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Summary

A growing study compared the effects of a diet consisting of corn distillers solubles (SOL) to the effects of a diet containing corn wet distillers grains plus solubles (WDGS) when ensiled with cornstalks (stalks). Four levels of SOL and WDGS were fed at 15%, 20%, 25% and 30% of diet DM. The effect of feeding ensiled WDGS and stalks was compared to feeding WDGS and stalks mixed fresh daily at 30% inclusion. WDGS-fed steers were more efficient than those fed solubles. Steer performance also improved with increased levels of byproducts. However, no interaction between byproduct and level was observed, except for DMI.

Introduction

Previous research shows that these byproducts can be utilized as a supplement in backgrounding operations or cow/calf situations. Producers may face the challenge of storing the product to feed later. The objective of the current study was to evaluate stored WDGS or SOL with cornstalks when fed to growing calves and determine the impact of level of WDGS and SOL mixed and stored with low quality forage on calf performance.

Procedure

Storage

Over four consecutive days, ground cornstalks were mixed with WDGS or SOL in a 50:50 ratio (DM basis) and bagged at the University of Nebraska Research Feedlot near Mead, Neb. Dry matter was assumed to be 31% for SOL, 32% for WDGS and 85% for stalks. The as-fed percentage of cornstalks was 27.3% or 26.7% when mixed with WDGS or SOL, respectively. WDGS and cornstalks (WDGS:stalks) mixture and SOL and stalks (SOL:stalks) mixture were stored for 20 days prior to trial initiation of block 1.

Treatments

One-hundred twenty individually fed growing steers (BW = 694 $\pm$ 21 lb) were limit-fed a mix of 47.5% alfalfa hay, 47.5% wet corn gluten feed and 5.0% supplement at 2% of BW for five days prior to trial initiation to minimize gut fill. Steers were weighed three consecutive days, and the average of the three-day weights was used as the initial BW. Weights obtained on the first two days were averaged and used to assign steers to one of nine treatments with 11 steers per treatment. Eight treatments were designed as a 2 x 4 factorial, WDGS or SOL, and level (15%, 20%, 25% and 30% of diet DM). The 30 WDGS:30 stalks mixture was utilized to compare feeding a stored diet to feeding a non-ensiled diet mixed fresh daily. The ensiled versus non-ensiled comparison consisted of 22 steers in the ensiled group and 21 in the non-ensiled group to increase replication. Levels of 15%, 20%, 25% and 30% of byproduct inclusion with an equal amount of stalks replaced mid-bloom bromegrass hay in the diet on a DM basis (Table 1). Block 1 steers were individually fed for 106 days and block 2 steers for 71 days using Calan electronic gates. Feed refusals were collected weekly and DM measured using a 60°C forced air oven. Bunks were evaluated and adjusted daily according to individual intake. Steers were limit fed for five days at trial completion and weighed for three consecutive days for ending BW.

Data were analyzed using MIXED procedures of SAS as a completely randomized design with animal as experimental unit. The 2 x 4 factorial design was analyzed for a type (SOL or WDGS) by level (15, 20, 25, 30) interaction. If the interaction was significant, simple effects were analyzed and presented. If no significant interaction was observed, main effects are presented. Orthogonal contrasts of linear and quadratic responses also were analyzed for level of byproduct. The ensiled versus non-ensiled comparison was analyzed separately using PROC MIXED and a simple means comparison.

Table 1. Diet composition on DM basis.

Ingredient	Level[1]			
	15	20	25	30[2]
Byproduct[3]	15	20	25	30
Stalks[4]	15	20	25	30
Grass hay	68	58	48	38
Supplement	2	2	2	2

[1]Byproduct inclusion on DM basis.
[2]30 WDGS:stalks the same for both ensiled and non-ensiled.
[3]SOL (distillers solubles) or WDGS (wet distillers grains plus solubles) included in diet on DM basis.
[4]Cornstalks mixed with byproduct and stored at a 50:50 ratio (DM basis).

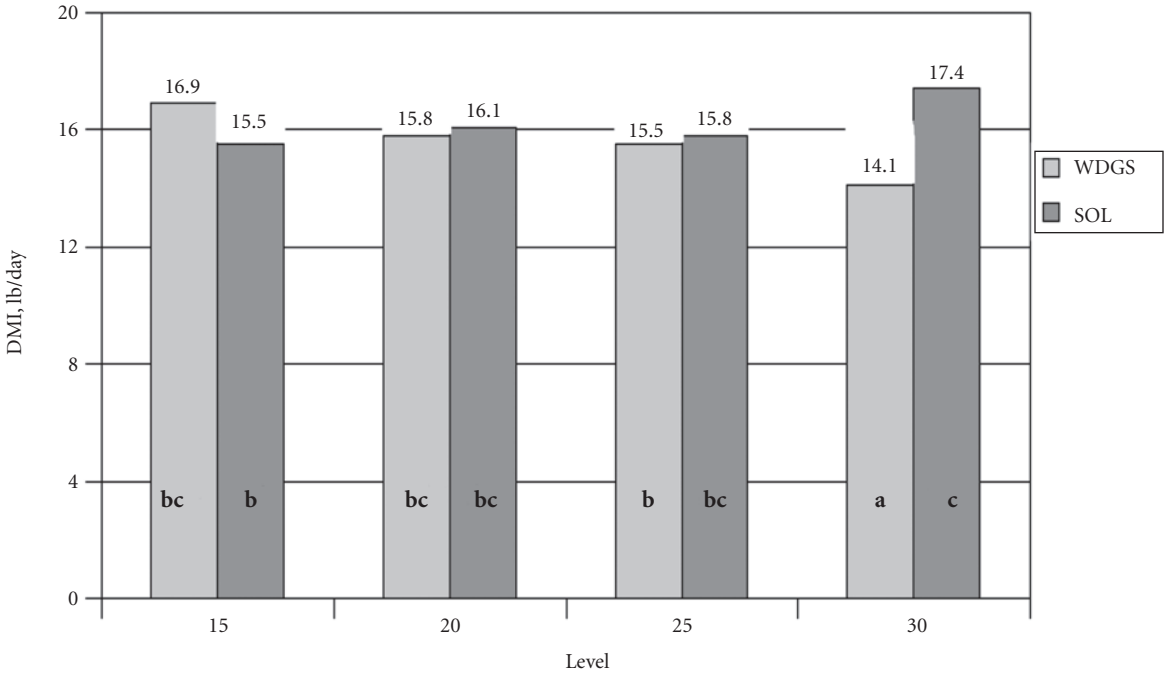

Figure 1. Dry matter intake interaction between byproduct of SOL or WDGS and level of 15, 20, 25 or 30 (as percent of byproduct included).

[a,b,c]Means without common superscript differ $P < 0.05$.

Lab Analysis

Feed ingredients were analyzed to determine DM, CP, fat and NDF values (Table 2). Dry matter determination was conducted using the 60°C forced air oven for 48 hours. Organic matter was calculated from six hours ash at 600°C oven. The combustion method was conducted for CP analysis. Fat was analyzed using the Gravimetric Fat Procedure modified by University of Nebraska. Percentage NDF was analyzed using Van Soest (1964) NDF procedure.

Results

The only type-by-level interaction observed was for DMI, as shown in Figure 1. Steers fed 30 WDGS:30 stalks consumed the least amount and were significantly different from all other treatments ($P < 0.01$). Steers fed 30 SOL:30 stalks consumed the most and were statistically similar to steers fed 20 SOL:20 stalks, 25 SOL:25 stalks, 15 WDGS:15 stalks and 20 WDGS:20 stalks ($P > 0.05$).

Table 2. Ingredient nutrient analysis.

Ingredient	DM	CP	Fat	NDF
SOL[1]	36.4	17.1	12.6	3.4
WDGS[2]	33.0	30.8	11.2	35.5
SOL:stalks[3]	46.4	13.4	11.0	35.4
WDGS:stalks[4]	46.1	19.2	6.2	58.0
Stalks	83.3	5.2	0.7	86.0
Grass hay	87.3	9.6	2.0	77.3

[1]Corn distillers solubles.
[2]Corn wet distillers grains plus solubles.
[3]Solubles and cornstalks mixed and stored in 50:50 ratio (DM basis).
[4]Wet distillers grains plus solubles and cornstalks mixed and stored in 50:50 ratio (DM basis).

Table 3. Main effects of feeding distillers solubles or wet distillers grains plus solubles to growing calves on performance.

Item	SOL[1]	WDGS[2]	SEM	*P*-value
Initial BW, lb	695	693	10	0.81
Ending BW, lb	806	825	10	0.06
ADG, lb	1.04	1.25	0.07	< 0.01
F:G	15.54	12.49	2.15	< 0.01

[1]Corn distillers solubles.
[2]Corn wet distillers grains plus solubles.

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Table 4. Main effects of feeding increasing levels[1] of byproducts to growing calves on performance.

Item	15	20	25	30	SEM	*P*-value
Initial BW, lb	693	696	696	691	14	0.98
Ending BW, lb[2]	788	804	834	835	14	< 0.01
ADG, lb[3]	0.90	1.02	1.30	1.35	0.09	< 0.01
F:G[4]	18.00	15.62	12.02	11.62	3.05	< 0.01

[1]15, 20, 25, 30 = % byproduct (solubles or WDGS) included in diet on DM basis.
[2]Linear response of $P < 0.01$; Quadratic response of $P = 0.47$.
[3]Linear response of $P < 0.01$; Quadratic response of $P = 0.60$.
[4]Linear response of $P < 0.01$; Quadratic response of $P = 0.58$.

Table 5. Effects of feeding a stored diet versus a diet mixed fresh daily to growing calves on performance.

Item	Ensiled[1]	Non-Ensiled[2]	SEM	*P*-value
Initial BW, lb	686	690	16	0.86
Ending BW, lb	838	798	20	0.05
DMI, lb/day	14.1	12.2	1.9	< 0.01
ADG, lb	1.43	1.02	0.41	< 0.01
F:G	9.83	11.95	1.05	0.07

[1]30 WDGS:stalks fed from stored product bagged in 50:50 ratio (DM basis).
[2]30 WDGS:stalks mixed fresh daily and fed.

Main effects of type of byproduct fed (Table 3) were analyzed by comparing performance of steers fed the SOL and stalks combinations to those fed WDGS and stalks combinations. Steers fed WDGS:stalks had higher ending BW ($P = 0.06$) than the steers fed the SOL:stalks mixtures. Average daily gain and F:G also were greater ($P < 0.05$) for steers fed WDGS:stalks than for those fed SOL:stalks.

Main effects of level of byproduct fed are presented in Table 4. Ending BW increased linearly as byproduct level increased in the diet ($P < 0.01$). Average daily gain increased linearly with byproduct level ($P < 0.01$), which led to a linear decrease in F:G ($P < 0.01$).

The performance results of steers fed a stored diet (ensiled) compared to a diet mixed fresh daily (non-ensiled) were analyzed separately and are shown in Table 5. The steers fed the ensiled mixture of WDGS and stalks weighed more at trial completion ($P = 0.05$) than steers consuming the same diet mixed fresh daily. Dry matter intake was greater ($P < 0.01$) for steers fed the ensiled treatment compared to those fed the non-ensiled diet. The steers fed the ensiled diet also had greater ADG ($P < 0.01$) than steers fed the diet mixed fresh daily. Interestingly, a trend was observed in F:G ($P = 0.07$) for steers fed the stored mixture to be more efficient than those fed the non-ensiled diet.

After the bagging process, DM analysis was performed using the 60°C forced air oven. Analysis suggested the DM of SOL and WDGS were greater (36% and 33%, respectively) than formulated at the time of ensiling. Likewise, the stalks had a lower DM (83%) than values used for mixing. Therefore, the actual ratio of SOL:stalks was 53:47 and the ratio of WDGS:stalks was 51:49. This demonstrates the value of accurate DM determination.

Even with the small differences in mixes, SOL and WDGS can be utilized as supplementation for growing calves when stored with cornstalks. Performance results showed that WDGS stored with stalks provided a higher quality diet in this study. However, more SOL could be fed as a mixture to produce the same performance. By comparing steers fed 30 SOL:30 stalks versus 20 WDGS:20 stalks, performance was statistically similar. Steers fed 30 SOL:30 stalks were as efficient as steers fed 20 WDGS:20 stalks, and both had similar DMI. Steers fed WDGS mixed with stalks did have lower F:G compared to steers fed SOL at the same level, but if a producer can purchase the SOL for less than the WDGS, it could be economically beneficial to use as a supplement even if they have to feed more.

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