Preconception Distillers Grains Supplementation Improves Mature Beef Cow Return to Estrous

Adam F. Summers
Daniel M. Larson
Andrea S. Cupp[1]

Summary

For three years, cows and first-calf heifers were supplemented two levels of RUP prior to breeding to determine the effect of RUP on reproductive efficiency and performance. Cows resumed estrous after being supplemented 30 days with distillers grains, but pregnancy rate was not different. First-calf heifer performance and reproductive efficiency was similar regardless of protein supplement offered. Protein supplements offered in this study did not impact cow BW, milk production, or progeny performance. More cows supplemented with distillers grains prior to the breeding season resumed luteal activity prior to breeding; however, pregnancy rates were similar.

Introduction

To maintain profitability and a 365 day calving interval, cows must return to estrous and become pregnant within 90 days after calving. Furthermore, protein intake and type have been reported to influence reproductive efficiency. Utilizing distillers grains during heifer development improved AI conception rate compared with heifers offered a dried corn gluten feed based supplement (*2007 Nebraska Beef Cattle Report*, pp. 5-6); however, final pregnancy rates were similar. Similarly, June-calving first-calf heifers supplemented 1.5 lb/day distillers grains for 60 days prior to the breeding season had similar final pregnancy rates as non-supplemented heifers (*2006 Nebraska Beef Cattle Report*, pp. 5-6). The objective of this study was to determine the effect of rumen undegradable intake protein level supplementation prior to the breeding season on first-calf heifer and cow reproductive efficiency.

Procedure

All procedures were approved by the University of Nebraska–Lincoln Institutional Animal Care and Use Committee. Non-lactating composite beef cows and first-calf heifers [25% MARC III (¼ Angus, ¼ Hereford, ¼ Pinzgauer, ¼ Red Poll) and 75% Red Angus] from the beef physiology herd located at the University of Nebraska Agricultural Research and Development Center (ARDC), Mead, Neb., were used in this study.

First-calf heifers (FCH; year 1= 49; year 2 = 51; year 3 = 43) and cows (year 1= 161; year 2= 170; year 3 = 160) were blocked by age, BW, and calving date and assigned to one of two treatment groups: receive a distillers based (DDGS) supplement or a dried corn gluten feed (CGF) based supplement (Table 1). Cows and FCH grazed predominately brome pastures during the supplement period and were offered 0.25% BW/day (cows) or 0.30% BW/day (FCH) of assigned supplement for 30 and 45 days, respectively, prior to the beginning of the breeding season. Supplement level was based on NRC calculations to allow FCH to gain a single BCS in 50 days. To determine the effect supplement treatment may have on milk production, a weigh-suckle-weigh procedure was conducted on all FCH, and a subset of mature cows (n = 50/year) approximately 14 days after initiation of supplementation.

Prior to supplementation, blood samples were collected 10 days apart to determine estrous status. Blood samples were then collected every 14 days during the supplementation period to determine resumption of estrus during the feeding period. Plasma progesterone concentration was determined via radioimmunoassay and samples with concentrations greater than 1 ng/mL were interpreted to indicate ovarian luteal activity, and resumption of estrus.

Table 1. Supplement composition and nutrient analysis.

	DM, %	
Item	CGF[1]	DDGS[2]
DDGS	—	91.5
Dried corn gluten feed	75.1	—
Corn germ	14.1	—
Urea	2.3	—
Supplement[3]	8.5	8.5
Nutrient analysis		
Crude fat, %	9.8	9.4
Crude protein, %	26.1	28.1
RUP, % CP	18.7	56.5
NEg, Mcal/lb	0.73	0.77

[1]CGF = dried corn gluten feed based supplement offered 30 (mature cows) or 45 (first-calf heifers) days prior to the breeding season.
[2]DDGS = dried distillers grains with solubles-based supplement offered 30 (mature cows) or 45 (first-calf heifers) days prior to the breeding season.
[3]Supplement = includes trace minerals, vitamins, molasses, and pellet binder.

Estrus was synchronized utilizing two injections of PG (Lutalyse, Zoetis, Madison, N.J.) 14 days apart. Estrus detection was performed for at least 1 hour in the early morning and late evening for 5 days after the second PG injection. First-calf heifers and cows in estrus received AI approximately 12 hours later. Artificial insemination was performed by one of four technicians used equally across treatments. Cows and FCH were exposed to bulls (1 bull to 25 cows) for approximately 45 days beginning 10 days after the final AI. Artificial insemination and final pregnancy rates were determined via transrectal ultrasonography approximately 45 days after AI and bull removal, respectively.

Data were analyzed using the MIXED and GLIMMIX procedures of SAS (SAS Institute, Inc., Cary,

(Continued on next page)

N.C.) for continuous and categorical data, respectively. Treatment group within year was the experimental unit (n = 3). Supplement was considered the main effect. Year and age were classified as random effects. A *P*-value ≤ 0.05 was considered significant.

Results

Performance and reproductive efficiency data are reported in Tables 2 and 3 for cows and FCH, respectively. Initial BW and final BW were similar between treatments for cows and FCH; however, BW change and ADG tended (*P* = 0.12) to be greater for FCH offered DDGS. First-calf heifers in early lactation have maintenance requirements as well as requirements for milk production and growth. Heifers offered DDGS, which is higher in RUP could have possibly utilized protein from the supplement for tissue growth, increasing BW.

Cows offered DDGS had greater (*P* = 0.01) estrous activity prior to the breeding season than CGF cows (91 vs. 78% ± 4%). However, AI and overall pregnancy rates were similar for DDGS- and CGF-supplemented cows (58 vs. 63% ± 5%; 76 vs. 81% ± 9%, respectively). There was no difference in the proportion of FCH in estrus prior to the breeding season based on supplement type, and similar to cow data, AI and final pregnancy rates were also similar (Table 3). Cows were placed on brome pastures during the prebreeding period (May through early June). This time period coincides with relatively high forage quality and it is likely protein supplementation was not needed to meet animal nutrient requirements.

In our study, maternal supplementation coincided with mid lactation. Increasing RUP during lactation may increase milk production and thus could increase calf weaning BW. Milk production was similar for FCH and cows regardless of protein supplement type. Similarly, calf weaning BW and 205-day adjusted weaning BW were similar for cows and FCH supplemented DDGS and CGF.

Table 2. Effect of protein source supplied 30 days prior to the breeding season on cow performance and reproduction.

	CGF[1]	DDGS[2]	SEM	*P*-value
n	3	3		
Weight, lb				
Initial	1,243	1,246	26	0.88
Final	1,327	1,355	19	0.35
Pregnancy diagnosis	1,317	1,341	22	0.39
BW change	76	101	31	0.20
ADG, lb/day	1.27	1.76	0.21	0.20
24 hour milk production, lb	24	22	6	0.73
DPP[3], day	74	74	1	1.00
Days to estrus[4], day	19	20	6	0.45
Resumed estrus by breeding, %	78	91	4	0.01
Estrus response, %	80	77	8	0.55
AI pregnancy rate, %	63	58	5	0.53
Final pregnancy rate, %	81	76	9	0.58
Calf weaning BW, lb	521	522	22	0.96
205-day adjusted weaning BW, lb	536	557	16	0.30

[1]CGF = dried corn gluten feed based supplement consisting of 75.1% dried corn gluten feed, 14.1% corn germ, 2.3% urea, and 8.5% supplement.
[2]DDGS = dried distillers grains with solubles based supplement consisting of 91.5% dried distillers grains with solubles and 8.5% supplement.
[3]DPP = days postpartum.
[4]Calculated as days from initiation of supplementation to resumption of estrus.

Table 3. Effect of protein source supplied 45 days prior to the breeding season on first-calf heifer performance and reproduction.

Item	CGF[1]	DDGS[2]	SEM	*P*-value
n	3	3		
Weight, lb				
Initial	1,114	1,119	65	0.65
Final	1,155	1,186	57	0.25
Pregnancy diagnosis	1,177	1,191	56	0.72
BW change	83	123	7	0.12
ADG, lb/day	1.12	1.77	0.44	0.12
24 hour milk production, lb	17	19	3	0.61
DPP[3], day	69	70	11	0.55
Days to estrus[4], day	28	24	8	0.13
Resumed estrus by breeding, %	82	84	7	0.83
Estrus response, %	53	60	12	0.41
AI pregnancy rate, %	61	59	5	0.79
Final pregnancy rate, %	89	88	3	0.85
Calf weaning BW, lb	511	504	10	0.41
205-day adjusted weaning BW, lb	557	558	9	0.93

[1]CGF = dried corn gluten feed based supplement consisting of 75.1% dried corn gluten feed, 14.1% corn germ, 2.3% urea, and 8.5% supplement.
[2]DDGS = dried distillers grains with solubles based supplement consisting of 91.5% dried distillers grains with solubles and 8.5% supplement.
[3]DPP = days postpartum.
[4]Calculated as days from initiation of supplementation to resumption of estrus.

Mature cows supplemented DDGS 30 days had greater resumption of estrus prior to the breeding season. However, AI and overall pregnancy rates were similar for DDGS- and CGF-supplemented cows and FCH.

[1]Adam F. Summers, postdoctoral research associate; Daniel M. Larson, former graduate student; Andrea S. Cupp, professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.

