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Effect of Distillers Grains Supplementation on Calves Grazing Irrigated or Non-Irrigated Corn Residue

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Summary

Steer calves grazing irrigated or non-irrigated corn residue received supplementation of dried or modified distillers grains plus solubles (DGS) at 0.3, 0.7, or 1.1% of BW . Steers were individually supplemented daily through Calan gates. Daily gain improved quadratically with increasing supplementation (1.55 lb/day to 2.12 lb/day) and for calves grazing non-irrigated (2.02 lb/day) compared to irrigated (1.77 lb/day) corn residue. Feeding dry instead of modified DGS did not significantly impact ADG. Supplementing DGS to calves grazing corn residue increased gain during the winter period.

Introduction

There is significant potential for grazing corn residues in Nebraska due to the acres of corn planted annually. Grazing residues increases the length of the grazing season, allowing producers to feed less harvested feeds, thereby reducing annual feed costs. However, residues are lower in CP and energy than what is required to meet the needs of growing calves gaining more than 1 lb per day. Providing protein supplementation in the form of rumen undegradable protein (RUP) allows producers to increase winter gain of growing calves on corn residue. A feed that acts as an excellent source of RUP and energy in forage-based diets is distillers grains plus solubles (DGS). A quadratic effect has previously been demonstrated for calves grazing irrigated corn residue and receiving dried DGS at increasing levels, with optimal supplementation being at 1.1% of body weight (*2006 Nebraska Beef Cattle Report*, pp. 36-37). Research in finishing cattle has shown improvements in ADG for wet DGS over partially dried (i.e., modified) DGS or dried DGS (2009 Nebraska Beef Cattle Report, pp. 28-29). However, a significant difference has not been observed in growing calves grazing forages.

For grazing cattle, stocking rates are traditionally based on available forage and not the quality of the forage. Non-irrigated corn residue has a greater nutritional value, although a lower quantity of total residue, compared to irrigated fields. Therefore, the increased energy observed for non-irrigated fields should result in an increase in ADG for the calves when stocked at similar grazing pressures. The objective of this trial was to compare two types of DGS at three levels of supplementation for calves grazing an irrigated or non-irrigated corn residue field.

Procedure

One hundred twenty crossbred steers (435 ± 16 lb) were backgrounded on corn residue from Nov. 1, 2012, to Dec. 22, 2012 at the University of Nebraska–Lincoln Agricultural Research and Development Center (ARDC) near Mead, Neb. The trial was terminated early due to substantial snowfall. Treatments were arranged in a 2 x 3 x 2 factorial design, with two types of DGS, three levels of inclusion, and two different field types of corn residue. Steers were assigned randomly to treatment to evaluate the effects of supplementing modified or dried DGS on calves grazing either irrigated or non-irrigated corn residue on ADG. Each type of DGS was fed at an inclusion level of 0.3, 0.7 or 1.1% of BW. Steers were offered daily supplementation through the Calan Gate System for approximately two hours each morning and were then turned out to graze residue for the remainder of the day. Calves were gathered early each morning at sunrise prior to grazing, penned up for supplement consumption, and then turned out for grazing the remainder of the day. All calves were implanted with Ralgro on day one of the trial and received monensin at 200mg/steer and limestone at 60g/steer daily as part of supplementation.

Stocking rate was calculated based on yield of the field at harvest and previous research quantifying the amount of residue consumed per acre. The yield (bu/acre), estimated forage availability (8 lb/bu), grazing efficiency factor (100% for non-irrigated, 85% for irrigated) and number of acres were multiplied together to estimate the total available forage for each field. Total available forage was then divided by estimated DMI of all steers allotted to graze each respective field in order to get days of available grazing. Using this calculation, the 32-acre irrigated field would allow 66 steers to graze for 70 days based on a yield of 214 bushels of grain/acre. The non-irrigated fields totaled 42 acres and had a yield of 100 bushels of grain/acre, allowing for 60 steers to graze 70 days. Due to the limited number of Calan gates, only 60 steers could be used on the irrigated field. The six ruminally fistulated steers utilized for diet sampling were able to graze irrigated corn residue and received daily supplementation in a feed bunk outside the barn.

Diet samples were collected four times throughout the trial by emptying the rumen of solid and liquid particulate matter. Prior to turn out, steers were assigned randomly to graze either the irrigated or non-irrigated field (three per field type). Once steers had a chance to graze for 30 minutes they were brought back in and the grazed forage was collected from the rumen, sealed in a labeled bag, and stored on ice for later analysis of *in-vitro* organic matter disappearance (IVOMD). The original rumen contents prior to diet sampling were replaced in the rumen of the respective steer prior to turning them out with the herd. Total grazed contents were frozen and subsequently freeze dried. Samples were ground through a 1 mm screen prior to analysis. The IVOMD calculation was determined by incubating each sample for 48 hours in a solution of MacDougall's buffer and rumen fluid. Samples were then filtered, dried,and ashed to obtain DM and OM amounts for the IVOMD calculation. Feed refusals were collected each week and analyzed for DM. Samples were dried in a forced air oven at 60ºC for 48 hours, weighed and then

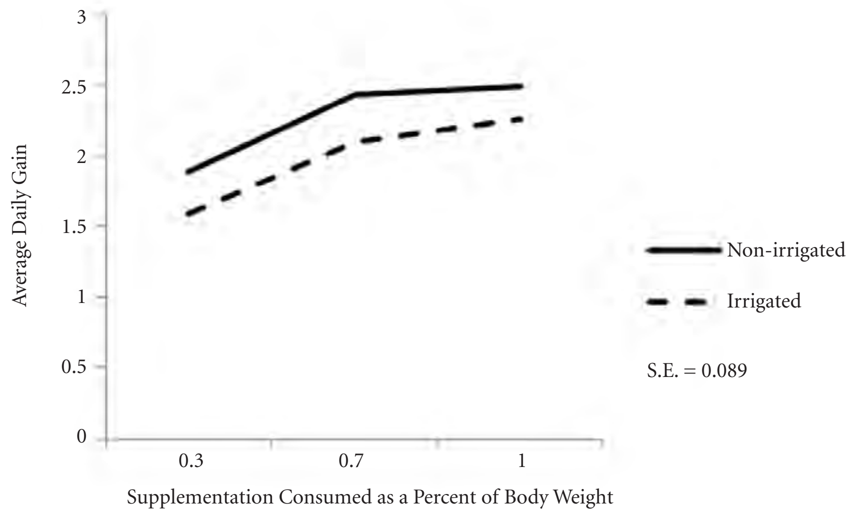

Figure 1. Relationship of distillers grains level and type of corn residue field on average daily gain.

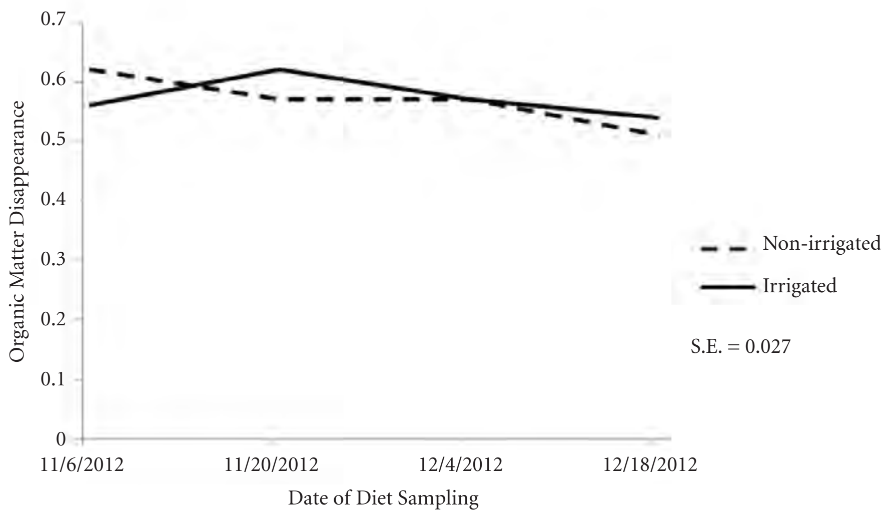

Figure 2. ***In vitro*** **organic matter disappearance of diet samples over time.**

dried in a 100°C oven for 12 hours to get a lab corrected DM. Refusals for each individual animal were subtracted from the total amount of supplement offered to calculate actual supplement intake as a percentage of BW.

Results

No interactions were present for the 2 x 3 x 2 factorial design ($P = 0.12$). Therefore, the main effects of DGS type, level of inclusion and field type are presented.

Average daily gain increased quadratically ($P = 0.01$) with increasing level of supplementation for calves grazing irrigated and non-irrigated corn residue. Calves supplemented at 0.3, 0.7, and 1.1% of BW gained an average of 1.55, 2.02, and 2.12 lb/day ($P < 0.0001$). Some feed refusals were observed for steers supplemented at 0.7 and 1.1% of BW. The gain response to increasing levels of DGS supplementation is shown in Figure 1. The quadratic effect suggests that minimal improvements in gain occurred when calves grazing corn residue are offered supplementation at more than 1.1% of body weight. Based on supplement intake and ADG, the optimal supplementation level was 1% for calves grazing irrigated corn residue and 0.9% of BW for calves grazing a non-irrigated field.

Calves receiving modified DGS gained 1.92 lb/day compared to 1.88 lb/day for calves on the dried DGS treatment. Gains were not different ($P = 0.51$), which is similar to previous work in forage-based diets. Therefore, the type of DGS utilized may be based on amount that can be used/stored, location, availability, and pricing on a DM basis.

Steers grazing the non-irrigated corn residue gained more ($P = 0.0002$; 2.02 lb/day) in comparison to steers grazing irrigated residue (1.77 lb/day). While non-irrigated corn residue is lower in quantity and requires a lower stocking rate per acre, previous research has shown that the nutritional quality is higher than with irrigated corn residue. The improvement in ADG of steers grazing the non-irrigated field supports previously observed differences in nutritional quality.

Differences were not present for diet samples collected and analyzed by sampling period ($P = 0.07$) or field type ($P = 0.76$). Figure 2 shows the changes in IVOMD over time. The IVOMD calculation shows the linear decline in quality of the diet samples throughout the sampling period for both the irrigated and non-irrigated fields. Grazing corn residue is unique in that all of the available forage is accessible to the animal on the first day of grazing. Animal selectivity occurs with the steer consuming the grain, husk, leaf, cob, and then stalk. Residue parts are selected for in order of highest to lowest nutrient quality, supporting the decline in IVOMD over the grazing period. Based on previous research and the performance data from this trial, non-irrigated residue was expected to be different in nutritive quality when compared to irrigated corn residue. The ruminally fistulated steers grazed the irrigated corn residue field unless being utilized for diet sampling. Those assigned to graze the non-irrigated field may have had the disadvantage of not knowing the best grazing areas in the unfamiliar field, forcing them to consume lower quality plant parts.

This experiment suggests ADG is greater for calves grazing non-irrigated residue in comparison to irrigated corn residue and a quadratic effect occurs with increasing levels of supplementation, with no difference between types of supplementation.

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