Effects of a Dietary Antioxidant on Performance and Carcass Characteristics of Feedlot Cattle With or Without WDGS

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Summary

Effect of a dietary antioxidant in diets with or without wet distillers grains plus solubles (WDGS) was evaluated for performance and carcass characteristics. The 2 x 2 factorial design consisted of 1) an antioxidant at 0 or 150 ppm (Agrado Plus) and 2) WDGS at 0 or 30%, which replaced dry-rolled corn. Feeding the antioxidant did not affect performance (P > 0.31) or carcass characteristics (P > 0.25). Feeding WDGS increased (P < 0.01) final body weight (BW), dry matter intake (DMI), and average daily gain (ADG) while decreasing the feed to gain (F:G) ratio (P < 0.01). Carcass characteristics were affected (P < 0.01) by feeding WDGS, which increased HCW and fatness.

Introduction

Feeding wet distillers grain plus solubles (WDGS) is becoming a common practice. However, WDGS contains high levels of unsaturated fatty acids that are prone to oxidation, which may increase oxidative stress (*2007 Nebraska Beef Cattle Report*, pp. 39-42; *2008 Nebraska Beef Cattle Report*, pp. 108-109; *2009 Nebraska Beef Cattle Report*, pp. 110-111; *2010 Nebraska Beef Cattle Report*, pp. 97-98). Dietary antioxidants may control excessive lipid oxidation and decrease negative effects by reducing the peroxidation of fatty acids (*2009 Nebraska Beef Cattle Report*, pp. 113-115).

The objectives of our study were to evaluate live performance and carcass characteristics of feedlot cattle receiving finishing diets, with or without a dietary antioxidant (ethoxyquin and tertiary-butyl-hydroquinone), in dry-rolled, corn-based diets with or without WDGS.

Procedure

Four hundred eighty British x Continental yearling steers (BW = 779 lb) were acclimated to the feedlot for five or six days, respectively, prior to initial processing, which included: 1) ear tags; 2) vaccinations; 3) de-worming; 4) implanting with Component TE-IS with Tylan® (Vetlife/Elanco, Overland Park, KS); and 5) individually weighing on two consecutive days for an average initial BW. Cattle were re-implanted with Component TE-S with Tylan® on day 71.

Cattle were stratified by BW, assigned to eight weight blocks and assigned randomly to 32 pens. Four treatment diets were assigned randomly to pens within each block, with eight pens per treatment and 15 steers per pen. A 21-day adaptation period consisted of three periods, each seven days, where roughage was replaced with an equal amount of concentrate. Two diets consisted of dry-rolled corn (DRC) (78%), soybean meal/urea pellet (1.86:1; 4%), corn silage (12%) and a liquid supplement (6%) with or without a dietary antioxidant (AOX) (0 or 150 ppm Agrado Plus, Novus International, Inc., St. Louis, MO) and two diets consisted of DRC (52%), WDGS (30%), corn silage (12%), and a liquid supplement (6%) with or without a dietary antioxidant (0 or 150 ppm Agrado Plus). The liquid supplement contained Rumensin (345 mg/hd/day) and Tylan (90 mg/hd/day). Diets containing WDGS had a CP level of 14.8%, compared to 13.4 % in the corn-based diets (Table 1). Fat level was greater for the WDGS compared to the corn-based diets.

When approximately 60% of steers within a block were expected to grade USDA Choice, the steers were sent to a commercial abattoir. Half of the weight blocks were fed 145 days and the other half for 160 days. On the day of slaughter, hot carcass weights (HCW) were recorded. Following a 24-hour chill, 12th rib fat thickness, lean muscle (LM) area, marbling score, USDA QG And USDA YG were recorded. To account for any gut-fill, the final live BW was adjusted using a common dressing percentage of 63% calculated from HCW. The carcass-adjusted final BW was used to calculate ADG and F:G.

Performance and carcass characteristics were analyzed as a 2 x 2 factorial using the PROC MIXED procedure of SAS (Version 9.1, SAS Inc., Cary, N.C.). Pen was used as the experimental unit. The factors included in the model were WDGS inclusion and dietary antioxidant inclusion, with weight block as a fixed variable and initial BW as a covariate. PROC FREQ was used in the Chi-square analyses of USDA QG distribution.

Results

No WDGS level x AOX level interaction was observed for performance ($P > 0.32$) or carcass characteristics ($P > 0.34$); therefore, only main effects were evaluated. Main effects of dietary antioxidant are reported in Table 2 and were not significantly different for performance ($P > 0.30$) or carcass characteristics ($P > 0.24$).

Performance and carcass characteristics for WDGS main effects have been summarized in Table 3. Initial BW was lighter ($P < 0.01$) for steers receiving the 30% WDGS; however, the difference was only 2 pounds. Final BW increased ($P < 0.01$) with WDGS inclusion (1387 lb to 1483 lb). Daily intake increased ($P < 0.01$) from 24.0 lb/day to 24.7 lb/day with

Table 1. Finishing diet nutrient analysis (% DM basis)[1].

Nutrient	Treatment			
	Control	Agrado Plus	WDGS + Agrado Plus	WDGS
DM, %	78.9	78.9	62.4	62.4
CP, %	13.4	13.4	14.8	14.8
Fat, %	3.73	3.73	5.74	5.74
S, %	0.15	0.15	0.25	0.25
Vit A, IU/lb	4914	4730	4775	4959
Vit D, IU/lb	140	121	121	140
Vit E, IU/lb	13	13	16	16

[1]Calculated from *Nutrient Requirements of Beef Cattle: Seventh Revised Edition: Update 2000.*

Table 2. Main effects of Agrado Plus on performance and carcass characteristics.

Item	Treatment			
	0 ppm	150 ppm	SE	*P*-value
Initial BW, lb	779	779	0.6	0.94
Final BW, lb[1]	1434	1436	5.2	0.84
DMI, lb/day	24.3	24.4	0.08	0.31
ADG, lb	4.27	4.28	0.04	0.90
F:G	5.71	5.74	0.04	0.70
HCW, lb	903	905	3.3	0.81
12th rib fat, in	0.60	0.60	0.01	0.68
LM area, in^2	14.2	14.2	0.13	0.70
USDA YG[2]	3.32	3.28	0.05	0.60
Marbling[3]	550	542	4.8	0.25

[1]HCW / 63% average dressing.
[2]Calculated Yield Grade = 2.5 + (2.5*12th rib fat, in) + (0.0038*HCW, lb) – (0.32*LM area, in^2) + (0.2*KPH, %).
[3]400 = slight 0; 500 = small 0.

Table 3. Main effects of WDGS on performance and carcass characteristics.

Item	Treatment			
	0% WDGS	30% WDGS	SE	*P*-value
Initial BW, lb	780	778	0.6	<0.01
Final BW, lb[1]	1387	1483	5.7	< 0.01
DMI, lb/day	24.0	24.7	0.09	< 0.01
ADG, lb	3.95	4.59	0.04	< 0.01
F:G	6.08	5.37	0.05	< 0.01
HCW, lb	873	934	3.6	< 0.01
12th rib fat, in	0.52	0.68	0.01	< 0.01
LM area, in^2	14.3	14.1	0.15	0.21
USDA YG[2]	2.93	3.67	0.06	< 0.01
Marbling[3]	542	550	5.3	0.35

[1]HCW / 63% average dressing.
[2]Calculated Yield Grade = 2.5 + (2.5*12th rib fat, in) + (0.0038*HCW, lb) – (0.32*LM area, in^2) + (0.2*KPH, %).
[3]400 = slight 0; 500 = small0.

WDGS inclusion. Gain increased ($P < 0.01$) when including WDGS in the diet (3.95 lb to 4.59 lb). WDGS inclusion resulted in a decrease ($P < 0.01$) in F:G (6.08 lb to 5.37 lb). Carcasses were heavier ($P < 0.01$), 12th rib fat increased ($P < 0.01$), and USDA YG increased ($P < 0.01$) with WDGS inclusion. Percentage USDA Choice and above tended to increase ($P = 0.14$), and percentage USDA Select tended to decrease ($P = 0.13$) when including WDGS. No differences were observed between treatments for LM area ($P = 0.21$) or marbling scores ($P = 0.35$).

Inclusion of a synthetic dietary antioxidant (ethoxyquin and tertiary-butyl-hydroquinone) at 150 ppm (DM basis) had no significant effect on performance or carcass characteristics. Conversely, WDGS inclusion resulted in a typical response on performance (*2008 Nebraska Beef Cattle Report*, pp.35-36; *2010 Nebraska Beef Cattle Report*, pp. 61-62) and increased carcass fatness (*2007 Nebraska Beef Cattle Report*, pp. 33-35). When WDGS was included at 30% diet DM, in a dry-rolled, corn-based diet, WDGS had a feeding value of 142% based on F:G, with a 16% increase in ADG and a 12% decrease in F:G.

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