THE EFFECTS OF CO-ENSILING WET DISTILLER'S GRAINS PLUS SOLUBLES WITH CORN SILAGE ON GROWTH PERFORMANCE OF BRED BEEF HEIFERS DURING LATE PREGNANCY

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Introduction:

The beef industry serves as one of the most important value-added enterprises in the U.S. with over a million farms and ranches benefiting directly from the sales of cattle (NCBA, 2006). In 2002, gross receipts from the sale of cattle and calves totaled over $45 billion and accounts for over 21% of all agricultural receipts. This makes the beef sector the single largest agricultural enterprise in the U.S. (USDA, 2006). It has been estimated that although the U.S. beef industry has less than 10% of the world's cattle population, it provides nearly 25% of the world's beef supply (USDA, 2002). Interestingly, small and medium-sized beef producers (less than 200 cows) account for 96.5% of the beef cow operations and 67 % of the U.S. beef cow inventory (USDA, 1997).

Despite increased consumption and growth within the industry, production agriculture is at a crossroads. Government subsidies given to the bio-fuel industries have contributed to the growth in the corn-based ethanol industry which, in turn, has resulted in future corn prices of over $7/bushel. The ramifications of the shift towards ethanol production are far reaching. The sudden increase in corn prices during the fall of 2007 has placed a heavy burden on beef producers. Small and medium-sized producers currently are not capable of utilizing commodity feeds with limited 'shelf-life', like wet distiller's grains (WDG), and this places them at a severe disadvantage compared to larger operations. The increasing cost of traditional feed grains (especially corn) which have been traditionally used in beef production has the potential to drive them out of business.

Garcia and Kalscheur (2004) reported successful storage and co-ensiling of WDG with corn silage, soybean hulls, and wet beet pulp. The challenge is that WDG are naturally low in pH and may inhibit the fermentation process; furthermore, how the ensiling process of the mixed ingredients affects spoilage at the face of the open silo structure and in the feed bunk is not known. Additional questions regarding performance of animals fed these mixtures, maximal inclusion rates to determine optimal end-product quality, and how these mixtures fit into small to medium-sized farm operations have not been answered.

Objectives:

The objectives of the current study are to evaluate the effects of co-ensiling corn silage and WDGS on performance of heifers during the third trimester of gestation.

About the Study:

This study was conducted at the Beef Unit of Purdue University with a total of 96 2-year old commercial Angus heifers with an average body weight (BW) of 1150 pounds and a body condition score (BCS) of 5.3 in

their last trimester of pregnancy. They were sorted in 16 groups by weight and body condition score.

In order to determine the effect of the co-ensiled product, 3 more diets were evaluated for a total of 4 diets as follows (Table 1):

1. Corn silage with soybean meal as control (**CON**); given that is the traditional diet for the winter in our region.
2. Corn silage co-ensiled with WDG in a proportion 3:1 (Dry matter basis) of corn silage and WDG respectively (**CO-EN**)..
3. Corn silage with dry distiller's grains (DDG) added at feeding time (**CS+DDG**)
4. Corn silage mixed with WDG added at feeding time (**CS+WDG**).

The diets were formulated to meet requirements (NRC, 1996) for Angus heifers during the last trimester of gestation and balanced to be equivalent one from another (Table 2). The heifers were fed once a day for the 62 day long trial.

To measure growth performance, the heifers were weighed and body condition scored at the beginning and the end of the study and the weights were corrected to remove the any weight produced by pregnancy itself. The most important performance indicators measured in this study were:

- Feed consumption in terms of dry matter intake (DMI)
- Average daily gain in weight (ADG)
- Efficiency measured as gain to feed ratio (G:F)
- BW (Final BW and overall change during the study)
- BCS (Final BCS and overall change during the study)

Results and Discussion:

For our indicators above we found the following results (Table 3):

a) DMI: the Heifers fed the CS+DDG diet had decreased DMI ($P < 0.01$) compared to all other diets.
b) ADG: Heifers fed the CO-EN treatment had greater ADG ($P = 0.03$) than those fed the CON and CS+DDG diets.
c) G:F: The CO-EN fed heifers also tended to have greater G:F ($P = 0.06$) compared to those fed the CON and CS+WDG.
d) BW: Heifers fed the CO-EN treatment had greater overall gain in BW ($P = 0.03$) compared to the CON and the CS+DDG treatments, while the CS+WDG treatment was intermediate. However, there was no significant differences in final BW ($P = 0.14$) due to dietary treatment.
e) BCS: There was no significant differences in final BCS ($P = 0.40$) or change in BCS ($P = 0.35$) due to the diets.

The increased performance (ADG and BW change) observed with heifers fed the CO-EN treatment compared to CON and CS+DDG treatments may be due, in part, to differences in DMI. It is interesting to note, however, that there were no differences in performance between heifers fed the CO-EN and CS+WDG diets, but there was a tendency ($P < 0.06$) for the CO-EN heifers to be more efficient that all the other diets.

Conclusions:

Results from this study suggest that WDG co-ensiled with corn silage have equal or greater feeding value when fed to heifers in the last trimester of gestation compared to corn silage based diets supplemented with

soybean meal, DDG or WDG at feeding time.

Implications:

Co-ensiling WDG with corn silage not only appears to enhance animal performance but additionally seems to be more palatable, easier to handle than TMRs with WDG and DDG added at feeding time, longer lasting in the feeders, and less susceptible to sorting by cattle and gravity; the co-ensiling process can be scheduled according to availability and pricing of the feedstuffs. This process can provide an economically viable feed source for any producer.

Selected References:

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Table 1. Ingredient composition of diets fed to heifers.

	Diets[1] (% of DM)			
Ingredient	**CON**	**CO-EN**	**CS+ DDG**	**CS+ WDG**
Corn Silage[2]	88.8	—	73.6	73.6
Soybean meal	10.2	—	—	—
Co-ensiled[3]	—	98.1	—	—
DDG[4]	—	—	24.5	—
WDG[5]	—	—	—	24.5
Mineral premix[6]	1.8	1.9	1.9	1.9

[1] CON = control (corn silage with soybean meal), CO-EN = co-ensiled, CS+DDG = corn silage plus DDG added at mixing, CS+WDG = corn silage plus WDG with solubles added at mixing.
[2] Corn silage: 35% DM, 9.1% CP, 40% NDF (DM basis).
[3] Co-ensiled corn silage with WDG 3:1 (DM basis).
[4] DDG = Dry distillers grains with solubles.
[5] WDG = Wet distillers grains with solubles.
[6] 70% $CaCo_3$, 11.5% inorganic mix, 18.5% NaCl.

Table 2. Composition of diets (DM basis) fed to heifers.

	Diets[1]			
Ingredient	**CON**	**CO-EN**	**CS+ DDG**	**CS+ WDG**
NEg, Mcal/Kg [2]	1.06	1.12	1.12	1.12
CP, %	12.2	12.5	12.4	12.4
Prot. Sol., % CP	44.7	41.6	38.3	34.5
aNDF, %	38.4	37.7	39.7	37.8
ADF, %	21.7	19.2	21.6	20.1
DM, %	38.3	36.1	38.8	40.5

[1] CON = control (corn silage with soybean meal), CO-EN = co-ensiled corn silage with wet distillers grains 3:1 (DM basis), CS+DDG = corn silage plus dry distillers grains with solubles added at mixing, CS+WDG = corn silage plus wet distillers grains with solubles added at mixing.
[2] Dietary energy and protein were formulated using tabular values (NRC, 1982).

Table 3. Effect of treatments on performance of Angus heifers during the last trimester of gestation.

	Treatments[1,2]					
Item	**CON**	**CO-EN**	**CS+DDG**	**CS+WDG**	***SE*[3]**	***P***
DMI, lbs	17.27[a]	17.73[a]	15.41[b]	17.95[a]	0.22	0.01
Initial BW, lbs	1149.3	1149.4	1155.9	1153.7	4.19	0.39
Initial BCS	5.43	5.36	5.33	5.27	0.09	0.36
ADG, lbs	1.83[b]	2.32[a]	1.96[b]	2.09[ab]	0.15	0.03
G:F	0.106	0.130	0.127	0.117	0.01	0.06
Final BW, lbs	1263.0	1292.6	1278.8	1283.3	11.9	0.14
Final BCS	5.62	5.73	5.54	5.48	0.15	0.40
Change in BW, lbs	113.56[b]	143.33[a]	121.28[b]	129.56[ab]	9.15	0.03
Change in BCS	0.19	0.38	0.21	0.21	0.11	0.35

[1] CON = control (corn silage with soybean meal), CO-EN = co-ensiled corn silage with wet distiller's grains plus solubles 3:1 (DM basis), CS+DDG = corn silage plus dry distiller's grains with solubles added at mixing, CS+WDG = corn silage plus wet distiller's grains with solubles added at mixing.

[2] Means within a row lacking a common superscript differ ($P < 0.05$)

[3] Standard Error