



Dairy Diet Phosphorus Source Effects on Runoff Losses

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Study Objective

- Compare P in simulated rainfall and natural runoff following land application of manure generated by feeding dairy cows three separate dietary P levels.





Three Feed P Variables

- 0.35% P basic diet
(National Research Council Feed Recommendations)
- 0.50% P organic diet
(additional organic P source)
- 0.50% P inorganic diet
(additional inorganic P source)



Formulation of diets

Ingredients	TMR 0.35% P- Basic	TMR 0.50% P- Organic	TMR 0.50%P- Inorganic
	-----	% diet DM	-----
Alfalfa silage	24.51	14.30	24.44
Corn silage	37.38	34.50	37.27
High moisture shelled corn	20.80	20.14	20.74
Roasted soybeans	9.38	6.02	9.35
SB meal, 48% CP	6.12	5.43	6.10
Wheat bran	0.49	8.50	0.49
Corn distiller's grain + solubles	0.00	9.54	0.00
Calcium carbonate	0.50	0.72	0.00
Di-calcium phosphate	0.00	0.00	0.76



Rainfall Simulation Study

- 4 replications of each:
 - NT control
 - CP control
 - NT @ 0.35% P
NRC recommended diet
 - NT @ 0.50% P
Organic diet
 - NT @ 0.50% P
Inorganic diet
 - CP @ 0.50 % P
Inorganic diet



Natural rainfall study

- 4 replications of each:
- NT control
- NT @ 0.35% P
NRC recommended diet
- NT @ 0.50% P
Organic diet
- NT @ 0.50% P
Inorganic diet



Measurements

- Dissolved Reactive P (DRP)
- Total P (TP)
- Sediment



P Concentrations in Manure

Diet	% Total P	% WEP
Basic 0.35% P	45	27
Organic 0.50% P	54	56
Inorganic 0.50% P	64	46



Rainfall Simulation

DRP conc.

Treatment	Fall <u>ppm</u>	Spring <u>ppm</u>
NT control	0.25 b	0.07
CP control	0.14 b	0.09
NT 0.35% basic	0.96 ab	0.73
NT 0.50% organic	1.25 a	0.19
NT 0.50% inorganic	1.32 a	0.47
CP 0.50% inorganic	0.22 b	0.17



Rainfall Simulation

Sediment conc.

Treatment	Fall <u>ppm</u>	Spring <u>ppm</u>
NT control	0.63 c	0.97 b
CP control	2.46 ab	1.90 ab
NT 0.35% basic	0.79 c	0.67 b
NT 0.50% organic	0.91 bc	1.06 b
NT 0.50% inorganic	1.15 bc	0.89 b
CP 0.50% inorganic	3.38 a	2.78 a



Natural Rainfall

Nov. 25, 2003

Treatment	DRP ppm	TP ppm
NT control	0.18 d	1.29 b
NT 0.35% basic	1.52 b	3.84 a
NT 0.50% organic	2.18 a	4.08 a
NT 0.50% inorganic	0.78 c	1.83 b



Natural Rainfall

Feb. 23, 2004

Treatment	DRP ppm	TP ppm
NT control	0.15 b	0.32 c
NT 0.35% basic	2.31 b	2.70 b
NT 0.50% organic	6.48 a	7.97 a
NT 0.50% inorganic	2.19 b	2.44 bc



Natural Rainfall

Aug. 4, 2004

Treatment	Cumulative Runoff Load inches	Cumulative Sediment Load lb/acre
NT control	3.5 a	866 a
NT 0.35% basic	1.85 b	316 b
NT 0.50% organic	1.73 b	319 b
NT 0.50% inorganic	1.85 b	244 b



Summary

- Natural runoff – high P organic diet had higher DRP and TP than inorganic diets or control.
- Excess diet P from organic sources had higher risk of P runoff losses.
- Diets containing recommended P levels had lower runoff P than high P organic diets.