

Nutrient Content of Liquid Dairy Manure in Iowa

RFR-A17120

Mark Honeyman, associate dean
Research and Demonstration Farms
Ben Drescher, manager
Department of Animal Science

Introduction

In 2008, ISU built a new dairy farm for research, teaching, and extension programs. The farm was designed for approximately 400 milking cows, plus capacity for developing heifers. The lactating cows are housed in a curtain-sided barn with free stalls. The free stalls are bedded with wood shavings and/or separated manure solids. The alley manure is scraped daily into a pit and moved to the solids separator.

Materials and Methods

Manure from the lactating cows is collected and processed through a solids separator (FAN Press Screw Separator). The liquid fraction is stored in a 3.5 million gallon open-top glass-lined tank (slurry store). The liquid dairy manure is agitated for 24 hours and then field applied via an umbilical-injection system into adjacent crop fields each spring and fall. The liquid manure is sampled after agitation and tested for nutrient content at each application. Tests are conducted by a certified commercial laboratory. There are at least two samples collected each season.

Results and Discussion

Results of the liquid manure test analyses are shown in Table 1 for the primary nutrients in the manure – nitrogen, phosphorous, and potassium. The phosphorus content was as P^2O^5 and the potassium content was as K^2O .

The liquid manure is approximately 95 percent water (total moisture). Nitrogen values ranged from 19.6 to 26 lb N/1,000 gallons as total nitrogen with an overall mean of 24.56 lb N/1,000 gallons (S.D. 2.57). Phosphorous ranged from 7 to 14 lb P/1,000 gallons with an overall mean of 10.19 lb P/1,000 gallons (S.D. 2.02). Potassium values ranged from 16 to 22.5 lb K/1,000 gallons with an overall mean of 19.25 lb K/1,000 gallons (S.D. 2.11).

In calculating the coefficient of variation (CV), the CV for N and K is 10.5 and 11.0 percent, respectively. However, the CV for P was approximately double at 19.8 percent. The authors do not have an explanation for this increased variation in P content of the dairy manure. Variations in rainfall, agitation, or manure separator settings should have impacted the other nutrient contents similarly.

Table 1. Nutrient content of liquid dairy manure, ISU Dairy Farm, Ames, IA.*

	Nitrogen		Phosphorus as P ² O ⁵		Potassium as K ² O	
	lb N/1,000 gal		lb P/1,000 gal		lb K/1,000 gal	
Year	Fall	Spring	Fall	Spring	Fall	Spring
2017	23.00	26.30	9.00	12.50	20.00	20.90
2016	20.50	23.40	11.70	11.70	20.00	22.50
2015	19.60	25.45	8.80	10.90	21.70	16.70
2014	25.00	26.70	9.20	10.00	20.90	18.40
2013	25.00	25.00	9.20	7.00	20.90	18.00
2012	21.70	26.00	8.40	8.00	20.50	16.00
2011	24.40	29.00	8.20	14.00	18.20	20.00
2010	22.50	28.00	9.00	11.00	16.00	20.00
2009	26.00	na	13.00	na	16.50	na
Seasonal						
Mean	23.08	26.23	9.61	10.64	19.41	19.06
Max.	26.00	29.00	13.00	14.00	21.70	22.50
Min.	19.60	23.40	8.20	7.00	16.00	16.00
Std. dev.	2.20	1.74	1.62	2.29	2.03	2.19
Overall						
Mean	24.56		10.19		19.25	
Max.	29.00		14.00		22.50	
Min.	19.60		7.00		16.00	
Std. dev.	2.57		2.02		2.11	

*Values are the average of two samples at each pumping season after agitation.

Liquid dairy manure stored in an open top glass-lined tank after processing through a solids separator.