

The feeding value of corn distillers solubles for lactating dairy cows

A.K. Sasikala-Appukuttan^{1*}, D.J. Schingoethe¹, A.R. Hippen¹, K.F. Kalscheur¹, K. Karges² and M.L. Gibson²

¹South Dakota State University, Brookings, ²Dakota Gold Research Association, Sioux Falls, SD

Abstract

Fifteen Holstein cows in early to midlactation (79.3 ± 9.2, DIM) were used in this experiment to evaluate and compare the use of condensed corn distillers solubles (CCDS) and dried distillers grains with solubles (DDGS) in the total mixed ration. The forage portion of the diets was kept constant at 27.5% corn silage and 27.5% alfalfa hay (DM basis). Diets were: 1) 0% distillers grains products (control), 2) 18.5% DDGS, 3) 10% CCDS, and 4) 20% CCDS, and 5) a combination diet of 18.5% DDGS with 10% CCDS. Diets 2 and 3 contained 2% added fat from DDGS or CCDS while diet 4 contained 4% added fat from CCDS and diet 5 contained 4% added fat from the blend of DDGS and CCDS. The diets were balanced to provide 17% CP with variation in ADF, NDF, and fat contents. Dry matter intake (21.4, 22.0, 20.9, 21.3, and 21.9 kg/d for diets 1 to 5, respectively) was similar ($P > 0.10$) for all diets, even though diets with CCDS were more moist. Milk yield (33.8, 36.2, 35.5, 36.0, and 36.0 kg/d) tended ($P < 0.10$) to be higher for diets 2 to 5 than for diet 1 while yields of fat (1.00, 1.01, 1.03, 1.05, and 1.04 kg/d) and protein (0.99, 1.03, 1.01, 1.03, and 1.04 kg/d), fat% (2.96, 2.84, 2.93, 2.93, and 2.86) and protein% (2.92, 2.88, 2.87, 2.88, and 2.90) were similar ($P > 0.10$) for all diets. Energy corrected milk (32.2 kg/d) and feed efficiency (1.58 kg ECM/kg DMI) were similar ($P > 0.10$) for all diets. Milk urea nitrogen (15.0, 10.9, 11.1, 11.0 and 11.4 mg/dL) was higher ($P < 0.01$) for diet 1 compared with all other diets. Ruminal acetate decreased ($P < 0.01$) and propionate increased ($P < 0.01$) for diet 2 to 5 compared to diet 1. The results showed that CCDS is as effective as DDGS in replacing soybean meal and corn grain in the total mixed ration.

Key words: Condensed corn distillers solubles, Dried distillers grains with solubles, Dairy Cattle

Objectives:

- To determine the influence of feeding CCDS to lactating cows on
 - Milk production and composition
 - feed intake and feed efficiency
- To determine the optimal concentration of CCDS in dairy cattle diets
- To determine the response of feeding CCDS in place/addition of DDGS

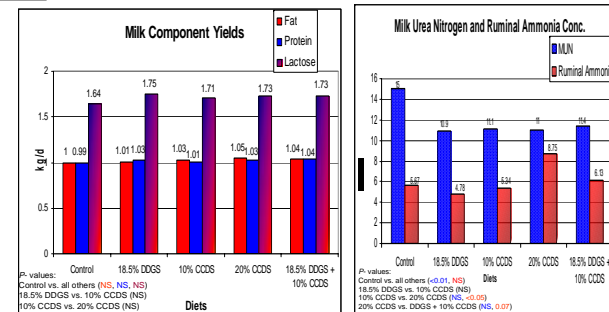
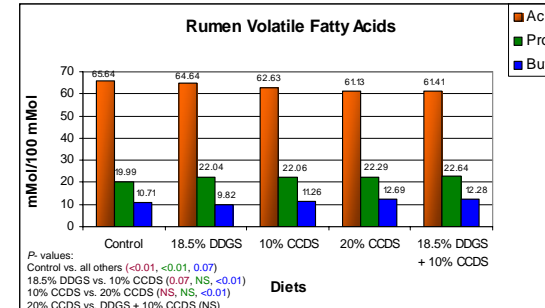
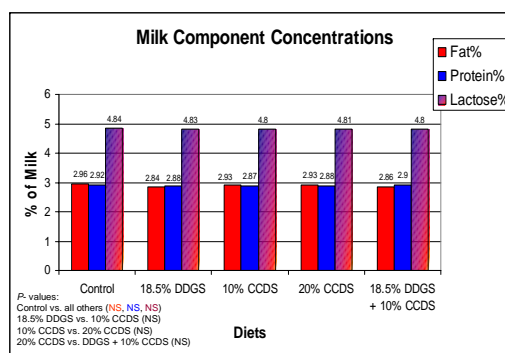
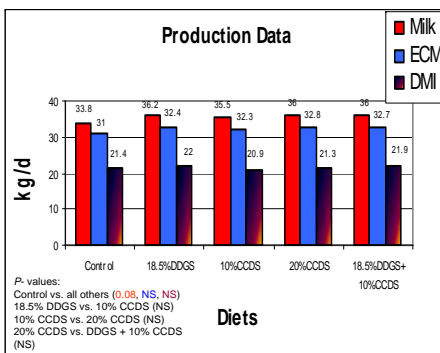
Materials and Methods:

- 10 multiparous and 5 primiparous Holstein cows in a 5 X 5 Latin square, blocked by production, DIM, and parity
- 5 periods, 4 wk each: 2 wk adjustment, 2 wk data collection
- Treatment diets:
 - Control -no added distillers source
 - 18.5% DDGS -2% added fat from DDGS
 - 10% CCDS -2% added fat from CCDS
 - 20% CCDS -4% added from CCDS
 - 18.5% DDGS + 10% CCDS -4% added fat from the blend of DDGS and CCDS
- Cows were fed w/ Calan gate feeding system & intakes recorded daily
- Cows were housed in free stall barn
- Cows were milked 3X per day
- Milk samples were taken on 2 d in wk 3 and 4 of each period
- Rumen fluid samples were taken via esophageal tube on 1 d in wk 4 of each period
- Data were analyzed using the MIXED procedure of SAS. Treatments compared w/ orthogonal contrasts were:
 - Control vs. all other diets
 - 18.5% DDGS vs. 10% CCDS (NS)
 - 10% CCDS vs. 20% CCDS (NS)
 - 20% CCDS vs. combination diet of 18.5% DDGS with 10% CCDS (NS)

Item	Diet Formulations				
	Control	18.5% DDGS	10% CCDS	20% CCDS	18.5% DDGS + 10% CCDS
	-----(% of DM)-----				
Corn Silage	27.50	27.50	27.50	27.50	27.50
Alfalfa Hay	27.50	27.50	27.50	27.50	27.50
Corn, ground, shelled	32.51	23.55	24.72	16.93	14.80
Soybean meal, 44% CP	10.43	1.08	8.50	6.36	0.00
DDGS	0.00	18.50	0.00	0.00	18.50
CCDS	0.00	0.00	10.00	20.00	10.00
Vit. & Min.	2.06	1.88	1.80	1.71	1.69

Chemical composition of Diets

Item	18.5% DDGS + 10% CCDS				
	Control	18.5% DDGS	10% CCDS	20% CCDS	10% CCDS
	-----(% of DM)-----				
Dry matter, %	53.3	54.7	46.3	40.4	47.3
Crude protein	16.8	16.0	17.1	17.9	16.9
Ether extract	2.5	3.5	3.7	5.6	5.1
ADF	18.9	19.4	19.1	19.1	19.6
NDF	30.8	33.8	30.9	30.2	33.6
Lignin	3.4	3.5	3.4	3.4	3.5
Ash	7.2	7.3	8.0	8.7	7.9



Summary:

- Milk yield tended to be higher for cows fed the distillers diets compared with control diet
- Cows fed CCDS diet and DDGS diet had similar production of milk
- Yields and concentrations of milk components were similar between CCDS and DDGS diets
- Ruminal acetate decreased and propionate concentration increased for cows fed distillers diets compared with the control diet.

Conclusions:

- CCDS can effectively replace DDGS in TMR rations
- Feeding as much as 20% CCDS (4% added dietary fat) did not adversely effect production