Effect of Bioreactor Extract on Corn Yield and Soil Properties

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Objective

Determine the effect of Johnson-Su compost bioreactor extract on corn production and soil properties.

Background

Crop Year: 2024	Previous Crop: Wheat
Location: Margraff Farms	Tillage: No-till
County/Town: McCutchenville/Seneca, Ohio	Planting Date: 05/25/2024
Soil Type: Blount Silty Loam	Seeding Rate: 32,000
Drainage: Pattern Tile	Harvest Date: 10/29/2024

This study compares the effect of a home-grown biological on agronomic and corn yield results. Johnson-Su compost extract is a liquid made by diluting compost in water. The compost consists of local soil, cattle manure and straw bedding, earthworms, and grass clippings which are layered in a watertight tote and kept moist and above freezing for 9 months. Aeration tubes are inserted but the pile is not turned. A soil amendment is created that is rich in beneficial microbes, especially fungi. A mesh bag of compost is drenched in a water filled container to create a liquid extract. The extract is then applied through a corn planter pop-up system at a rate of 6 gallon/acre. The extract was tested by the Living Soil Compost Lab to verify viability and beneficial microbe content.

Methods

This study utilized a randomized complete block design with two treatments and four replications. The two treatments in this study were 1) No extract added and 2) 6 gallons of extract added directly on corn seed. Each treatment replication was 30 feet wide by 1700 feet long. Sidedressed UAN nitrogen was reduced by 5 gallons/acre in the extract treatment compared to no extract treatments. Fall of 2023 an application of 2 tons/acre poultry litter was applied to all treatments. All treatments received the same fertilizer and other agronomic inputs. On August 1, 2023, a multi-species cover crop mix was drilled into wheat stubble. Corn was no-till planted into green cover crop which was terminated with glyphosate.

Soil samples were collected on July 2, 2024, by sampling across the corn row. A micro biometer was used on the same soil samples to determine percent fungi and microbial biomass. Corn ear leaf tissue samples were collected at R1 on July 23, 2024. Yields and moistures were obtained by using a calibrated yield monitor. Yields were adjusted to 15.5% moisture.

Results

Table 1. Impact of Bioreactor Extract on Grain Yield and Return				
Extract gal/ac	**Total UAN gal/ac**	**UAN($/ac)**	**Yield (bu/ac) Grain $**	**Return ($/ac)**
0	67	117.25	141.2a 529.50	412.25
6	62	108.50	143.9a 539.62	431.12
C.V = 5.98; LSD (0.10) = 14.19 Corn = $3.75 UAN = $1.75/gal				

Table 2. Weather Data

Growing Season Weather Summary							
	APR	**MAY**	**JUNE**	**JUL**	**AUG**	**SEP**	**Total**
Precip (in.)	6.00	4.66	2.80	1.91	2.94	2.49	20.80
Cumulative GDDs	240	729	1390	2109	2793	3360	3360

Table 3a. Agronomic Results- Soil Tests			
LSD (P<10)	**No Extract**	**6-Gal Extract**	**CV**
OM %	3.6	3.4	4.5
P-M3 (ppm)	69.0	59.5	21.05
K (ppm)	178	191.5	6.18
pH	6.9	7.0	1.31
CEC	16.5	16.5	11.29

Table 3b. Agronomic Results- Tissue Tests			
LSD (P<10)	**No Extract**	**6-Gal Extract**	**CV**
N %	4.0	3.9	3.52
P %	0.4	0.4	2.45
K %	2.3	2.3	5.14
Mg %	0.3	0.2	16.69
Ca %	0.5	0.5	8.25
S %	0.3	0.2	8.08
Micro Biometer % Fungi	26.3	34.0	25.6
Microbial Biomass µgC/g	217.5	281.5	17.56

Summary

There was not a statistical difference in corn yield with the addition of bioreactor extract. Additionally, there was an economic advantage to the amendment. The treatment returned $18.87 per acre more after the UAN cost was realized (Table 1). Soil nutrients, chemical properties and plant nutrient content showed no significant difference with an extract amendment (Table 3a & 3b). The extract treatment trended higher percent fungi and microbial biomass but the differences were not statistically significant.

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