Update: Meta-Analysis of UNL Feedlot Trials Replacing Corn with WDGS

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Summary

An updated meta-analysis of UNL feedlot trials replacing dry rolled (DRC) or high moisture (HMC) corn with wet distillers grains plus solubles (WDGS) indicated feeding performance similar to previous estimates. The feeding value of WDGS was similar for winter-fed calves, summer-fed yearlings, and fall-fed yearlings. The improvement in F:G from both WDGS and HMC was synergistic compared to DRC with or without WDGS. Feeding WDGS at increased levels in HMC-based diets provided performance superior to DRC with or without WDGS.

Introduction

A previous meta-analysis of UNL feedlot trials evaluated replacing corn with WDGS (*2008 Nebraska Beef Report*, pp. 35-36). Since publication of the original meta-analysis, additional trials have been completed that augment the original dataset.

Previous UNL research has shown high moisture corn (HMC) to have increased feeding value relative to dry rolled corn (DRC) in feedlot diets with no byproducts. However, the previous meta-analysis was not robust enough to accurately evaluate the impact of corn processing type on feeding value of WDGS.

The UNL feedlot research utilizes spring-born black crossbred steers weaned in the fall for most research trials. After an initial receiving period, the largest steers are fed as calf-feds in the winter, the medium steers are fed as short yearlings in the summer after wintering on cornstalks, and the small steers are wintered wintered on cornstalks, grazed on grass through the summer, and finished in the fall to market by 24 months of age. Previous UNL research has shown the winter-fed calves to be more efficient than yearlings at converting feedlot diets to gain (*2007 Nebraska Beef Report*, pp. 58-60). We realize that season of feeding and calf age are confounded; however, the data set allows for the evaluation of WDGS feeding value with winter-fed calf-feds, summer-fed short yearlings, and fall-fed long yearlings.

The objectives of this meta-analysis were to update the existing meta-analysis and to more accurately evaluate the impact of corn type and season of feeding on the feeding value of WDGS.

Procedure

The criteria for trial inclusion in the dataset were the same as for the previous meta-analysis. Five additional UNL feedlot trials replacing corn with WDGS have been completed since the previous meta-analysis publication (*2009 Nebraska Beef Report*, pp. 59-61; 2009 *Nebraska Beef Report*, pp. 66-69; *2009 Nebraska Beef Report*, pp. 76-78; *2009 Nebraska Beef Report*, pp. 86-88; *2010 Nebraska Beef Report*, pp. 43-45). Five winter, six summer, and three fall studies (n = 2,534 steers) were included in the dataset with 46 treatment means. Seven trials fed a blend (mainly 1:1) of HMC and DRC; seven trials fed DRC only; and one of the DRC trials also fed HMC diets without DRC. In all trials, WDGS replaced corn in the diets (0 to 50% of diet DM).

An iterative meta-analysis was used to integrate quantitative findings from multiple studies using the PROC MIXED procedure of SAS. Trials were weighted by number of WDGS levels to prevent artificial linear responses from trials with only 0 and one other level of WDGS. The initial model (similar to the previous analysis) included the effects of trial and WDGS inclusion as percentage of diet DM (linear, quadratic, and cubic effects when significant). The advanced model for evaluating F:G for season of feeding and corn processing (DRC, HMC, and a 1:1 DRC:HMC blend) also included the effects of season (winter, summer, or fall), percentage of diet corn as HMC, and the linear interaction of percentage of diet corn as HMC with WDGS inclusion level.

Results

Replacement of corn up to 50% of diet DM as WDGS resulted in superior performance compared to cattle fed no WDGS (see Table 1 below). These data agree with the previous meta-analysis. Dry matter intake, ADG, F:G, 12th rib fat, and marbling score improved quadratically as WDGS inclusion level increased. The feeding value of WDGS was consistently higher than that of corn when WDGS was included up to 50% of diet DM. The feeding value was greater at lower WDGS inclusion levels and decreased as inclusion level increased. The increased feeding value of WDGS was due to improvements in ADG when WDGS replaced corn.

According to the advanced model calculations, winter-fed calves have F:G superior to summer- and fall-fed yearlings (see Table 2 on next page). The feeding value of WDGS was similar for calves fed in the winter, short yearlings fed in the summer, and long yearlings fed in the fall.

Feeding HMC instead of DRC in 0% WDGS diets improved F:G by 23% when adjusted for roughage and supplement inclusion in the diet (see Table 3 on next page). This value may be inflated from actual biological value due to the synergistic effect of feeding a DRC and HMC blend with WDGS in the diet that is not accounted for by the model.

The feeding value of WDGS in a diet containing HMC was in addition to the feeding performance benefit of HMC. The WDGS in the 40% WDGS diet with HMC was worth 135% the feeding value of HMC. The 42.5% HMC and 40% WDGS were both worth 139% the feeding value of DRC. This means the 42.5% HMC with WDGS had feeding value at least equal to that of the 40% WDGS. The feeding value of the HMC was improved when it was fed with WDGS.

An intermediate, synergistic improvement in F:G is seen when a blend of DRC and HMC is fed with 40% WDGS relative to DRC or HMC as the only corn source. The WDGS in this diet was worth 125% the feeding value of the DRC:HMC blend. The 21% HMC and 40% WDGS were both worth 131% the feeding value of DRC.

These data suggested feeding WDGS with HMC provides improved feedlot performance relative to DRC diets with or without WDGS. No significant difference in feeding value was observed when WDGS was fed to winter calves, summer yearlings, or fall yearlings.

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Table 1. Finishing steer performance when fed different dietary inclusions of wet distillers grains plus solubles (WDGS).

WDGS Inclusion[1]	0WDGS	10WDGS	20WDGS	30WDGS	40WDGS	50WDGS	Lin[2]	Quad[2]	Cubic[2]
DMI, lb/day	23.0	23.3	23.4	23.1	22.5	21.6	0.05	< 0.01	0.63
ADG, lb	3.52	3.73	3.85	3.88	3.82	3.68	< 0.01	< 0.01	0.33
F:G	6.55	6.27	6.07	5.94	5.88	5.90	< 0.01	0.03	0.46
12th rib fat, in	0.49	0.52	0.54	0.55	0.54	0.51	0.05	0.03	0.09
Marbling score[3]	521	528	530	527	520	507	0.85	0.03	0.70
Feeding value, %[4]	100	148	142	136	129	123			

[1]Dietary treatment levels (DM basis) of wet distillers grains plus solubles (WDGS): 0WDGS = 0% WDGS; 10WDGS = 10% WDGS; 20WDGS = 20% WDGS; 30WDGS = 30% WDGS; 40WDGS = 40% WDGS; 50WDGS = 50% WDGS.
[2]Estimation equation linear, quadratic, and cubic term t-statistic for variable of interest response to WDGS level.
[3]500 = Small[0].
[4]Percentage of corn feeding value, calculated from predicted feed conversion relative to 0WDGS feed conversion, divided by WDGS inclusion.

Table 2. Finishing steer performance when fed different dietary inclusions of wet distillers grains plus solubles (WDGS) in winter, summer, or fall.

WDGS Inclusion[1]	0WDGS	10WDGS	20WDGS	30WDGS	40WDGS	50WDGS
Winter F:G[a]	5.97	5.70	5.50	5.40	5.45	5.68
Summer F:G[a]	6.75	6.40	6.15	6.03	6.09	6.38
Fall F:G[a]	6.19	5.91	5.69	5.59	5.63	5.88
Winter Feeding Value, %[2]		147	142	134	124	110
Summer Feeding Value, %[2]		153	148	139	127	111
Fall Feeding Value, %[2]		148	144	136	124	110

[1]Dietary treatment levels (DM basis) of wet distillers grains plus solubles (WDGS): 0WDGS = 0% WDGS; 10WDGS = 10% WDGS; 20WDGS = 20% WDGS; 30WDGS = 30% WDGS; 40WDGS = 40% WDGS; 50WDGS = 50% WDGS.
[2]Percentage of corn feeding value, calculated from predicted feed conversion relative to 0WDGS feed conversion, divided by WDGS inclusion.
[a]Significant season of feeding effect ($P < 0.01$) and no season by WDGS level interaction ($P = 0.93$).

Table 3. Finishing steer performance when fed different dietary inclusions of wet distillers grains plus solubles (WDGS) in diets containing dry rolled corn (DRC), high moisture corn (HMC), or a 1:1 blend of DRC:HMC.

WDGS Inclusion[1]	0WDGS	10WDGS	20WDGS	30WDGS	40WDGS	50WDGS
DRC F:G[a]	6.78	6.52	6.33	6.28	6.41	6.82
DRC:HMC F:G[a]	6.29	5.99	5.77	5.66	5.71	5.97
HMC F:G[a]	5.86	5.54	5.30	5.16	5.15	5.30
DRC feeding value, %[2]		141	136	127	115	99
DRC:HMC feeding value, %[2]		150	145	137	125	111
HMC feeding value, %[2]		157	153	145	135	121

[1]Dietary treatment levels (DM basis) of wet distillers grains plus solubles (WDGS): 0WDGS = 0% WDGS; 10WDGS = 10% WDGS; 20WDGS = 20% WDGS; 30WDGS = 30% WDGS; 40WDGS = 40% WDGS; 50WDGS = 50% WDGS.
[2]Percentage of corn feeding value, calculated from predicted feed conversion relative to 0WDGS feed conversion, divided by WDGS inclusion.
[a]Significant corn processing effect ($P < 0.01$) and significant corn processing by WDGS level interaction ($P < 0.01$).