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Liquid Swine Manure as a Fertilizer Source for Annual and Perennial Grass Forage

Stephen K. Barnhart
Iowa State University

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Abstract
Manure application during the mid-summer months is a problem on many farms. Corn or soybeans occupy most of the crop acres. Producers inquire as to the advisability of applying liquid swine manure to established bromegrass or an annual forage grass crop. A series of studies was initiated in 1998 at the Northern Iowa Research Farm to investigate the suitability of liquid swine pit manure as a fertilizer source for annual and perennial grass forage crops.

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Stephen K. Barnhart, professor
Department of Agronomy

Introduction

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Materials and Methods

1998. Swine pit manure was applied to a crop of Japanese millet, a warm-season annual grass frequently used as an emergency summer forage. Manure was 'hand applied' to individual plots using a PTO-driven pump. Manure rates of 0, 3000, 4500, 6000, and 9000 gallons/acre were applied.

1999. The same application equipment was used to apply liquid swine pit manure treatments to established smooth bromegrass. Treatment rates for the smooth bromegrass were 0, 2000, 4000 and 6000 gallons/acre, and commercial fertilizer at levels approximately equivalent to 2000 and 4000 gallon manure applications. The nutrient concentrations in the manure used were 37.9, 31.7 and 28.1 lb/1000 gallons of N, P_2O_5, and K_2O, respectively. The 2000 and 4000 gallons/acre manure rates were applied to different sets of plots following each of the two harvest periods in 1999. The 6000 gallon manure rate and the commercial N-P-K were applied after the first harvest only.

Plot yield estimates were recorded for the late summer harvest. Yields reported are for the second harvest of smooth bromegrass. Due to the planned post-harvest manure applications, these yields do not reflect well all of the effects of the manure application treatments made in the application year; however, they do reflect the post- first-cut manure and commercial fertilizer treatments. Seasonal yield totals are not available.

2000. First harvest yields of this study were taken to provide an indication of the residual effects of manure and fertilizer treatments of the previous year. Plots have been retained for further evaluation. As part of a larger soil sampling and testing project at the farm, soil samples were taken in the spring of 2000.

Results and Discussion

The Japanese millet, a grass crop, responded with an increasing yield at each manure application level, Table 1. Swine manure applied to smooth bromegrass after first cut greatly improved yields of second cut and first cut yields the following spring, Table 2. These studies indicate that liquid swine pit manure can be surface applied at rates up to 6000 gallons/acre as a fertilizer nutrient source for smooth bromegrass. More research on manure application timing is needed. The soil test data and those summarized in Table 3, indicate that applications of swine manure and commercial fertilizer increased the soil test values for phosphorus, and that data from individual plots are verifying that soil pH and the different laboratory testing procedures used have an influence on test indices. Work continues on interpretation of these soil testing results.

Table 1. Dry matter yields of foxtail millet fertilized with liquid swine pit manure.

Manure Application Rate	Approximate Fertilizer Nutrient Equivalent			One-Cut Yield of Japanese Millet
	Nitrogen	P_2O_5	K_2O	
gallons/acre	------ lb/acre ------			dry matter tons/acre
0	-	-	-	0.6
3000	150	105	75	1.27
4500	225	158	113	1.34
6000	300	210	150	1.95
9000	450	316	226	2.23

Table 2. Yield response of smooth bromegrass to swine manure and commercial fertilizer.

Treatment		Yield	
Manure or Fertilizer Rate	Application Time	1999 (Aug 18)	2000 (June 6)
lb or gallons/acre		------dry matter, tons/acre-----	
0	- -	0.74	0.82
2000 gal	Post 1st cut	1.70	1.35
2000 gal equivalent ($115\ N / 72\ P_2O_5 / 55\ K_2O$)	Post 1st	2.14	1.27
4000 gal	Post 1st	2.36	1.40
NPK 4000 gal equivalent ($230\ N / 144\ P_2O_5 / 110\ K_2O$)	Post 1st	2.29	1.81
6000 gal	Post 1st	2.66	1.72
2000 gal	Post 2nd	0.85	1.35
4000 gal	Post 2nd	0.85	2.99

Table 3. Summary of soil test results taken in 2000.

	Soil test values and fertility level indices			
Treatment Rate Averages	Bray P1	Olsen P	Mehlich-3 P	pH
control	24.2 (Optimum)	11.3 (Optimum)	26.2 (High)	6.7
2000 gal	26.3 (High)	11.5 Optimum)	30.5 (High)	7.0
4000 gal	36.2 (V.High)	18.2 (Optimum)	42.8 (V.High)	7.0
6000 gal	49.5 (V.High)	26.2 (V.High)	53.0 (V.High)	6.7
NPK-2000 gal equivalent	23.5 (Optimum)	10.8 (V.Low)	31.2 (V.High)	7.4
NPK-4000 gal	39.7 (V.High)	18.2 (Optimum)	51.0 (V.High)	7.7