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## Summary of Grazing Trials Using Dried Distillers Grains Supplementation

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# Summary of Grazing Trials Using Dried Distillers Grains Supplementation

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## Summary

*A meta-analysis of grazing trials in which cattle were supplemented with dried distillers grains with solubles (DDGS) was conducted to determine effects of supplementation on average daily gain (ADG) and final BW in pasture grazing situations. Additionally, pen studies were evaluated to determine the effects of DDGS supplementation on cattle intake, forage replacement, ADG and final BW. In both the pasture and the pen studies, ADG and final BW increased quadratically with increased level of DDGS supplementation. Feeding DDGS decreased forage intake quadratically; however, total intake for cattle supplemented DDGS increased quadratically with increased level of supplementation.*

## Introduction

The increase in ethanol production has led to increased corn prices and increased costs of finishing cattle. This increase in finishing cost has caused producers to search for opportunities to increase cattle BW prior to feedlot entry using forage and feed resources other than corn grain. In growing studies comparing growing rations containing corn and growing rations containing DDGS, DDGS has been shown to have 125% the energy value of corn (2003 *Nebraska Beef Report*, pg. 8-10). Additionally, DDGS is typically priced lower than corn grain (approximately 70-90% the price of corn on a DM basis). The increased supply and competitive price of DDGS relative to corn make DDGS a viable resource for supplementing growing cattle consuming forage-based diets.

Meta-analysis procedures are used to account for individual trial variation when combining results from multiple studies. The objective of this meta-analysis was to evaluate the effect of increasing DDGS supplementation in forage-based production systems on cattle performance and forage replacement.

## Procedure

Treatment means were compiled from 14 trials in which cattle were allowed to graze pasture and supplemented DDGS (treatment means = 35) and seven trials in which cattle were pen fed a forage-based growing ration and supplemented DDGS (treatment means = 28). Studies in which DDGS was supplemented to cattle grazing pasture (2004 *Nebraska Beef Report*, pp. 25-27; 2006 *Nebraska Beef Report*, pp. 27-29; 2006 *Nebraska Beef Report*, pp. 31-32; 2008 *Nebraska Beef Report*, pp. 28-30; 2008 *Nebraska Beef Report*, pp. 31-32; Lomas and Moyer [unpublished] and Griffin et al. [unpublished]) included 394 cattle that were allowed to graze either cool or warm season grasses for 60 to 196 days (average, 119 days). Pastures included smooth brome grass and bermudagrass in Kansas, and smooth brome grass and Sandhills range in Nebraska. Within each pasture grazing experiment, cattle were stratified by initial BW and assigned randomly to supplementation treatment. Additionally, cattle in each treatment were allowed to graze the same number of days. Supplementation of DDGS ranged from 0.0 to 8.0 lb/head daily, with an average supplementation of 2.8 lb/head daily.

Studies in which cattle were pen fed and supplemented DDGS (2003 *Nebraska Beef Report*, pp. 8-10; 2005 *Nebraska Beef Report*, pp. 18-20; 2006 *Nebraska Beef Report*, pp. 36-37; 2007 *Nebraska Beef Report*, pp. 15-16; 2007 *Nebraska Beef Report*, pp. 17-18; and 2008 *Nebraska Beef Report*, pp. 33-34) included 348 cattle that were fed

either hay or a forage mixture containing 60% sorghum silage and 40% alfalfa hay. The mixture was used to simulate the diet that cattle would consume if grazing green forage. Within each pen study, cattle were stratified by initial BW, assigned randomly to treatment and fed the same number of days. In the pen studies, supplementation with DDGS ranged from 0.0 to 7.6 lb/head daily (average, 3.7 lb/head daily). Pen study duration ranged from 82 to 95 days, with an average study length of 86 days.

In all pasture and pen studies, initial BW and final BW were determined by averaging multiple day weights at trial initiation and conclusion. For the pen studies, forage intake was measured to determine the amount of forage that DDGS would replace in the diet. Data from pen and pasture studies were analyzed separately using an iterative meta-analysis methodology that integrated quantitative findings from multiple studies using the MIXED procedure of SAS.

## Results

### Pasture Studies

Effect of DDGS supplementation on final BW and ADG are presented in Table 1. For gain and final BW performance, supplemented DDGS is represented as % of BW because of differences in BW across pasture and pen-fed studies. Supplementing DDGS to cattle grazing pasture linearly increased final BW ( $P < 0.01$ ) and ADG ( $P < 0.01$ ) with increased supplementation. However, final BW ( $P = 0.07$ ) and ADG ( $P = 0.21$ ; Figure 1) tended to be quadratic.

### Pen Studies

Supplementing DDGS in growing rations and hay-fed situations consistently increased final BW ( $P = 0.01$ ) and ADG ( $P < 0.01$ ; Figure 1) quadratically as level of DDGS supplementation increased.

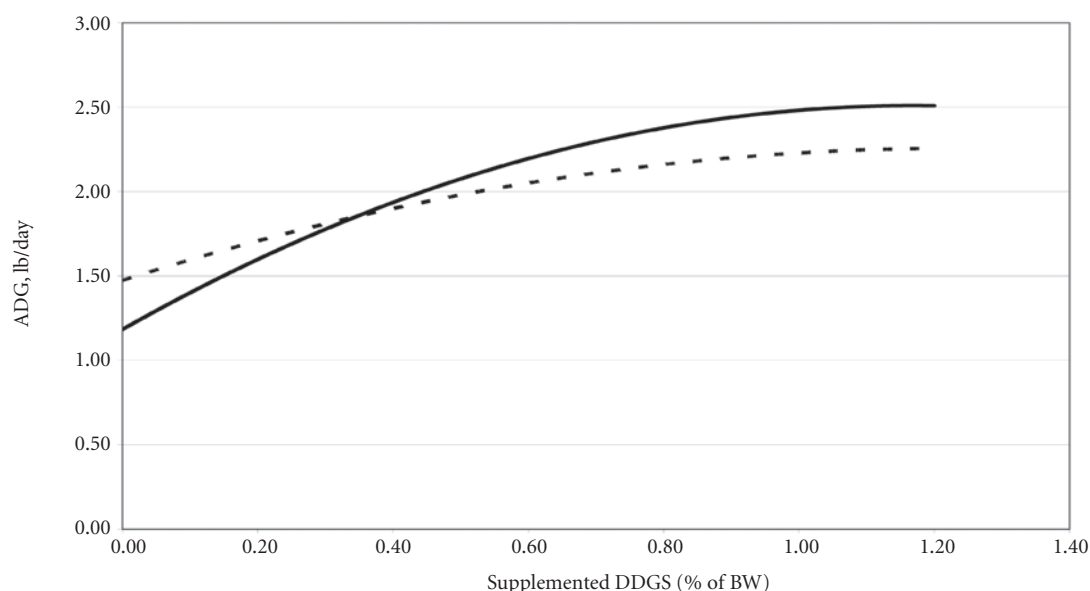
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**Table 1. Effect of supplemental level of dried distillers grains plus solubles (DDGS) on final BW and gain of growing cattle.**

DDGS supplementation <sup>1</sup>	0.0	0.2	0.4	0.6	0.8	1.0	1.2	Lin <sup>2</sup>	Quad <sup>2</sup>
<b>Pasture studies:</b> (Treatment means = 35)									
Final BW, lb	827	859	884	900	908	908	900	< 0.01	0.07
ADG, lb/day	1.47	1.71	1.90	2.05	2.16	2.23	2.26	< 0.01	0.21
<b>Pen studies:</b> (Treatment means = 28)									
Final BW, lb	685	720	749	772	790	803	811	< 0.01	< 0.01
ADG, lb/day	1.18	1.60	1.94	2.20	2.38	2.48	2.51	< 0.01	< 0.01

<sup>1</sup>Supplemented level of DDGS (DM-basis) as % of BW.<sup>2</sup>Estimation equation linear and quadratic term t-statistic for variable of interest.**Table 2. Effect of supplemental level of dried distillers grains plus solubles (DDGS) on intake of growing cattle in pen-fed studies.**

DDGS supplementation <sup>1</sup>	0.0	1.5	3.0	4.5	6.0	7.5	Lin <sup>2</sup>	Quad <sup>2</sup>
Total intake, lb/day	12.7	13.9	14.9	15.7	16.3	16.6	< 0.01	< 0.01
Forage intake, lb/day	12.7	12.4	11.9	11.2	10.3	9.1	0.31	< 0.01
Forage replacement <sup>3</sup> , lb/day	0.0	0.3	0.8	1.5	2.4	3.6	—	—
Forage replaced/ DDGS <sup>4</sup> , lb/lb	0.00	0.20	0.27	0.33	0.40	0.48	—	—

<sup>1</sup>Supplemented level of DDGS (DM-basis) in lb/head daily.<sup>2</sup>Estimation equation linear and quadratic term t-statistic for variable of interest.<sup>3</sup>Forage replacement calculated using forage intake at 0.0 lb/day supplementation and subtracting forage intake value for respective level of supplementation.<sup>4</sup>The amount of forage replaced per lb of DDGS supplemented.**Figure 1. Effect of DDGS supplementation on ADG for growing cattle supplemented DDGS. Pasture ADG (---) =  $1.4736 + 1.2705x - 0.5156x^2$ . Pen ADG (—) =  $1.1828 + 2.2703x - 0.9715x^2$ .**

Intake data are presented as lb/day fed (Table 2). Total intake response to increasing levels of DDGS supplementation was quadratic ( $P < 0.01$ ). However, as DDGS supplementation increased, forage intake decreased quadratically ( $P < 0.01$ ). Additionally, forage replacement per pound of DDGS supplementation increased with increasing level of DDGS supplementation.

Final BW and ADG exhibited a significant linear response in the pasture studies; however, in the pen-fed studies, final BW and ADG were quadratically impacted by DDGS level. This difference in pasture and pen-fed studies is likely due to higher variation in the pasture studies when compared to the pen-fed studies. In the pen-fed studies feeding conditions are more tightly controlled. We

conclude performance responses in the pasture studies are in fact quadratic; however, due to the increased variation we were able to detect only a trend in the pasture studies. Additionally, when comparing ADG across pasture and pen studies, pen studies showed a greater response to DDGS supplementation than pasture studies. The greater response may be due to differences in metabolizable protein

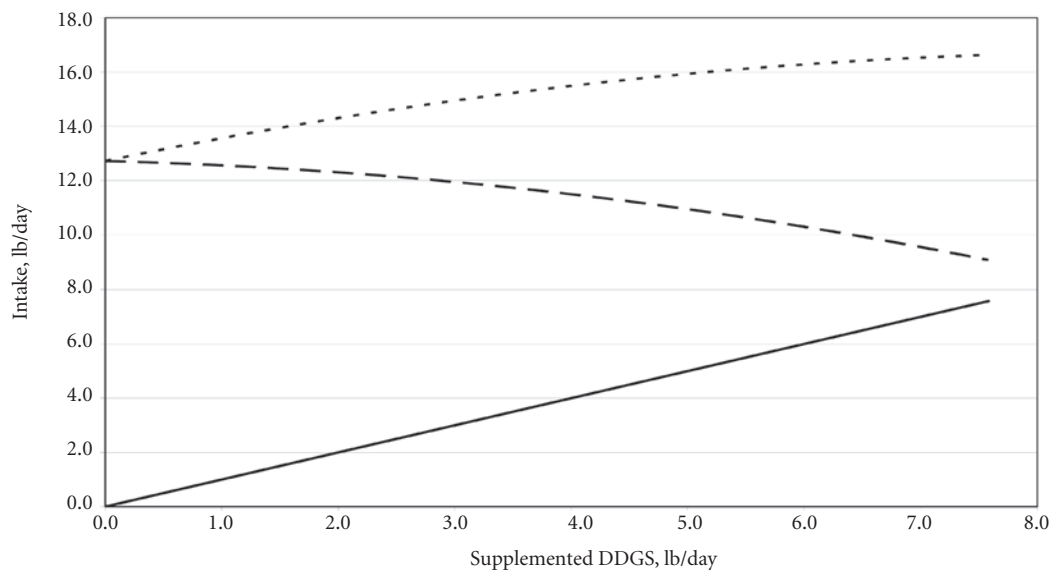


Figure 2. Effect of DDGS supplementation on intake for cattle fed in pen studies. DDG Supplementation (—) =  $x$ . Forage intake (---) =  $12.719 - 0.1103x - 0.0490x^2$ . Total Intake (····) =  $12.719 + 0.8899x - 0.0494x^2$ .

(MP) requirements for the cattle. In the pen studies, cattle were lighter and younger at trial initiation, leading to greater requirement for MP in terms of grams of MP required per pound of BW. Also, energy response for lighter animals is greater per pound of BW when compared to heavier cattle. Because the ADG response was greater for pen-fed than for grazing cattle, forage replacement could have been greater in pasture-fed animals than in pen-fed calves. Since DDGS supplementation was at the same level, this leaves the forage intake as the variable input. In pasture and pen studies, forage quality was similar; therefore, the amount of forage replaced could be a logical explanation for the increased ADG response in the pen studies compared to the pasture studies.

Data were collected on cattle from 10 of the grazing trials during feedlot finishing subsequent to grazing. On average the supplemented cattle gained 81 lb more weight on grass than unsupplemented controls. The supplemented cattle were 69 lb heavier than control cattle at slaughter, indicating greater than 84% of the weight was maintained. In six of the 10 studies, dry matter intake (DMI) was measured in the feedlot. In general

DMI was not increased in cattle fed DDGS on grass. The economics of feeding DDGS on grass are dependent upon the selling prices of cattle at the end of grazing and the pasture saved by supplementation. If ownership is retained, DMI in the feedlot and amount of weight retained through finishing are important considerations. It is very difficult to measure intake of cattle on pasture. Therefore, we attempted to estimate intake indirectly using National Research Council (1996) net energy equations and the pen-fed performance. Several assumptions on total digestible nutrient (TDN) values of the forages and net energy adjusters must be made. The most conservative estimate (lowest forage replacement) showed 0.76 lb reduced forage intake per pound of DDGS dry matter supplemented. Assuming 16 lb dry matter intake of controls, that gives a savings of 24% of grass with supplementation of 5 lb dry matter from DDGS. Greenquist et al. (2009 *Nebraska Beef Report* pp. 25-27) showed 60% increase in carrying capacity of brome pasture by supplementing with 5 lb DDGS DM. Some of that response may have resulted from N in the DDGS increasing growth of grass. However, it supports

a savings in grass consumption of at least 24% as calculated above.

Given the assumptions on grass replacement by DDGS, we can estimate the economics of supplementing DDGS on pasture. The cost of grass for yearlings is about \$.60/day. Twenty-four percent savings in grass would be \$.14/day. Five pounds DDGS DM would be about \$.50 at current prices. The net cost would be \$.36/day. The yearlings should have 0.6 lb increased gain from 5 lb DDGS supplement and 0.5 lb should be retained through the feedlot. That 0.5 lb should be worth \$.50. The net profit would then be \$.14/day (\$.50 minus \$.36).

In conclusion, supplementing DDGS increased final BW and ADG quadratically for cattle in forage based production systems. Additionally, feeding DDGS decreased forage intake quadratically; however, total intake for cattle supplemented DDGS increased quadratically with increased level of supplementation.

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