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Effect of Pelleted Byproducts on Performance When Fed to Growing Cattle

Cody A. Welchons, Curtis J. Bittner, Dirk B. Burken, Jim C. MacDonald, and Galen E. Erickson

Summary

Heifers fed a basal diet of either low or high quality forage were supplemented with a corn residue and corn by-product pellet at 0, 0.5, or 1.0% of BW. A linear increase in final BW, ADG, and feed efficiency was observed as supplement increased for heifers fed high quality forage while a quadratic response was observed for those fed low quality forage. Increasing supplement linearly decreased daily average forage dry matter intake from 16.5 lb to 12.6 lb at 0 and 1.0% of BW, respectively. Accordingly, as supplement intake increased, total dry matter intake increased linearly from 16.5 lb to 19.5 lb at 0 and 1.0% of BW, respectively.

Introduction

During the last decade, a significant amount of grazing land has been converted into cropland due to increased grain prices. From 2007–2011, 1.3 million acres of grazing land were converted in the North Central region of the U.S. alone. As a result, there is reduced availability of traditional forages and an increased amount of corn residue available. Additionally, due to the decrease in grazing land, there has been an increase in rent prices for grazing. During the same period of time, the U.S. cow herd decreased by 2.39 million head with 1.13 million (47%) of the decrease occurring in the North Central region. With current economics pointing some producers toward expansion of the cow herd, there may be a further increase in competition and prices for grazable land. To increase production per fixed unit of land, utilizing the increased amount of corn residue and associated by-products that arise from the increase in cropland as a supplement may be beneficial. Pelleted distillers grain and treated corn stover can replace up to 20% of the corn in finishing diets containing 40% MDGS with no negative effects on performance (*2015 Nebraska Beef Report*, pp. 86–87). The objective of this study was to evaluate the effects of feeding a similar pellet as a supplement on the performance of growing cattle consuming *ad libitum* forage.

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Procedure

An 84-d growing trial was conducted utilizing 300 heifers (initial BW = 615 lb; SD = 49) in a 2 × 3 factorial design. The first factor was forage quality with low quality (LQ) or high quality (HQ) forage as the basal diet. The LQ diet consisted of bromegrass hay and the HQ diet was comprised of 50% bromegrass silage, 37.5% alfalfa hay, and 12.5% sorghum silage (Table 1). The second factor was increasing levels of pellet supplement at 0, 0.5, or 1.0% of BW. The pellet consisted of 53% corn stover treated with calcium oxide, 32% dried distillers grains, 14% solubles, and 1% urea (provided by Pellet Technology, USA Gretna, Neb.). All heifers were limit fed a diet consisting of 50% alfalfa and 50% Sweet Bran for 5 days to equalize gut fill. Heifers were weighed on 2 consecutive days and the average of those 2 days was used as initial BW. Heifers were blocked by BW (n = 3) and stratified by BW within block and assigned randomly to pens using the first day weights. Treatments (n = 6) assigned randomly to pens with 5 replications per treatment, and 10 heifers per pen. The first weight block had 1 replication, the second weight block had 3 replications, and the third weight block had 1 replication. Pen was the experimental unit. Cattle were implanted with Ralgro® on d 1.

The NRC model was used to estimate initial forage intake and pens were fed *ad libitum* forage thereafter. Initial BW was used to calculate initial supplement amount and adjusted every 28 days using the NRC estimate of gain given actual forage and supplement intake. Actual supplement intake was within 0.02% of BW of targeted intake for all treatments. Ending BW was determined similarly to initial BW. Heifers were limit fed a 50% alfalfa, 50% Sweet Bran diet for 5 consecutive days and weighed 2 days thereafter. Ending BW was then calculated by averaging the 2-d weights.

Performance (BW, ADG, F:G) and intake (forage DMI and total DMI) data were analyzed using the GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.) with pen as the experimental unit. Six heifers were removed from the study due to non-treatment related issues. Initial BW was used in the model as a covariate due to subtle differences across treatments but was non-significant as a covariate, and removed from subsequent analysis.

Table 1. Nutrient composition of dietary ingredients and diet

Item	DM, %	OM, % of DM	CP, % of DM	NDF, % of DM	Fat, % of DM
Ingredient					
Alfalfa	87	92	16.4	54	—
Bromegrass Hay	92	92	7.1	71	—
Bromegrass Silage	90	92	15.8	68	—
Pellet	85	85	21.2	52	3.9
Sorghum Silage	85	92	8.6	59	—
Diet					
Low Quality[a]	92	92	7.1	71	—
High Quality[b]	88	92	15.1	62	—

[a]Bromegrass hay
[b]Bromegrass silage (50%), Alfalfa (37.5%), sorghum silage (12.5%).

Table 2. Effects of supplementing growing cattle with 0, 0.5, or 1.0% (of BW) with a corn byproduct pellet with either low or high quality forage

Supplement, % BW	Low			Lin[a]	Quad[b]	High			Lin[c]	Quad[d]	SEM	*P*-Value		
	0	0.5	1.0			0	0.5	1.0				Int.[e]	Forage	Supp.
Initial BW, lb	615[fg]	612[g]	616[f]	0.54	0.02	614[fg]	616[f]	613[fg]	0.54	0.15	1.17	0.02	0.78	0.78
Ending BW, lb	670[f]	720[g]	749[h]	< 0.01	0.03	744[h]	770[i]	796[j]	< 0.01	1.00	3.69	< 0.01	< 0.01	< 0.01
ADG, lb/d	0.66[f]	1.29[g]	1.59[h]	< 0.01	< 0.01	1.55[h]	1.84[i]	2.18[j]	< 0.01	0.59	0.04	< 0.01	< 0.01	< 0.01
Forage DMI, lb/d	16.2[f]	14.5[g]	12.4[h]	< 0.01	0.57	16.8[f]	14.2[g]	12.9[h]	< 0.01	0.17	0.36	0.38	0.35	< 0.01
Total DMI, lb/d	16.2[f]	17.9[g]	19.2[h]	< 0.01	0.72	16.8[fi]	17.6[gi]	19.8[h]	< 0.01	0.13	0.36	0.40	0.31	< 0.01
F:G	24.5[f]	13.9[g]	12.1[h]	< 0.01	< 0.01	10.8[i]	9.6[j]	9.1[j]	< 0.01	0.23	—	< 0.01	< 0.01	< 0.01

[a]Linear contrasts for supplement level with low quality forage.
[b]Quadratic contrasts for supplement level with low quality forage.
[c]Linear contrasts for supplement level with high quality forage.
[d]Quadratic contrasts for supplement level with high quality forage.
[e]Forage quality by supplement level interaction.
[fghij]From the P-values, means within a row with differing superscripts are different ($P < 0.05$).

Results

A forage × supplement interaction existed for ending BW, ADG, and F:G ($P < 0.01$) (Table 2). For the HQ forage diet there was a linear increase in ending BW and ADG and a linear decrease in F:G as supplement level increased ($P < 0.01$). For the LQ forage diet, there was a quadratic response ($P \leq 0.03$) for ending BW, ADG, and F:G as supplement level increased; ending BW and ADG increased at a decreasing rate while F:G decreased at a decreasing rate. In the LQ diet, as supplement level increased from 0 to 0.5% there was a 0.63 lb increase in ADG and a 10.6 decrease in F:G. As supplement increased from 0.5 to 1%, ADG and F:G only increased and decreased by 0.30 lb and 1.8, respectively. The ADG and F:G response between 0.5 and 1% in LQ forage was similar to relative changes in HQ diet between 0.5 and 1% levels of supplementation (0.34 lb increase and 0.5 decrease for ADG and F:G, respectively). Retrospectively, the levels of RDP and MP were analyzed with the NRC model. The LQ control diet was deficient in RDP (−142 g/d) while the HQ control diet did not have the deficiency for RDP (+ 438g/d). As supplement level increased to 0.5% of BW, the LQ diet was no longer deficient in RDP. The larger increase in ADG with the LQ diet from 0 to 0.5% of BW supplementation would suggest a response to supplementing RDP, while the rate of increase from 0.05 to 1% of BW is similar to the response observed in the HQ forage diets, suggesting an energy response as supplement level increased from 0.5 to 1.0% of BW. Forage DMI and total DMI had linear responses as supplement increased, with forage DMI decreasing and total DMI increasing ($P < 0.01$). However, forage quality did not affect either forage or total DMI ($P \geq 0.35$).

Supplementing a corn residue-based pellet increased ADG and decreased F:G of growing calves fed either a low or high quality roughage diet, although there is a greater response when fed in a low quality forage diet, likely due to the addition of RDP.

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