University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Nebraska Beef Cattle Reports | Animal Science Department

2009

Level of Wet Distillers Grains Plus Solubles and Solubles Ensiled with Wheat Straw for Growing Steers

Megan Peterson
University of Nebraska-Lincoln, mpeterson7@unl.edu

Matt K. Luebbe
University of Nebraska - Lincoln, mluebbe2@unl.edu

Richard J. Rasby
University of Nebraska-Lincoln, rrasby1@unl.edu

Terry J. Klopfenstein
University of Nebraska-Lincoln, tklopfenstein1@unl.edu

Galen E. Erickson
University of Nebraska-Lincoln, gerickson4@unl.edu

See next page for additional authors

Follow this and additional works at: https://digitalcommons.unl.edu/animalscinbcr

Part of the Animal Sciences Commons

Peterson, Megan; Luebbe, Matt K.; Rasby, Richard J.; Klopfenstein, Terry J.; Erickson, Galen E.; and Kovarik, Luke, "Level of Wet Distillers Grains Plus Solubles and Solubles Ensiled with Wheat Straw for Growing Steers" (2009). *Nebraska Beef Cattle Reports*. 518.
https://digitalcommons.unl.edu/animalscinbcr/518

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Beef Cattle Reports by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Authors

Megan Peterson, Matt K. Luebbe, Richard J. Rasby, Terry J. Klopfenstein, Galen E. Erickson, and Luke Kovarik

This article is available at DigitalCommons@University of Nebraska - Lincoln: https://digitalcommons.unl.edu/animalscinbcr/518

Level of Wet Distillers Grains Plus Solubles and Solubles Ensiled with Wheat Straw for Growing Steers

Megan M. Peterson
Matt K. Luebbe
Rick J. Rasby
Terry J. Klopfenstein
Galen E. Erickson
Luke M. Kovarik[1]

Summary

A growing study compared wet distillers grains plus solubles (WDGS) and solubles ensiled with wheat straw individually fed to crossbred steers. Four blends of ensiled distillers grain and solubles were used to compare performance on growing calves versus feeding ensiled byproducts alone. Increasing the level of distillers grains in the diet increased average daily gain (ADG) and dry matter intake (DMI). The nonensiled distillers grain treatments had at least equal ADG and feed-to-gain ratio (F:G) compared to the ensiled treatments.

Introduction

Previous research has shown WDGS can be mixed with dry forages and stored in silo bags (Adams et al., *2008 Nebraska Beef Report*, pp. 23-25). The objectives of this study were to: 1) evaluate ensiled solubles and ensiled and nonensiled WDGS with wheat straw and their impact on performance of growing calves; and 2) compare blends of ensiled WDGS and solubles on performance of growing calves versus feeding ensiled byproducts alone.

Procedure

In November, four silo bags were filled using wheat straw, WDGS and solubles. Wheat straw was ground through a 5-in screen. Five hundred pounds of wheat straw were loaded into a feed truck, and 444 lb of WDGS were added to obtain a mix of 25% WDGS and 75% wheat straw (DM basis). Water was added to obtain a moisture content of 50%. The blend was mixed in the roto-mix feed truck for five minutes and then placed into a silo bag using 300 psi to exclude oxygen. Three additional bags were made using combinations of 55% WDGS + 45% wheat straw, 25% solubles + 75% wheat straw and 45% solubles + 55% wheat straw. Only the 55% WDGS silo bag did not have additional water added to the mixture to bring the mix to 50% moisture. The bags were sealed, and the ensiled byproducts were stored for 50 days before being fed.

Crossbred steers (n = 120) were individually fed for 80 days using the Calan gate system. Prior to initiation of the trial, steers were trained to use the Calan gate system for 21 days. Steers were limit-fed for five days at the beginning of the trial to minimize gut fill differences. Steers were weighed on three consecutive days to determine initial body weight. Based on body weight, steers were stratified and blocked into light, medium and heavy weight blocks. Steers were randomly assigned to treatment within each weight block (eight steers per treatment). Cattle were fed daily at 0600, and feed refusals were weighed and sampled weekly. Samples were dried in a 60°C forced air oven for 48 hours to calculate dry matter intake (DMI). At the conclusion of the trial, steers were limit-fed for five days, and consecutive weights were recorded daily for three days and averaged for final weights.

There were a total of 15 treatments. The first seven treatments included: 25% solubles; 35% solubles and 45% solubles ensiled with ground wheat straw; and 25% WDGS, 35% WDGS, 45% WDGS and 55% WDGS combined with wheat straw. The 25% solubles treatment was taken from the 25% solubles silo bag. Using a combination of the 25% and 45% ensiled material, the 35% treatment was produced. The 45% solubles treatment was taken from the 45% solubles silo bag. Similarly, the 25% WDGS was acquired from the 25% WDGS silo bag. The 35% and 45% WDGS treatments were combinations of the 25% and 55% silo bags.

The next four treatments consisted of a 35% and 45% WDGS ensiled and nonensiled group. The nonensiled treatments were made from mixing fresh WDGS and ground wheat straw daily. The ensiled treatments came from the combinations of the 25% WDGS and 55% WDGS silo bags. Two calves of similar weight were assigned either to ensiled 35% WDGS or fresh 35% WDGS treatment. The steer on the 35% WDGS treatments intake was limited to the intake of the nonensiled WDGS 35% treatment. Similarly, an ensiled 45% WDGS treatment had intake defined by a nonensiled 45% WDGS companion animal.

The last four treatments were blends of solubles. WDGS and wheat straw blends included: 17.5% solubles + 17.5% WDGS; 25% solubles + 10% WDGS; 25% solubles + 20% WDGS; and 26.25% solubles + 8.75% WDGS.

Each treatment was fed with a 2% supplement consisting of limestone, salt, tallow, vitamins A, D, and E and a beef trace mineral mix fed with a fine ground corn carrier.

Results

The sulfur contents (Table 1) of 35% solubles; 45% solubles; 25% solubles + 10% WDGS; 25% solubles + 20% WDGS; 26.25% solubles + 8.75% WDGS; and 55% WDGS were all calculated to be over 0.5%, which is greater than the National Research Council's recommended level of 0.4%. However, in this trial, we did not observe any signs of polioencephalomalacia. The percentage fat in diet was highest (8.7%) for the 45% solubles treatment. However, intake was not reduced and this treatment had the second highest intake of all the treatments.

Data from the treatments involving WDGS and solubles level were analyzed for effects of level and type of byproduct (Table 2). Treatments of 25% and 35% solubles were similar for ADG, but ADG increased for the 45%

(Continued on next page)

© The Board of Regents of the University of Nebraska. All rights reserved.

Table 1. Sulfur % and fat % of WDGS and soluble treatments.

Treatment	Sulfur[1] %	Fat [2] %
Ensiled WDGS 35 (limited)	.35	4.96
Ensiled WDGS 45(limited)	.45	6.14
Nonensiled WDGS 35	.35	4.96
Nonensiled WDGS 45	.45	6.14
Sol 25	.40	5.17
Sol 35	.56	6.92
Sol 45	.72	8.69
Sol 17.5 + WDGS 17.5	.46	6.07
Sol 25 + WDGS 10	.50	6.44
Sol 25 + WDGS 20	.60	7.69
Sol 26.25 + WDGS 8.75	.51	6.50
WDGS 25	.25	3.59
WDGS 35	.35	4.96
WDGS 45	.45	6.14
WDGS 55	.55	7.73

[1]Calculated daily sulfur intake when WDGS =1.0% S and solubles = 1.6%.
[2]Calculated percent fat in the diet due to grain byproduct when WDGS = 13.3% and solubles = 18.3%.

Table 2. Performance characteristics related to inclusion level of solubles or WDGS.

Item	25 % Solubles	35% Solubles	45% Solubles	25% WDGS	35% WDGS	45% WDGS	55% WDGS	SEM	*P*-value
Int BW, lb	555	554	555	562	557	554	555	11.49	0.99
Final BW, lb	639[b]	634[b]	654[bc]	600[a]	632[b]	652[bc]	681[c]	14.87	< 0.01
DMI, lb/day	10.47[bc]	11.15[c]	11.25[c]	9.04[a]	9.73[ab]	10.84[c]	11.17[c]	0.533	< 0.01
ADG, lb	1.05[bc]	1.00[bc]	1.24[cd]	0.47[a]	0.94[b]	1.23[c]	1.60[d]	0.128	< 0.01
F:G	10.14[bc]	11.49[b]	8.8[bc]	21.0[a]	10.52[bc]	9.20[c]	6.86[d]	1.757	< 0.01

[a,b,c] Within a row, means without a common superscript differ ($P < 0.05$).

Table 3. Performance characteristics of four blends of solubles and WDGS.

Item	17.5% Sol + 17.5% WDGS	25% Sol + 10% WDGS	25% Sol + 20% WDGS	26.25% Sol + 8.75% WDGS	SEM	*P*-value
Int BW, lb	551	549	557	559	13.95	0.87
Final BW, lb	630	632	666	650	16.80	0.14
DMI, lb/day	9.54[a]	10.26[ab]	11.52[c]	9.71[ab]	0.57	< 0.01
ADG, lb	0.99	1.03	1.36	1.10	0.15	0.08
F:G	10.06	10.20	8.80	9.33	1.01	0.49

[a,b,c]Within a row, means without a common superscript differ ($P < 0.05$).

Table 4. Performance characteristics on level and type of WDGS.

	Level		Type		SEM	*P*-value Type	*P*-value Level
	35	45	Ensiled	Nonensiled			
Int BW, lb	556	559	558	557	11.07	0.94	0.64
Final BW, lb	635	648	636	647	12.68	0.19	0.17
DMI, lb/day	9.87	9.01	9.37	9.50	0.53	0.74	0.03
ADG, lb	0.99	1.1	0.97	1.13	0.12	0.08	0.22
F:G	10.85	8.35	10.56	8.64	1.52	0.09	0.03

solubles level. There was a quadratic trend ($P = .069$) for F:G to decrease as inclusion of solubles increased. The 35% solubles treatment had the highest F:G, with 45% solubles being the most efficient and 25% solubles in the middle of the other two treatments.

The DMI and ADG increased linearly ($P < .01$) as the WDGS inclusion increased from 25% to 55%. Additionally, F:G of WDGS treatment decreased linearly ($P < 0.01$) as the level of inclusion increased. ADG of steers fed solubles and WDGS at the same inclusion rates were not different except for the 25% level of inclusion. Intake was greater for the 25% solubles compared to the 25% WDGS treatment.

Four blends were made using different inclusion levels of solubles and WDGS (Table 3). Differences in DMI ($P < 0.01$) were found between treatments. Steers on the 17.5% solubles + 17.5% WDGS treatment had a lower ($P < 0.01$) intake (9.54 lb) compared to steers on the 25% solubles + 20% WDGS treatment (11.52 lb). Additionally, ADG tended ($P = .08$) to be different among groups. However, F:G was not different ($P > .10$) among the four treatment blends. The blends totaling 35% byproduct resulted in gains of 0.99 to 1.1 lb/day, similar to gains achieved with either of the byproducts fed alone. There appears to be no associative effect of feeding the combinations. The 25% solubles + 20% WDGS blend also resulted in similar ADG to either of the byproducts fed alone.

Using a 2 x 2 factorial, the level (35% vs. 45%) and type (ensiled vs. nonensiled) of WDGS were compared (Table 4). The type x level interaction was not significant. There were no differences in type for initial and final BW or DMI. For type there was a trend for ADG ($P = 0.08$) and F:G ($P = 0.09$) to be different. There were no differences between the two levels for ADG and initial and final body weights. However, DMI and F:G differed ($P = 0.08$) between the 35% and 45% WDGS levels. Steers fed the 45% diet have lower F:G and DMI compared to steers fed the 35% diet.

In summary, both solubles and WDGS ensiled with wheat straw stored successfully in the silo bags. Calves responded positively to increasing levels of either solubles or WDGS, and the feeding values of solubles were at least equal to those of WDGS. Blends of solubles and WDGS resulted in performances similar to those of either solubles or WDGS fed alone. There were no associative effects. The WDGS mixed with wheat straw at feeding time gave comparable performance to similar levels of WDGS that had been ensiled for more than 50 days.

[1]Megan M. Peterson, graduate student; Matt K. Luebbe, research technician; Rick J. Rasby, professor; Terry J. Klopfenstein, professor; Galen E. Erickson, associate professor; Luke M. Kovarik, graduate student, Animal Science, Lincoln.

© The Board of Regents of the University of Nebraska. All rights reserved.