Evaluation of Two Soil Amendments

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Introduction

For many years, home gardeners have recognized the benefits of applying compost and other soil amendments to their soils. Though not considered a fertilizer by industry standards, compost is universally recognized for improving structure, water-holding capacity, and the nutrient content of our soils. In many gardening systems, including both organic and conventional, compost is often the major soil enrichment product. On occasion, other soil amending products, such as humic acid, have been tried by gardeners in hopes of achieving many of the same benefits of compost, but with less volume and cost.

When compost has been applied at recommended rates to low fertility garden soils, it has consistently increased vegetable yields and improved soil fertility. Less is known about the benefits of adding humic acid to Iowa soils. Considering the fact that many Iowa home gardens contain soils testing in the high range for fertility, one might question if the additional soil amendments to these soils would prove effective.

Methods

In 2003, a study was conducted at the Armstrong Research Farm to evaluate the benefits of two soil amendments on a soil that tested high in fertility (Table 1). Recommended rates of municipal yard waste compost from a local recycling facility and a commercially marketed humic acid product were applied to five vegetables to evaluate their effects on crop yield and soil fertility. Both soil amendments were applied preplant and worked deeply into the soil with a tiller. A second sidedress application of the humic acid was applied in midsummer as per label instructions. The application rate per 100 ft^2 was 480 lb for the compost and 1.5 lb for each treatment of humic acid.

The site selected for the garden was a Marshall silty clay loam with an organic matter of 4.2% and a cation exchange capability (CEC) of 17-1 mEq/100 g. Potatoes, onions, green beans, sweet corn, and tomatoes were planted in a completely randomized block design with four replications. Each individual plot consisted of one row, 8 ft in length. Urea nitrogen at a 100 lb/acre rate was applied as a sidedress to the sweet corn plots at the V 5 stage. Weekly applications of the fungicide Bravo 720 and insecticide Sevin XLR were applied for disease and pest control. Weed control was achieved through cultivation and hand weeding. The tomato plots were caged and mulched. No irrigation was made available to the garden.

Results and Discussion

Growing conditions throughout the season were favorable and yields were good for all crops. Yield results for the five vegetables tested are presented in (Table 2). The compost treatment increased the total yield and size of four of the vegetables tested, while the humic acid treatment was effective on two. Both soil amending products were effective on the potato and tomato crops, while neither was effective on the onion variety tested. The yield responses with the compost treatment were quite large, ranging from 18 to 45%, with the tomato and potato crops providing the greatest responses for both products. In most cases the yield increase was the result of both an increase in fruit size and number. Interestingly, the compost treatment caused a delay in the maturity of the green bean variety, while at the same time it increased the early harvest of the tomato variety.

Soil samples taken at the end of the growing season (Table 1) indicate that the humic acid treatment had little effect on the soil fertility

measurements taken, while the compost treatment caused all the soil phosphorous, potassium, and organic matter levels to rise.

Based on this one-year study, it is apparent that many garden vegetables will indeed respond to certain soil amendments, even in a high-fertility environment. The yield responses were larger and more consistent for the compost treatment, and only the compost treatment increased soil fertility levels. What is not apparent from this study is exactly which soil property was affected by the soil amendment and thus caused the yield increases. Did the soil amendments increase soil nutrients, water, holding capacity, density, porosity. or microorganisms? Further experiments would be needed to explore this question.

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Table 1. Soil analysis results.

	Soil Sampling Dates	
Treatment	April 15, 2004	November 10, 2004
Check	7.0 pH, 4.6% OM 45 ppm P, 203 ppm K	7.2 pH, 3.4% OM 25 ppm P, 130 ppm K
Compost	7.0 pH, 4.6% OM 45 ppm P, 203 ppm K	7.0 pH, 5.2% OM 67 ppm P, 693 ppm K
Humic Acid	7.0 pH, 4.6% OM 45 ppm P, 203 ppm K	7.4 pH, 3.0% OM 26 ppm P, 144 ppm K

Table 2. Crop yields for five garden vegetables.

Potato

Variety = Yukon Gold
Harvest Date = August 6
Harvest Area = 1 row × 8 ft, 4 reps.

Treatment	# of Tubers	Lb/tuber	Total yield (lb/plot)
Check	113	0.38	43.5
Compost	159	0.5	79.2
Humic acid	110	0.48	52.5

Onion

Variety = Copra
Harvest Date = August 9
Harvest Area = 1 row × 8 ft, 4 reps

Treatment	# of Bulbs	Lb/bulb	Total yield (lb/plot)
Check	66	0.71	46.6
Compost	66	0.72	47.3
Humic Acid	65	0.71	46.4

Green Bean

Variety = Jade
Harvest dates = July 12, 15, 19, 23, 26
Harvest area = 1 row × 8 ft, 4 reps

Treatment	Grams/10 pods	Early yield (lb)	Total yield (lb)
Check	70	20.7	42.7
Compost	74	19.8	51.9
Humic Acid	67	21.5	42.6

Sweet Corn

Varieties = Ambrosia (early), Delectable (mid), Seneca Dancer (late)
Harvest Dates = August 6, August 9, August 25
Harvest Area = 1 row × 8 ft, 4 reps

Treatment	# of Ears	Lb/ears	Total yield (lb)
Check	181	0.76	136.9
Compost	212	0.8	169.7
Humic acid	186	0.72	134.8

Tomato

Variety = Florida 47
Harvest Dates = August 9, 15, 19, 26, 31 and September 3, 9, 16, 20, 28
Harvest area = 1 row × 8 ft, 4 reps

Treatment	# of Fruit	Early yield (lb)	Total yield (lb)
Check	0.58	68.1	351.4
Compost	0.59	213.8	490.2
Humic acid	0.62	116.8	447.2