

Project: Evaluation of Manure Ash Fertilizer Formulations to Provide Nitrogen and Potassium.

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Summary: Three manure ash products were formulated for use at golf courses to supply potassium and nitrogen. Product 1 (P1) is a potassium (K) source primarily using ash. Product 2 (P2) is a K and nitrogen (N) source using ash and urea. Product 4 (P4) is a potassium and nitrogen source using ash and blood meal. Eco Soil Systems 0-2-34 was used as a commercial product comparison.

Each product was applied to a golf course approach area to determine efficacy in delivering potassium and nitrogen to the turfgrass. Turfgrass tissues collected from P2 treated areas reported significantly higher K and N levels than the other treatments. All three products increased tissue potassium levels compared to the non-treated check plots two weeks after treatment (WAT). None of the products provided significant increases in tissue K or N at the 4 or 6 WAT evaluations. In addition, none of the products significantly increased soil K levels. Product 2 performed significantly better than the commercial standard (Eco Soil Systems 0-2-34) based upon 2 WAT tissue evaluations. Products 1 and 4 were equivalent to the commercial standard for K and N tissue levels but

both products exceeded the commercial standard in clipping weight at 2 WAT. Based upon these results and the discussion below, all three products are suitable for use as potassium sources and the nitrogen containing products 2 and 4 improved turfgrass color.

Materials and methods

Fertilizers were applied on a bentgrass approach at Dove Canyon Country Club on July 7, 1994. Applications were made with a Gandy drop spreader. Tissues were air dried prior to shipping to Brookside Laboratories, New Knoxville, Ohio for analysis. Due to product contamination at the 2 and 4 WAT sampling, tissues were washed briefly in water to separate tissue from granules. Tissues were air dried after washing prior to shipping to Brookside for analysis. Soil Samples were collected using a 1 inch diameter soil sampler to a depth of approximately 4 inches. Soils were also analyzed by Brookside Laboratories.

Product 1 (0.2-3.5-4) was applied at 2 lb K₂O/1000 sq ft. Product 2 (5.4-2.8-3.7) was applied at 1 lb N/1000 sq ft. Product 4 (3.1-2.9-3.7) was applied at

1 lb N/1000 sq ft. Eco Soil Systems (0-2-34) was applied at 2 lbs K₂O/1000 sq ft.

Results and discussion

All three products (P1, P2, P4) performed similar to the commercial standard (Eco Soil Systems 0-2-34). Table 1 summarizes the tissue K levels at 0, 2, 4, and 6 WAT. All treatments were significantly higher than the non-treated check at 2 WAT only. Product 2 provided the largest increase in tissue potassium. Table 2 summarizes the tissue N levels at 0, 2, 4, and 6 WAT. Only P2 provided significantly higher tissue nitrogen levels compared to the non-treated check. Table 3 lists the clipping weight increases and improvement in turfgrass color. Products 2 and 4 were expected to provide a nitrogen

response with greater clipping yield and color improvement. The color improvement was consistent with the expected nitrogen response. The clipping increase reported for P1 can not be explained. Only the 1.2 lb N/1000 sq ft rate treatment of P4 significantly increased clipping yield but both the 1.0 and 1.2 lb N/1000 sq ft treatments of P4 improved turfgrass color. Only clipping weight and color data were collected for the 1.2 lb N/1000 sq ft P4 treatment

The table at the end of this report provides a complete summary of averages for each time point for each parameter measured. The abbreviations used in the tables are described below:

Table abbreviation Description

WAT	Weeks after treatment
B-Soil	Soil boron levels (ppm)
B-Tissue	Tissue boron levels (ppm)
Ca-Soil	Soil calcium levels (ppm)
Ca-Tissue	Tissue calcium levels (percent)
Cl-Soil	Soil chlorine levels (ppm)
Cl-Tissue	Tissue chlorine levels (ppm)
EC-Soil	Soil electrical conductivity (dS/m)
K-Soil	Soil potassium levels (ppm)
K-Tissue	Tissue potassium levels (percent)
Na-Soil	Soil sodium levels (ppm)
Na-Tissue	Tissue sodium levels (ppm)
N-Tissue	Tissue nitrogen levels (percent)

Table values followed by the same letter are not significantly different (Fisher's LSD $p=0.05$). Analysis of variance was conducted only within each treatment for each rating time (0, 2, 4, 6 WAT). For example, Product 1 reports 1.1c 0.9 b, 0.9 b, and 0.8 a for B-soil values at 0, 2, 4, and 6 WAT respectively. This indicates that soil boron levels were significantly higher at the beginning of the trial (0 WAT) than at 2, 4, or 6 WAT. There was no difference between the 2 and 4 WAT values and the 6 WAT value was significantly lower than all other values.

Table 1. Tissue potassium levels 0, 2, 4, and 6 weeks after treatment (WAT). Product 1 = P1, Product 2 = P2, Product 4 = P4, Eco Soil Systems = ECO, non-treated check = CHK. Numbers followed by the same letter are not significantly different (Fisher's LSD $p=0.05$).

0 WAT		2 WAT		4 WAT		6 WAT	
TRT	% Tissue K	TRT	% Tissue K	TRT	% Tissue K	TRT	% Tissue K
P1	2.6 a	P2	3.2 a	CHK	3.0 a	P4	2.6 a
P2	2.6 a	ECO	2.9 b	P4	2.4 a	P2	2.6 ab
P4	2.6 a	P4	2.8 b	P1	2.3 a	P1	2.4 ab
ECO	2.5 a	P1	2.7 b	P2	2.3 a	CHK	2.4 ab
CHK	2.5 a	CHK	2.6 c	ECO	2.2 a	ECO	2.3 b

Table 2. Tissue Nitrogen levels 0, 2, 4, and 6 weeks after treatment (WAT). Product 1 = P1, Product 2 = P2, Product 4 = P4, Eco Soil Systems = ECO, non-treated check = CHK. Numbers followed by the same letter are not significantly different (Fisher's LSD $p=0.05$).

0 WAT		2 WAT		4 WAT		6 WAT	
TRT	% Tissue N	TRT	% Tissue N	TRT	% Tissue N	TRT	% Tissue N
P4	4.4 a	P2	4.7 a	P4	5.3 a	P4	4.9 a
P2	4.4 a	P4	4.7 b	P2	5.1 a	P1	4.8 ab
CHK	4.4 a	CHK	4.4 b	P1	4.8 a	P2	4.6 ab
P1	4.3 a	P1	4.3 b	ECO	4.3 a	CHK	4.6 ab
ECO	4.2 a	ECO	4.0 b	CHK	4.1 a	ECO	4.2 b

Table 3. Clipping fresh weights in grams 2 weeks after treatment (WAT). Product 1 = P1, Product 2 = P2, Product 4 = P4, Eco Soil Systems = ECO, non-treated check = CHK. Numbers followed by the same letter are not significantly different (Fisher's LSD $p=0.05$).

TRT	Clippings (g fwt)	Improved Color
P2	391 a	Yes
P4 (1.2 lbs N)	365 a	Yes
P1	357 a	No
P4 (1.0 lb N)	345 ab	Yes
CHK	285 b	No
ECO	276 b	No