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A.F. Park

J.M. Defrain

M. J. Meyer

See next page for additional authors

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Abstract

Eight primiparous and nine multiparous Holstein cows were used in a randomized block design to determine the effect of wet corn gluten feed in the diet during the last 21 days of gestation on dry matter intake and early postpartum performance. Multilactation cows fed wet corn gluten feed maintained a higher dry matter intake and intake as a percentage of body weight during the last week before calving than cows fed the control diet. First-lactation cows fed wet corn gluten feed consumed less dry matter, both total and as a percentage of body weight, across calving than first-lactation cows fed the control diet. Milk, milk components, and blood metabolites were not influenced by diet. Wet corn gluten feed may help alleviate the depression in intake typically observed during late gestation for multiparous but not primiparous cows.; Dairy Day, 2000, Kansas State University, Manhattan, KS, 2000;

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Authors

A.F. Park, J.M. Defrain, M. J. Meyer, and Evan C. Titgemeyer

INTAKE AND PERFORMANCE OF DAIRY COWS FED WET CORN GLUTEN FEED DURING THE PERIPARTURIENT PERIOD

A. F. Park, J. M. Defrain, M. J. Meyer, J. E. Shirley, E. C. Titgemeyer, T. T. Marston, J. F. Gleghorn, and L. E. Wankel

Summary

Eight primiparous and nine multiparous Holstein cows were used in a randomized block design to determine the effect of wet corn gluten feed in the diet during the last 21 days of gestation on dry matter intake and early postpartum performance. Multilactation cows fed wet corn gluten feed maintained a higher dry matter intake and intake as a percentage of body weight during the last week before calving than cows fed the control diet. First-lactation cows fed wet corn gluten feed consumed less dry matter, both total and as a percentage of body weight, across calving than first-lactation cows fed the control diet. Milk, milk components, and blood metabolites were not influenced by diet. Wet corn gluten feed may help alleviate the depression in intake typically observed during late gestation for multiparous but not primiparous cows.

(Key Words: Wet Corn Gluten Feed, Transition Cow, Intake.)

Introduction

The 30% decrease in dry matter (DM) intake often observed in dairy cows during the last week before calving is of interest, because it appears to be associated with an increase in body fat mobilization, the onset of fatty liver, and a lower DM intake after calving. The exact cause of this depression in intake and its physiological role remain unclear. Efforts to reduce the severity of this intake depression or reduce its effects on nutrient balance have not been very successful.

Wet corn gluten feed (WCGF) increased DM intake and milk yield in two lactating-cow studies at Kansas State University. The observed improvement in intake may have been due partially to an increase in dietary fiber digestibility and a positive effect on ruminal pH as reported by others. If this is the case, then its inclusion in close-up diets might reduce the severity of the observed prepartum intake depression and enhance DM intake immediately after calving. Our objective was to evaluate the effect of wet corn gluten feed on DM intake and performance of dairy cows during the periparturient period.

Procedures

Eight primiparous and nine multiparous Holstein cows were used in this study. Cows were randomly assigned to a 20% WCGF diet (DM basis) or control diet (Table 1). Cows were housed in a tie-stall barn, and experimental diets fed from 21 days prior to projected calving date until calving. All cows received a common diet after calving. Cow performance was measured through 4 wk postpartum. Daily feed intakes, milk weights, and body weights were recorded for individual cows. Body condition scores were assigned weekly (1 = thin and 5 = fat). Milk samples (AM, PM, and composite) were obtained on day 6 of lactation, and the contents of protein, fat, lactose, solids-not-fat, milk urea nitrogen (MUN), and somatic cells were determined by the Heart of America DHI Laboratory, Manhattan, KS. Blood samples were collected from the tail vein on days 21, 3, and 1 prior to projected calving, and on days 1, 2, 6 and 10 postpartum.

Results and Discussion

The experimental diets and their chemical composition are shown in Tables 1 and 2, respectively. Expeller soybean meal (Soybest) replaced solvent soybean meal in the WCGF diet to balance ruminally degradable protein, and WCGF replaced a portion of the alfalfa hay and corn grain. The WCGF diet contained more moisture than the control diet and was higher in neutral detergent fiber but similar to the control diet in acid detergent fiber. The diets were similar in NE_L, because the control diet contained less fat and more nonfiber carbohydrates.

The average DM intakes during the pre- and postpartum periods were numerically, but not significantly, higher for primiparous cows fed the control diet (Table 3). First-lactation cows fed WCGF tended (P=0.15) to be heavier than those fed the control diet, but body condition was similar between treatments. Multilactation cows were similar in body weight and average DM intake during the pre- and postpartum periods, but those fed WCGF tended to lose more body condition during the first 30 days after calving. The difference in apparent DM intake responses between first- and multilactation cows fed WCGF may have resulted from the difference in nonfiber carbohydrate content of the two diets. The working hypothesis that fiber digestibility of the WCGF would be sufficient to offset the reduction in nonfiber carbohydrates that occurred when it replaced part of the corn grain in the diet seems to fit multilactation but not first-lactation cows. Irrespective of diet, DM intakes averaged 25.8 and 39.5 pounds per head daily during the prepartum period for first- and multilactation cows, respectively. Older cows also consumed more DM as a percent of body weight than first-lactation cows (2.41 vs 1.85%). Because intake in first-lactation cows is limited by body capacity, body condition, or both, they may be more responsive to diets higher in starch than multilactation cows.

Including WCGF in lactating cow diets improved DM intake in earlier studies. These results provided the basis for this study, because of the current interest in the depression in DM intake routinely observed prior to calving. The use of WCGF in prepartum diets may offer a means of maintaining dietary fiber, while improving nutrient delivery to the cow because the fiber fraction of WCGF is hypothesized to be more digestible than alfalfa fiber. The multiparous cows responded to WCGF as expected; DM intake decreased by 8% between 1 and 2 wk prepartum compared to a 16% decrease for control cows. Conversely, first-lactation cows fed WCGF experienced a 23% drop in intake between 1 and 2 wk prepartum compared to an 11% decrease for those fed the control diet. The decrease in DM intake observed for all cows was less than the 30% often reported, because our values represent the decrease experienced between the average intake during days 7, 8, and 9 and days 1, 2, and 3 prepartum instead of 1 to 3 wk prepartum.

Milk yield and composition data are shown in Table 4 and reflect the average daily milk yield for the first 30 days postpartum and milk composition on day 6 postpartum. No differences were observed in milk yield across treatments for either the first or multi-lactation cows. Milk composition was variable among cows within treatments, and the number of cows used in the study was not sufficient to detect differences except for somatic cells. Cows consuming WCGF had a higher somatic cell count than those consuming the control diet. These results differ from the results of earlier studies and may reflect the limited number of observations.

The most interesting observation in this study was that milk yield during the first 30 days of lactation was not affected by the difference observed in prepartum intake depression. We realize that this is a small number of observations on which to make a final judgement, but the results indicate that the degree of intake depression during the week before calving may be insignificant as an indicator of postpartum performance. Further studies with larger numbers of cows are warranted.

None of the cows in the study experienced clinical ketosis, milk fever, displaced abomasum, or dystocia. Calf birth weights were not affected by WCGF in first-lactation cows (91 vs 88 lb, control vs WCGF, respectively), but multilactation cows fed the control diet produced larger calves than cows fed WCGF (104 vs 79 lb, respectively). The reason for the observed difference in birth weights is not apparent from the data collected in this study. The multilactation cows were similar in body weight, body condition, and average dry matter intake during the last 2 wk before calving. No treatment differences occurred in plasma total alpha amino nitrogen, glucose, or urea nitrogen (Table 5) during the prepartum period.

In summary, cows fed WCGF during the close-up dry period performed as well as those fed a standard diet. Further research with other diet formulations and more cows per treatment group is needed to clarify the benefits or deficiencies derived from the inclusion of WCGF in diets for close-up dry cows.

Table 1. Diet Compositions

	Prepartum Diets		Common
Ingredient	Control	WCGF[1]	Postpartum Diet
Alfalfa hay	15.0	12.5	30.0
Prairie hay	20.0	20.0	-
Corn silage	23.0	23.0	14.5
Whole cottonseed	-	-	9.6
Wet corn gluten feed	-	20.0	-
Corn grain, ground	30.2	13.4	32.4
Soybean meal, 48% CP	9.1	-	5.1
Soybest[3]	-	8.5	4
Wet molasses	-	-	1.2
Vit./min. premix[2]	2.7	2.6	3.2

[1] Wet corn gluten feed.

[2] Vitamin and mineral premix = dical; limestone; Na bicarbonate; Mg oxide; trace mineralized salt; vitamins A, D, E; and selenium.

[3] Expeller soybean meal.

Table 2. Chemical Compositions (% DM) of Experimental Diets

Nutrient	Prepartum Diets: Control	Prepartum Diets: WCGF[1]	Common Postpartum Diet
Dry matter, %	77.2	68.0	81.5
Crude protein, %	13.9	14.3	16.8
RUP[2], % of DM	5.55	5.95	7.73
NE_L , Mcal/lb	0.68	0.67	0.77
Fat, %	3.04	3.66	4.78
Neutral detergent fiber, %	36.4	42.6	29.1
Acid detergent fiber, %	21.5	22.7	19.4
Nonfiber carbohydrate, %	39.1	31.4	41.4
Calcium, %	0.85	1.13	1.21
Phosphorus,%	0.48	0.46	0.55
Sodium, %	0.22	0.17	0.37
Potassium, %	1.33	1.37	1.41
Chlorine, %	0.41	0.37	0.36
Sulfur, %	0.15	0.19	0.18

[1]Wet corn gluten feed.
[2]Rumen-undegraded protein.

Table 3. Prepartum and Postpartum Measurements

Item	Prepartum: Control	Prepartum: WCGF[1]	Prepartum: SEM	Postpartum: Control	Postpartum: WCGF	Postpartum: SEM
First-lactation cows (n = 8)						
DMI[2], lb/day	26.7	24.9	1.3	37.3	34.8	1.5
DMI as % of BW[3]	1.9	1.8	0.12	2.9	2.8	0.15
BW, lb	1385	1435	15	1283	1259	51
BCS[4]	3.6	3.5	0.11	3.2	3.3	0.2
Rectal temperature, °F	101.4	101.1	0.2	101.1	101.4	0.2
Urine pH	8.2	8.3	0.06	8.3	8.3	0.3
Fecal pH	6.86	6.90	0.06	6.4	6.5	0.06
Multilactation cows (n = 9)						
DMI, lb/day	39	40	2.0	54.2	53.4	2.6
DMI as % of BW	2.43	2.39	0.09	3.7	3.4	0.14
BW, lb	1632	1634	29	1508	1524	31
BCS	3.0	2.9	0.2	2.8	2.6	0.09
Rectal temperature, °F	101.5	100.9	0.2	101.7	101.1	0.2
Urine pH	8.3	8.3	0.03	8.3	8.4	0.09
Fecal pH	6.6	6.7	0.08	6.3	6.4	0.09

[1]Wet corn gluten feed.
[2]Dry matter intake.
[3]Body weight.
[4]Body condition score (1 = thin and 5 = fat).

Table 4. Milk Production and Composition

Item	Prepartum Diets Control	WCGF[1]	SEM
First-lactation cows (n = 8)			
Milk, lb/day	63.3	64.6	3.2
Fat, %	4.19	4.50	0.21
Protein, %	3.7	3.78	0.10
Lactose, %	4.81	4.69	0.05
SNF, %	9.34	9.29	0.14
SCC, × 1000[a]	140	191	42
MUN, mg/dL	9.90	10.51	1.14
Multilactation cows (n = 9)			
Milk, lb/day	86.7	85.8	3.2
Fat, %	3.68	3.97	0.28
Protein, %	4.14	4.07	0.16
Lactose, %	4.55	4.69	0.09
SNF, %	9.46	9.56	0.15
SCC, x 1000[a]	190	360	11
MUN, mg/dL	11.46	11.80	0.77

[1]Wet corn gluten feed.
*Different (P<0.01) from control diet.

Table 5. Prepartum Plasma Total Amino Acid Nitrogen (TAAN), Glucose, and Plasma Urea Nitrogen (PUN)

Item	Prepartum Diets Control	WCGF	SEM
First-lactation cows			
TAAN, mM	2.30	2.38	0.05
Glucose, mg/dL	73.2	72.9	1.8
PUN, mg/dL	8.8	9.3	0.5
Multilactation cows			
TAAN, mM	2.3	2.4	0.09
Glucose, mg/dL	65.2	66.4	0.9
PUN, mg/dL	10.4	10.6	0.4