Compost Specialist coffee grounds and soil trial November 2008-September 2009

The popularity of gourmet coffee has given rise to a new problem in organic waste; what to do with the estimated million pounds of coffee grounds produced in Lane County alone each year. Popular gardening advice touts the benefits of coffee grounds for acid loving plants, as a slug repellant and soil amendment. Little research based information is available to back up many of these claims. From November 2008 to September 2009 OSU Extension Service Master Gardener Compost Specialists in Lane County conducted an observational trial to see what the effect coffee grounds had on soil pH and nitrogen content when incorporated into soil. Three locations were used, one at the OSU Extension Service in Eugene, and two at private homes.

Each location divided the trial plot into thirds, one as a control in which no coffee grounds were used, one with 2“ of coffee grounds and one with 4“ of coffee grounds. At each location a soil sample was taken from each of the three plots to set a baseline pH and nitrogen level. Coffee grounds were collected and then incorporated into the soil to a depth of about 10” (about one shovel full deep). The plots were then covered with burlap coffee sacks and left undisturbed until March when a second soil sample was taken from each plot. In June a third sample was taken from each of the plots at each location. All samples were sent to a certified soil lab for analysis.

The following are the results of the samples taken from each of the plots at each location. Compost Specialist coffee grounds and soil trial ~ November 2008-June 2009

Name	pH Nov	NH4 Nov	NO3 Nov	Mineralizable Nitrogen
Private H		ammonia	nitrate	
No grounds	6.2	4.8ppm	3.0ppm	16.2ppm
2” grounds	6.0	9.5ppm	9.5ppm	7.5ppm
4” grounds	6.0	12.8ppm	2.3ppm	8.2ppm
Hafner	pH March	NH4 March	NO3 March	
No grounds	6.2	4.5ppm	1.0ppm	
2” grounds	5.8	5.3ppm	2.3ppm	
4”grounds	5.6	18.3ppm	3.0ppm	
Hafner	pH June	NH4 June	NO3 June	
No grounds	6.1	10.3ppm	11.3ppm	
2” grounds	6.0	13.0ppm	14.5ppm	
4” grounds	6.0	9.3ppm	16.5ppm	
Private M	pH Nov	NH4 Nov	NO3 Nov	Nov
No grounds	6.1	8.5ppm	8.3ppm	28.5ppm
2” grounds	6.0	15.3ppm	1.8ppm	11.7ppm
4” grounds	5.8	17.8ppm	23.8ppm	14.2ppm
Moore	pH March	NH4 March	NO3 March	
No grounds	6.3	6.3ppm	5.5ppm	
2” grounds	6.0	12.8ppm	2.8ppm	
4” grounds	5.5	22.0ppm	13.0ppm	
Moore	pH June	NH4 June	NO3 June	
No grounds	6.0	8.5ppm	25.3ppm	
2” grounds	5.9	13.3ppm	30.5ppm	
4” grounds	5.5	35.0ppm	24.0ppm	
Extension	pH Nov	NH4 Nov	NO3 Nov	Nov
No grounds	6.2	40.0ppm	110.0ppm	49.0ppm
2” grounds	6.4	39.0ppm	10.0ppm	22.0ppm
4” grounds	5.5	59.0ppm	7.5ppm	52.0ppm
Extension 2 “	pH March	NH4 March	NO3 March	
No grounds	6.8	8.5ppm	2.3ppm	
2” grounds	5.9	39.5ppm	4.3ppm	
4”grounds	6.0	35.5ppm	2.8ppm	
Extension 4”	pH June	NH4 June	NO3 June	
No grounds	6.4	11.0ppm	13.3ppm	
2’ grounds	6.3	57.5ppm	32.0ppm	
4”grounds	5.9	112.5ppm	71.3ppm	

Over the course of the trial pH remained relatively stable fluctuating between two to four tenths of a point. All soil samples were moderately acidic to begin with.

In June each plot was planted with Contender bush beans to see if the coffee grounds provided enough nitrogen to grow a crop of beans to maturity. No supplemental nutrition was added to the plots during the growing season

Observations

Beans all germinated well in all locations.
Coffee grounds did not seem to affect rates of germination.
Early growth of bush beans was comparable in all plots.
Plants that grew in the 2” bed and the 4” bed showed slower rates of later growth than those planted in the bed with no coffee grounds.
Plants grown in the coffee grounds free soil showed larger plants, greener growth and overall greater health and vigor.
Beans were more abundant, longer and a darker green in the no grounds bed than in the experimental beds.
Plants grown in the 4” plot showed greater yellowing of leaves than in the other two beds.
Soil tilth was affected. Plots with no grounds drained slowly when watered. Plots with 2” of grounds showed a crumbly soil structure with medium sized aggregates, good drainage and good retention of water. Plots with 4” of grounds showed crumbly soil structure with larger aggregates, fast drainage, and good water retention.
Some residual non-decomposed grounds were still observed in June 2009 in the soil in all plots.

Yields from Extension plot (3’X3’ plot)

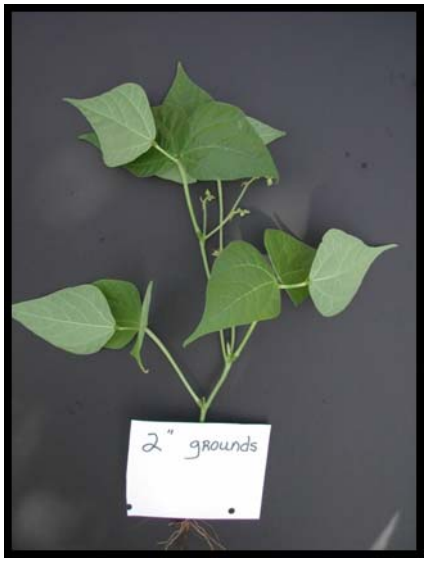
	First harvest August 18	Second harvest August 31	Total
No grounds	1lb 12oz	10 oz	2 lb 6oz
2” of grounds	8oz	8oz	1 lb
4 “of grounds	12oz	4oz	1 lb

Yields from Private M plot (3’x3’ plot)

	Single harvest 9/1/09	Total
No grounds	3.1 oz	3.1 oz
2” of grounds	7.5 oz	7.5 oz
4” of grounds	3.55 oz	3.55 oz

No results were available from Private H plot

Bean growth showing the results when grown in no coffee grounds added, 2” grounds added and 4” grounds added.



Conclusions?

From the observations of each plot June 2009 to September 2009 non-composted coffee grounds did appear to affect the growth rate and productivity of bush beans. Greater amounts of coffee grounds incorporated into the soil did appear to have a more adverse effect on the growth and productivity of plants than smaller amounts.

Six months did not appear to be sufficient time to fully decompose the grounds in the soil. Based on our observations we would recommend that when coffee grounds are added to soil it may take up to a year before full decomposition takes place. We would encourage coffee grounds be added to compost piles and be fully decomposed before adding to soil as a soil amendment.

*This trial was an observational trial only. Further controlled studies need to be done to determine the value and appropriate amount of coffee grounds used as a soil amendment and nutritional source for growing plants.