Effects of Supplemental Distillers Dried Grains With Solubles on Carcass Characteristics and Meat Quality of Grazing Heifers

Q.P. Larson[1], A.N. Lepper-Blilie[1], R.J. Maddock[1], K.K. Karges[2] and B.W. Neville[3]

[1]Department of Animal Sciences, NDSU, Fargo
[2]Poet Nutrition Technical Services, Sioux Falls, S.D.
[3]Central Grasslands Research Extension Center, NDSU, Streeter

The objective of this study was to evaluate the impact of supplemental distillers dried grains with solubles (DDGS) on subsequent carcass characteristics and meat quality of heifers grazing Northern Plains rangelands. Supplementing DDGS to growing heifers during grazing did not impact carcass characteristics. However, taste panelists found steaks from supplemented heifers to have an increased tenderness, compared with steaks from nonsupplemented heifers.

Summary
A total of 82 yearling spayed heifers (initial body weight [BW]: 702.9 ± 8.8 pounds) were allotted to one of two supplementation treatments during the grazing season. Heifers were assigned randomly to one of six pastures, with each pasture randomly assigned to one of two treatments: 1) 0 percent supplementation (CONT) or 2) 0.6 percent of BW supplementation of DDGS (SUP). After a 70-day grazing season, heifers were placed into feedlot pens for a 109-day finishing study.

Heifers were harvested at a commercial abattoir, where carcass characteristics, U.S. Department of Agriculture yield grade and quality grade were evaluated by trained personnel. Strip loins were removed and transported back to North Dakota State University for Warner Bratzler shear force (WBSF**)**, retail display shelf life and taste panels.

Rib-eye area, 12th-rib fat thickness, and kidney, pelvic and heart (KPH) fat did not differ ($P \geq 0.50$) between treatments. No differences were found between treatments ($P \geq 0.24$) in yield grade or marbling ($Small^0 = 400$). Results from WBSF indicated that steaks from supplemented heifers tended ($P = 0.06$) to have increased tenderness, as compared with those from the control heifers (7.30 vs. 8.23 ± 0.12 pound, respectively).

Supplementation during grazing significantly increased meat color (L*: 100 = white, 0 = black) as compared with no supplement ($P = 0.01$). Results from the trained panel indicated that steaks from supplemented heifers were significantly more tender ($P = 0.02$) than those from the control heifers (5.87 vs. 5.51 ± 0.11; 8-point hedonic scale). Supplementation of DDGS during grazing did not impact carcass characteristics but did improve tenderness and steak sensory attributes.

Introduction

Distillers dried grains with solubles (DDGS) are used not only as a supplemental form of energy and protein in grazing animals, but also as a component in beef finishing rations. Utilization of DDGS has shown to increase animal performance and be economically viable in some markets (Morris et al., 2006; MacDonald et al., 2007). However, more research is needed on the impacts that supplemental DDGS during grazing has on finishing performance and meat quality. Beef consumers want high-quality meat products, which should make quality one of the main focuses in the beef industry.

Inclusion of DDGS in beef finishing rations increases the formation of polyunsaturated fatty acids in meat, which leads to a faster oxidation, or reduced a* (muscle redness) during retail shelf life (Depenbusch et al., 2009; Gill et al., 2008). Zerby et al. (1999) correlated a* values to consumer acceptance of the product with increased a* values, leading to increased consumer acceptance. A consumer is more likely to buy a meat product that is bright cherry red (increased a*) versus a meat product that is discolored and brown (decreased a*).

Research is needed to evaluate supplementation during grazing on the comprehensive impacts throughout the entire management system. This study evaluates the impact of DDGS provided to growing heifers grazing Northern Plains rangelands on subsequent carcass characteristics and meat quality.

Procedures

Procedures were approved by the North Dakota State University Animal Care and Use Committee prior to initiation of study. Procedures using human subjects for sensory panel were approved by the North Dakota State University Institutional Review Board before initiation of the panel.

A total of 82 yearling spayed heifers (initial body weight [BW]: 702.9 ± 8.8 pounds) were allotted to one of two supplementation treatments during the grazing season. Heifers were assigned randomly to one of six pastures, with each pasture randomly assigned to one of two treatments: 1) 0 percent supplementation (CONT) or 2) 0.6 percent of BW supplementation of DDGS (SUP). After a 70-day grazing season, heifers were placed into a feedlot pens for a 109-day finishing study. All heifers received the same conventional corn-based finishing diet containing no DDGS.

Results and Discussion

No differences were found between treatments (Table 1) in hot carcass weight (HCW) (P = 0.47). Rib-eye area, 12th-rib fat thickness and KPH were not different ($P \geq 0.50$) between treatments; therefore, no differences ($P \geq 0.30$) were observed for yield grade. Marbling was similar (P = 0.24) between SUP and CONT treatments (514 vs. 470 ± 22.3, respectively; $Small^0$ = 400). Klopfenstein et al. (2008) performed a meta-analysis and found marbling would decrease linearly in cattle fed DDGS at concentrations ranging from 0 to 40 percent of their dietary DM.

Warner-Bratzler shear force from heifers fed supplemental DDGS during grazing tended (P = 0.07, Table 2) to be more tender than steaks from heifers fed no supplemental DDGS (7.30 vs. 8.23 pounds, respectively). Differences for WBSF may come from the slight increase in the marbling scores exhibited by the SUP treatment. However, Leupp et al. (2009) fed steers 0:0, 30:0, 0:30 or 30:30 DDGS (percent-

age fed during growing and finishing periods, respectively) and found no difference in WBSF.

For retail shelf life display, no differences were found between SUP and CONT treatments for a* ($P \geq 0.47$) or b* ($P \geq 0.11$) color values. Steaks from the SUP treatment had a significant increase in L* ($P = 0.01$) when compared with steaks from the CONT treatment. Leupp et al. (2009) reported reduced L* color values regardless of growing or finishing period with 30 percent DDGS inclusion when compared with feeding dry-rolled corn. Differences reported for L* between the current study and Leupp et al. (2009) may be due to different packaging methods. Steaks rated by the trained panel indicated no differences ($P \geq 0.20$) in juiciness or flavor between treatments. However, panelists rated steaks from heifers supplemented with DDGS during grazing as more tender ($P = 0.02$) than steaks from non-supplemented heifers (5.87 vs. 5.51 ± 0.10; 8-point hedonic scale).

Results indicate that supplementing distillers dried grains with solubles during grazing had some comprehensive impacts on meat quality. Supplementing DDGS does not impact carcass characteristics or retail shelf life display but possibly could improve tenderness.

Acknowledgements
The authors thank Poet Nutrition Technical Services for its support of this project.

Table 1. Effect of distillers dried grains with solubles (DDGS) supplementation to grazing heifers on northern Great Plains on subsequent carcass characteristics.[1]

	Treatment[2]			
Item	**CON**	**SUP**	**SEM[3]**	***P*- value**
HCW, pound	734	747	9.66	0.47
Rib-eye area, in^2	12.7	12.5	0.19	0.50
12th rib back fat, in	0.48	0.50	0.02	0.57
Marbling score[4]	470	514	22.3	0.24
KPH, %	1.85	1.85	0.08	0.99
Quality grade[5]	10.2	10.6	0.25	0.28
Yield grade	2.8	3.0	0.10	0.30
Dress, %	58.7	58.3	0.33	0.52

[1] Means presented are least squares means.
[2] CONT = 0 percent DDGS supplementation; SUP = 0.6 percent of BW DDGS supplementation.
[3] n=3.
[4] Marbling score based on 400 = $Small^{00}$.
[5] Quality grade based on Low Choice (Ch^-) = 10, High Prime (Pr^+) = 15.

Table 2. Effect of distillers dried grains with solubles (DDGS) supplementation to grazing heifers on Northern Great Plains on steak shear force, color analysis and sensory characteristics.[1]

Item	Treatment[2]		SEM[3]	*P*- value
	CON	SUP		
Steaks, n	41	41	---	
Shear force, pound	8.23	7.30	0.12	0.07
Color[4]				
L*	45.51	56.52	0.27	0.01
a*	21.59	21.48	0.11	0.47
b*	9.41	9.30	0.05	0.11
Sensory characteristics[5]				
Tenderness	5.51	5.87	0.11	0.02
Juiciness	5.51	5.64	0.07	0.20
Flavor	5.41	5.44	0.05	0.70

[1] Means presented are least squares means.
[2] CONT = 0 percent DDGS supplementation; SUP = 0.6 percent of BW DDGS supplementation.
[3] n=3.
[4] L* = white to black (100 = white, 0 = black); a* = red to green (35 = red, -35 = green) b* = yellow to blue (35 = yellow, -35 = blue).
[5] Tenderness (8 = extremely tender, 1 = extremely tough); juiciness (8 = extremely juicy, 1 = extremely dry); flavor (8= extremely flavorful, 1 = extremely bland).

Literature Cited

Depenbusch, B.E., C.M. Coleman, J.J. Higgins and J.S. Drouillard. 2009. Effects of increasing levels of dried corn distillers grains with solubles on growth performance, carcass characteristics, and meat quality. J. Anim. Sci. 87:2653-2663.

Gill, R.K., D.L. VanOverbeke, B. Depenbusch, J. S. Drouillard and A. DiCostanzo. 2008. Impact of beef cattle diets containing corn or sorghum distiller's grains on beef color, fatty acid profiles, and sensory attributes. J. Anim. Sci. 86:923-935.

Klopfenstein, T.J., G.E. Erickson and V.R. Bremer. 2008. Board-invited review: Use of distillers by-products in the beef cattle feeding industry. J. Anim. Sci. 86:1223-1231.

Leupp, J.L., G.P. Lardy, M.L. Bauer, K.K. Karges, M.L. Gibson, J.S. Caton and R.J. Maddock. 2009. Effects of distillers dried grains with solubles on growing and finishing steer intake, performance, carcass characteristics, and steak color and sensory attributes. J. Anim. Sci. 87:4118-4124.

MacDonald, J.C., T.J. Klopfenstein, G.E. Erickson and W.A. Griffin. 2007. Effects of dried distillers grains and equivalent undegradable intake protein on ether extract on performance and forage intake of heifers grazing smooth bromegrass pastures. J. Anim. Sci. 85:2614-2624.

Morris, S.E., T.J. Klopfenstein, D.C. Adams, G.E. Erickson and K.J. VanderPol. 2006. Effects of supplementing dried distillers grains to steers grazing summer sandhill range. Pages 30-32 in Nebraska Beef Cattle Report. MP 88-A. Univ. Nebraska, Lincoln.

Zerby, H.N., K.E. Belk, J.N. Sofos, L.R. McDowell and G.C. Smith. 1999. Case life of seven products from beef cattle supplemented with alpha-tocopheryl acetate. J. Anim. Sci. 77:2458-2463.