

Effect of a Limit-Feeding Regimen on Growth and Fecal Excretion of Gravid Holstein Heifers



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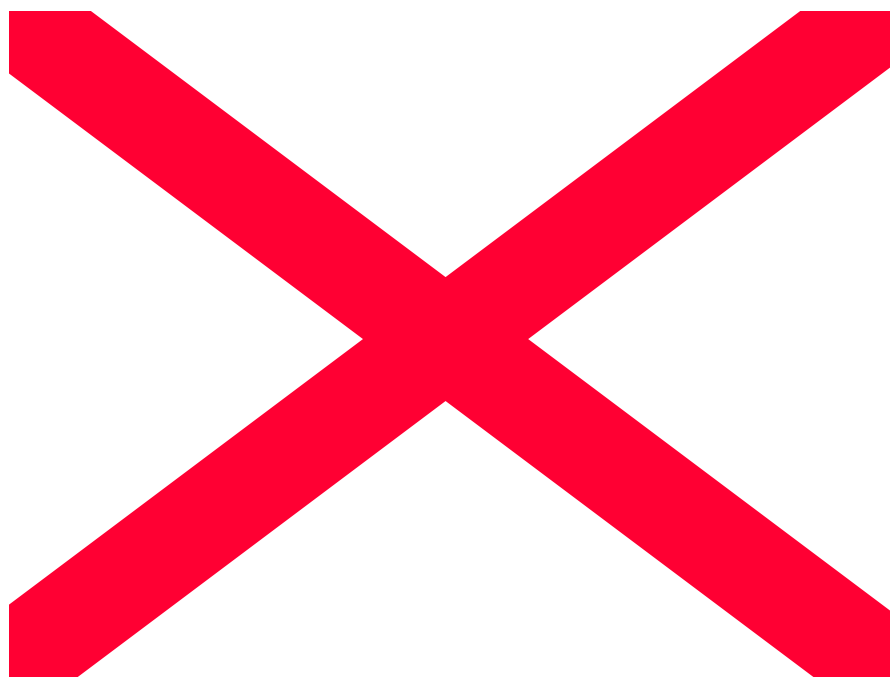
Trial Design

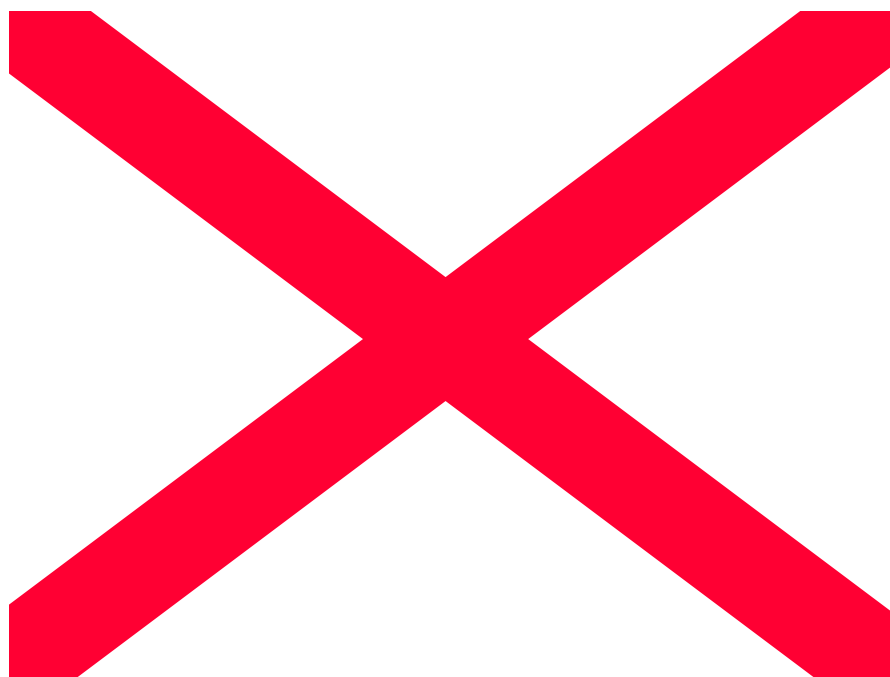
- * 54 Holstein Heifers (1000 lbs $\pm$ 99)**
- * Randomized Design (3 pen replicates/trt – 6 heifers/pen)**
- * 111 d Feeding Period (TMR)**
- * 3 Treatment Diets**
 - Control**
 - L-90 (Limit-Fed @ 90 % of DMI)**
 - L-80 (Limit-Fed @ 80 % of DMI)**
- * Goal = Isocaloric and Isonitrogenous Intakes**



Measurements

- * DM and Nutrient Intakes
- * Growth (Body Weight, Height, Heart Girth)
- * Blood (Protein, Glucose, AP)
- * Fecal Excretion
- * Behavior
- * Parturition (Body Weight, Dystocia)
- * 90 d Milk Production







Treatment Diets

Table 1. Ingredient and nutrient composition of treatment diets.

Item	Treatment (% Ad libitum intake)		
	C-100	L-90	L-80
Ingredient	-----	% of DM	-----
Small grain silage	47.0	39.6	30.5
Corn silage	47.3	40.7	32.2
Shelled corn	2.1	11.5	23.5
Soybean meal	2.0	6.4	11.7
Urea	0.51	0.52	0.51
Calcium carbonate	0.32	0.43	0.61
Sodium bicarbonate	0.11	0.14	0.19
Magnesium Sulfate	0.39	0.43	0.49
Vitamin premix	0.18	0.20	0.22
Mineral premix	0.13	0.15	0.17
Nutrient composition			
DM	40.2	43.0	51.2
CP	11.3	12.7	14.2
NDF	47.3	41.8	35.6
IV NDFD, % NDF	60.9	59.1	59.7
NFC	34.0	38.2	42.9
Fat	2.3	2.3	2.5
P	0.27	0.29	0.31
Ca	0.40	0.45	0.49
K	1.7	1.6	1.5
Mg	0.18	0.19	0.20
Ash	7.1	7.0	6.9
Energy Calculations			
TDN	67.5	70.0	73.9
ME, Mcal/kg	2.46	2.55	2.69
NE _g , Mcal/kg	0.97	1.04	1.15
NE _m , Mcal/kg	1.41	1.48	1.57

Table 2. Nutrient and energy intake of heifers fed treatment diets.

Item	Treatment ¹		
	C-100	R-90	R-80
Nutrient intake, lbs/d			
DM	21.3	19.9	18.3
CP	2.42	2.54	2.57
NDF	10.06	8.29	6.50
Non-fiber carbohydrate	7.26	7.60	7.85
P	0.057	0.058	0.058
Ca	0.086	0.090	0.089
Energy intake ³			
TDN, lbs/heifer/d	14.4	13.9	13.5
NE _g , Mcals/d	9.4	9.4	9.5
NE _m , Mcals/d	13.7	13.3	13.0

Hoffman et al. 2005

Table 3. Effect of dietary regimen on body size and growth of replacement heifers.

Item	Treatment ¹		
	C-100	R-90	R-80
Initial			
Weight, lbs	1036	1021	1011
Hip height, in	54.20	54.60	54.90
Body condition score	3.1	3.0	2.9
Final			
Weight, lbs	1220	1234	1217
Hip height, in	56.0	56.3	56.4
Body condition score	3.2	3.2	3.2
Growth			
Average daily gain, lbs/d	1.66	1.92	1.84
Feed efficiency, lbs DM/lb gain	13.2	10.7	11.1
Excretion			
DM, lbs/d	7.7	6.9	5.8

Hoffman et al. 2005

Table 4. Effect of feeding regimen on voluntary behavior of replacement heifers¹.

Item	Treatment ²		
	C-100	R-90	R-80
Eating, % of time	19.3	15.7	10.3
Standing, % of time	19.6	24.4	32.9
Lying, % of time	60.9	59.8	56.7
Vocalization, % of time	0.02	0.04	1.10
Eating, hrs/day	2.3	1.9	1.2
Standing, hrs/day	4.7	5.8	7.9
Lying, hrs/day	14.6	14.4	13.6

Hoffman et al. 2005





Table 4. Effect of limit feeding on fecal excretion of replacement heifers.

Item	Treatment ¹			SEM	Effect(P<) ²		
	C100	L90	L80		Treatment	Linear	C vs L
Intake							
DM, kg/d	10.0	9.1	7.8	0.2	0.002	0.001	0.002
N, g/d	182.9	181.4	181.8	5.3	...	...	...
P, g/d	27.2	26.1	27.2	0.6	...	...	...
Excretion							
DM, kg/d	3.5	3.1	2.6	0.3	...	0.10	0.10
N, g/d	140.2	141.7	146.8	9.7	...	...	...
P, g/d	24.7	25.2	24.3	2.3	...	...	...
Urea nitrogen retention ³							
N, g/d	42.4	39.5	35.2	11.9	...	...	...
P, g/d	2.5	1.1	2.8	2.3	...	...	...

C100, control heifers fed ad libitum, L90, limited to 90.0 percent of intake, L80, limited to 80.0 of intake.

Treatment means expressed on a per heifer basis.

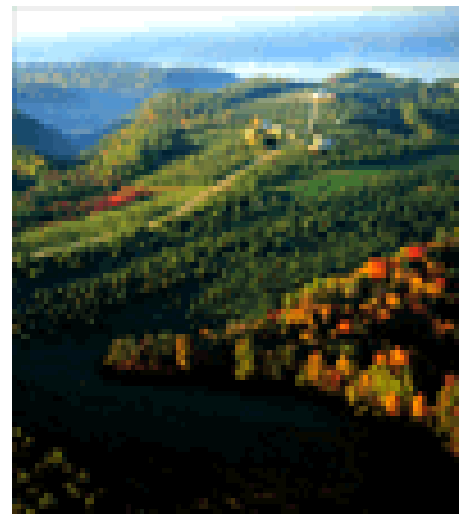
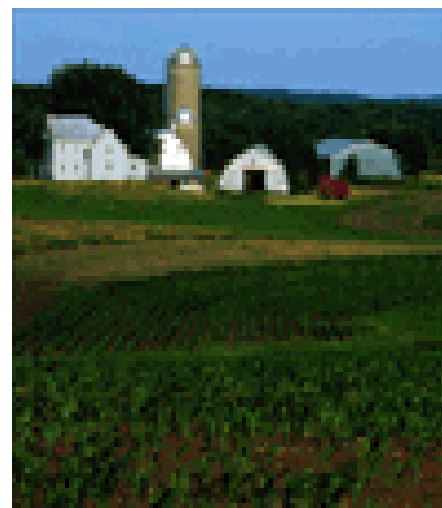
C=Control (C-100) vs L=Limited (L90,L80). Entries without values are not significant (P>0.10).

Does not account for potential N volatilization.

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Conclusions

- Limit-feeding more nutrient dense diets to dairy heifers may be an effective alternative feeding management system as compared to feeding high fiber forage diets
- Limit-feeding could result in increased feed efficiency and lower costs IF rations were formulated to least cost parameters
- Our studies showed decreased DM excretion but no N and P advantage.