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Dried Distillers Grains as a Grazed Forage Supplement

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Summary

Thirty heifers grazing smooth bromegrass were individually supplemented with 0, 1.0, 2.1, 3.1, or 4.2 lb per head per day (DM) dried distillers grains (DDG) for 84 days to determine effects of DDG supplementation on ADG and forage intake and to determine the value of DDG in grazing enterprises. Forage intake was estimated using the 1996 NRC model. Supplementation of DDG resulted in a linear increase in ADG and decreased estimated forage intake. DDG may be an attractive forage supplement due to increased revenue from additional ADG and savings from decreased forage intake.

Introduction

The cost of grazed forages in Nebraska has increased by 20 to 25 percent over the past 10 years while the price of corn has remained relatively constant within a cyclical price pattern. By-products of the corn milling industry may fit well into high forage utilization production systems. They provide a highly fermentable fiber source that would not be expected to negatively affect forage digestion. These by-products also supply additional undegradable intake protein (UIP) to meet metabolizable protein deficiencies common in grazing situations. The corn milling by-products are becoming increasingly available and are typically priced relative to corn. Therefore, as the cost of grazed forages increases relative to price of corn, by-products may prove to be an economical forage supplement.

Characteristics of forage supplementation may include improved performance and/or reduced forage intake (i.e. forage substitution). Forage substitution allows for additional animal units to graze a fixed amount of forage and thus is an important consideration when determining value of a forage supplement. By-products which are accurately priced into a grazed forage system must be characterized in terms of their effects on forage intake as well as animal performance. The objective of this research was to determine effects of dried distillers grains (DDG) supplementation on animal performance and forage intake in a grazed forage production system and to demonstrate how DDG might be valued in this situation.

Procedure

Experimental design and animal performance

Thirty heifers (650 lb, SD = 80) were supplemented with 0, 1.0, 2.1, 3.1, or 4.2 lb per head per day (DM) DDG for 84 days. Heifers rotationally grazed four smooth bromegrass pastures which were 15 acres each. Heifers in this study were a part of a larger supplementation experiment investigating the effects of supplemental methionine. Levels of DDG provided were based on supplying 0, 1, 2, 3, or 4 grams of supplemental methionine. Heifers were stratified by weight, blocked by treatment from the previous experiment due to weight differences and assigned randomly to treatment. Supplemental DDG was provided individually using a Calan gate system. Heifer performance was determined by measuring ADG. Heifers were limit fed for five days at the beginning and end of the trial and weights were measured for three consecutive days to minimize variation in gut fill.

Determination of forage intake

Forage intake was estimated using the 1996 NRC model. DDG intake was known and forage intake was adjusted to achieve the observed ADG. DDG included solubles and had a fat content of 8.5%. It was assumed DDG contained 100% TDN, 29.5% CP, and 17.7% UIP (DM). Smooth bromegrass inputs were based on previous IVDMD and CP analysis and were assumed to be 61.5% TDN, 20% CP, and 1% UIP (DM). Animal inputs were based on a 14 month old 2 way british-continental cross animal weighing 730 lb with a 1350 lb mature weight. Implants and additives were not used. Net energy adjusters were set at 100% and microbial yield was set at 13%.

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Determination of DDG value

The value of DDG supplementation to grazed forages was determined by combining the estimated value of the additional gain achieved per unit of DDG supplementation with the estimated value of the forage that was replaced. The value of the additional gain achieved by supplementing DDG was determined by calculating the additional weight sold at the end of the grazing period. Price paid per hundred weight was estimated using the regression equation $y = 0.00005x^2 - 0.1071x + 127.3$ where y = price paid and x = animal weight. This equation was previously developed from September - October average feeder calf prices from 1992 - 1999. The equation has a good relationship to actual prices (r = 0.987) and accounts for a price slide where heavier cattle sell for less money on a per hundred weight basis. The value of the forage replaced by DDG was assumed to be the 10-year average Nebraska pasture price of $21.65 per animal unit month (AUM).

Results

Figure 1 shows the relationship between supplemental DDG and ADG. Additional supplementation of DDG tended to result in higher ADG ($P = 0.16$). There was a linear relationship between level of supplemental DDG and ADG ($P = 0.10$). This relationship can be described by the equation $y = 0.06x + 1.50$ ($r^2 = 0.45$) where y = expected ADG (lb) and x = DDG supplemented (lb per day, DM). Thus an additional 0.06 (±0.05) lb per day gain can be expected for every lb per day DDG supplemented in situations where unsupplemented cattle would gain 1.50 lb per day.

Figure 2 shows the relationship between supplemental DDG and forage intake as predicted by the 1996 NRC model. This relationship

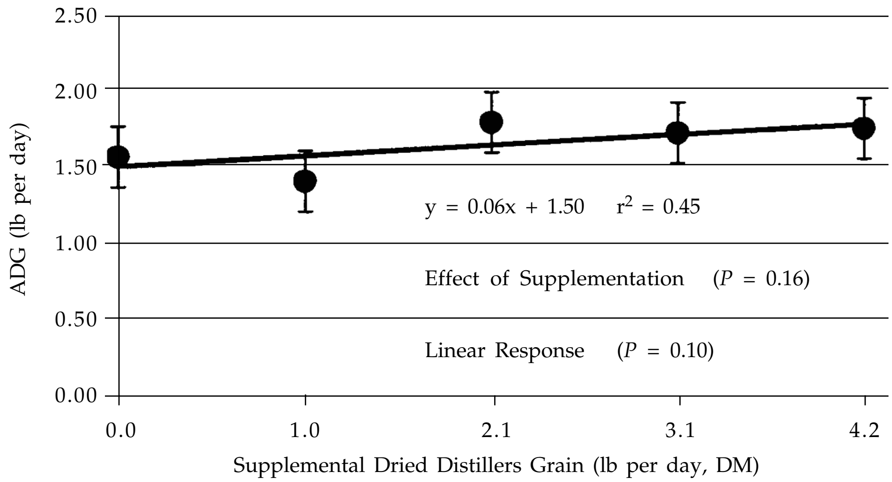

Figure 1. Effect of supplemental dried distillers grains on ADG.

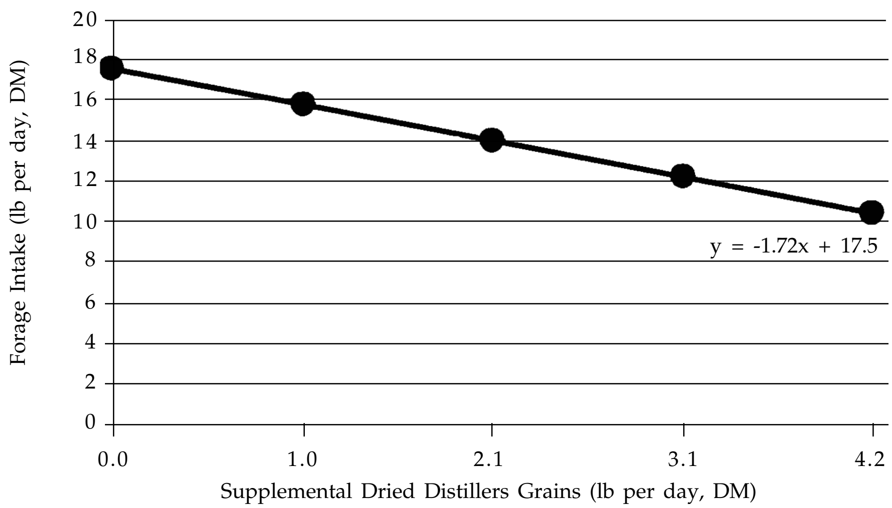

Figure 2. Effect of supplemental dried distillers grains on forage intake as predicted by the 1996 NRC model.

Table 1. Value of dried distillers grains (DDG) due to improved animal performance (IAP) and reduced forage intake(RFI).

Supplemental DDG, lb per d (DM):	0	1.0	2.1	3.1	4.2
Beginning wt, lb[a]	650	650	650	650	650
End wt, lb[b]	776	782	787	793	798
Sale price, $ per 100 lb[c]	74.30	74.14	73.98	73.82	73.66
Revenue, $[d]	576.52	579.42	582.32	585.23	588.15
DDG value from IAP, $ per ton[e]	—	65.97	66.04	66.12	66.20
DDG value from RFI, $ per ton[f]	—	109.68	109.68	109.68	109.68
Total DDG value, $ per ton[g]	—	175.65	175.73	175.80	175.88

[a]Average start weight for this trial.
[b]Expected weight after 84 days based on the equation $y = 0.06x + 1.50$ where y = ADG and x = DDG intake.
[c]Sale price per 100 lb determined from the equation $y = 0.00005x^2 - 0.1071x + 127.3$ where y = sale price and x = sale weight.
[d]Revenue determined by multiplying end weight and sale price/100.
[e]DDG value (DM) due to improved animal performance. Calculated from additional revenue over 0 DDG / level / days (84).
[f]DDG value (DM) due to reduced forage intake assuming a forage cost of $21.65 per animal unit month.
[g]Total DDG value (DM) from IAP + RFI. DDG value can be determined relative to forage cost with the equation $y = 5.07x + 66.08$ where y = DDG value and x = forage cost ($ per animal unit month).

is described by the equation y = -1.72x + 17.5 where y = forage intake (lb per day, DM) and x = supplemented DDG (lb per day, DM). This relationship suggests that one lb DDG will replace 1.72 lb forage in situations where unsupplemented cattle would be expected to consume 17.5 lb forage per day. By definition, there are 680 lb forage DM in one AUM. Therefore, 395 lb DDG will replace one AUM of forage or one ton DDG will replace 5.07 AUMs of forage. This relationship allows for DDG to be valued based on the forage it will replace. Table 1 shows the value of DDG as a result of increased animal performance and reduced forage intake. The additional gain of 0.06 lb per lb DDG supplemented results in an average additional value of DDG of $66.08 per ton(DM). Using these relationships, the value of DDG can be calculated from the cost of forage using the equation y = 5.07x + 66.08 where y = the value of DDG ($ per ton, DM) and x = the value of forage ($ per AUM). Using the 10-year average price of forage in Nebraska of $21.65 per AUM, the value of DDG is $175.84 per ton (DM).

It is appropriate to consider several points of discussion regarding these data. First, it is important to note that this value for DDG does not include a charge for delivery to the pasture because this cost is highly variable among producers. Second, DDG fed in this trial had a fat content of 8.5%. However, DDG may contain as much as 13% fat. Additional fat would supply more energy which would further increase gain or reduce forage intake. Thus, we feel these estimates are conservative. Finally, the highest level of supplemental DDG included in this data set was approaching 30% of dietary DM intake. This is a high level of supplementation and fat provided from DDG and forage above these levels may inhibit fiber digestibility. Therefore, we caution against extrapolating results of this data set beyond 4.2 lb of DDG supplementation. The process of determining the value of DDG relative to the price of forage suggests that supplementing DDG may be beneficial in many grazing situations.

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