 was addressed by reducing fertilizer rates in several treatments while compost and manure were applied at varying rates (11.2, 16.8, 22.4 or 33.6 t/ha each, f.w. basis). Fertilization rates were reduced based on an estimate of available nutrients contained in the amendments. At the highest rate of amendment application fertilization rates for N, phosphate, and potash were only 65, 0, and 25 kg/ha, respectively. The response variables for these treatments were the same as those listed above. Tuber yields and size have remained constant as fertilizer rates decreased. Specific gravity has increased. Only N nutrition has been sub-optimal with the reduced chemical fertilizer rates. This was reflected in lower petiole nitrate concentrations, lower leaf N, and reduced haulm and tuber uptake. The compost and manure applications increased leaf Ca, K, and B concentration relative to unamended plots.