Lick Tanks to Deliver Condensed Corn Distillers Solubles to Summer Grazing Beef Cows

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Summary and Implications

This project was a preliminary investigation of the use of lick tanks to deliver condensed corn distillers soluble (CCDS) to summer grazing beef cows. During the first four paddock rotations, there was an increase in the amount of pasture dry matter consumed. As hot, dry weather persisted, forage quality and hence, pasture dry matter intake declined. This was accompanied by increased dry matter consumption of CCDS. Dry matter consumption of CCDS ranged from 2.66 pounds (14.8 pounds as-fed at the beginning of the project) to 8.11 pounds (30 pounds as-fed near the end of the project). Dietary intake of sulfur ranged from .43 to .62% of total diet dry matter. However, cattle health appeared to be unaffected by CCDS intake. Mold analyses for the CCDS are incomplete. Yeasts were consistently isolated from the assayed samples, but very few colonies of filamentous fungi (molds) were recovered. In fact, in most samples mold colonies were not detected. Mycotoxins were non-detectable for all mycotoxins analyzed, except fumonisins, which were present at low levels in all CCDS samples and likely came from the original grain. This data suggests that, if carefully managed, lick tanks may be used to deliver CCDS to summer grazing cows. However, the cows in this project had access to ample quantities of pasture and corn silage. A shortage of additional feedstuffs could alter the conclusions of this project.

Introduction

Northwest Iowa is home to four dry milling ethanol plants that produce corn condensed distillers solubles (CCDS). Traditionally, CCDS has been used in feedlot rations. However, there is growing interest in supplementing CCDS to grazing cows. A newer, but under-researched, method to deliver CCDS involves the use of lick tanks in pastures when there may be a "summer slump" in forage quantity and quality.

This method of delivery for CCDS is not without variability. Some producers report no adverse effects; whereas, other producers cite animal losses. The cause of these animal losses is unclear. Sulfur levels are high in CCDS. Hence, animal losses could be attributed to over consumption of CCDS and sulfur toxicity when forage availability is reduced. However, there may also be mold and mycotoxin development in CCDS stored in lick tanks during the summer.

The purpose of this study was three-fold: 1) to determine consumption levels of CCDS provided via a lick tank to summer grazing cows, 2) to determine sulfur intake and its impact on cow health and 3) to monitor mold and mycotoxin development in CCDS stored in lick tanks during the summer.

Materials and Methods

This demonstration project was conducted at an Ida County cow-calf operation. The pastures consisted of 167 acres, broken into six paddocks ranging in size from 15 to 51 acres. The forage species was primarily smooth bromegrass with some bluegrass.

The operation ran from 79 to 110 spring-calving cows and 80 calves. Head days did not include the calves. Artificial insemination was conducted June 4 through June 26, followed by natural service with one bull for the remainder of the project. Health status was monitored by visual observation and records supplied by the producer.

Data collection began May 16 and concluded August 9. Archived weather data (for this time period and the Sioux City area) was obtained from National Oceanic and Atmospheric Administration's National Weather Service.

Feeds for the cows included pasture, corn silage (20 pounds per cow fed June 8 through August 9), trace mineral, CCDS, and water from a deep well. Trace mineral consumption was estimated at 3 oz. per cow per day. Water consumption was estimated at 18% of body weight for a 1400-pound cow. Feeds for the calves included pasture, trace mineral, CCDS, pelleted creep (in a Linebacker creep feeder) and water.

Pasture disappearance was determined using a sward density meter to measure pasture heights at entry, removal or paddock consolidation. Three to four tracts per paddock were measured every 20 steps. Forage re-growth, while in a paddock, was estimated using the ISU Forage Planner and added to disappearance to calculate pasture dry matter intake.

Baseline dry matter and sulfur concentrations were obtained for the pasture, corn silage and trace mineral. Two samples of forage (1 square yard each) in each paddock were hand clipped on May 18. These twelve samples were composited on an equal weight basis and submitted for analysis. A baseline sulfur concentration was obtained on water drawn directly from the pipeline. All baseline analyses were conducted at the ISU Veterinary Diagnostic

Laboratory. Baseline values were used to compute dry matter and sulfur intake for the pasture, corn silage and trace mineral. The water tested <100 ppm sulfate. A baseline value of 99 ppm sulfate for the water was used to compute sulfur intake.

CCDS was offered via four Ace Roto Mold lick tanks. Each lick tank had a 285-gallon capacity and two wheels. Prior to the project, the lick tanks were rinsed. All lick tanks were moved from paddock to paddock simultaneously when the cattle were rotated. CCDS was delivered only once weekly – usually on a Monday - from Quad County Corn Processors directly to the lick tanks. Delivery weight slips were used to determine pounds of CCDS available weekly. The number of days to consume the CCDS was determined by the producer and/or visual monitoring when the tanks were sampled.

CCDS was sampled from each tank weekly at least one day after delivery and composited. Eleven of the composited samples were obtained 8 inches below the surface next to the wheel. Two of the composited samples (July 2 and August 9) were from the bottom of the tanks. Each composited sample of CCDS was split. The ISU Veterinary Diagnostic Lab analyzed concentration of dry matter, sulfur and mycotoxins (aflatoxins, zearalenone, zearalenol, vomitoxin, T-2 toxin and fumonisins). The ISU Plant Pathology Department conducted mold analyses.

Results and Discussion

Baseline sulfur concentrations (on a dry matter basis) for the pasture, corn silage and trace mineral were .33, .29 and .23%, respectively. There was considerable variability in the dry matter and sulfur concentrations for the CCDS. Dry matter concentration ranged from 18 to 30%, and sulfur concentration ranged from 1.33 to 2.08%. Some of this variation may be due to inherent differences in each load of CCDS. Settling in the lick tanks could have also contributed to variability.

Weather created the ideal scenario for CCDS consumption. Weather data is reported in Tables 1 and 2. Most of the average high and low temperatures were greater than the normal temperatures. Precipitation in June and July was below normal. Because of hot and dry weather, the animals were allowed to graze two paddocks simultaneously from July 16 through August 9.

Average daily dry matter intake is reported in Table 3 by paddock and in the order of rotation. There was an increase in the amount of pasture dry matter consumed during the first four paddock rotations. The cows were in early-to-mid lactation, calf growth was increasing and forage quality was good. As hot, dry weather persisted, forage quality and hence, pasture dry matter intake declined. This was accompanied by increased dry matter consumption of CCDS.

To be expected, cows consumed the majority of the CCDS. However, older calves also licked, but to a lesser extent. Dry matter consumption for the various loads of CCDS ranged from 2.66 pounds (14.8 pounds as-fed at the beginning of the project) to 8.11 pounds (30 pounds as-fed near the end of the project). At the start of the project, the CCDS lasted a week. Toward the end of the project, it was consumed in 3 days.

The maximum tolerable concentration of dietary sulfur has been estimated at .40% (National Research Council, 1980). Clinical signs of acute sulfur toxicity can range from restlessness, blindness, diarrhea, muscle twitching, dyspnea, seizures and in some cases, death. In this project, the dietary intake of sulfur (Table 3) ranged from .43 to .62% of the total diet. However, cattle health appeared to be unaffected by CCDS intake. There were 10 cases of lameness in the cows and one case in a calf. These were presumably due to toe cracks and occurred after rain preceded by extremely dry weather.

The high and low daily temperatures when CCDS was sampled are graphed in Chart 1. The high temperature exceeded 90 degrees on five sampling days. Warm temperatures should have been conducive for mold development. Pictures of the CCDS in the lick tanks were taken approximately one month apart in June, July and August. Date, temperature and an estimation of the amount of CCDS remaining in the tank were noted for each picture.

On June 7 (Picture 1), there was a thin white scum and a little separation of the mat layer on the surface. July 5 (Picture 2) was a hot day – 93 degrees. The mat surface was thicker, and bubbles were rising to the surface, leading to speculation there might be some kind of fermentation occurring. By August 8, the CCDS (Picture 3) had developed a greenish cast, and there was distinctive separation in the ½ inch of surface scum. Picture 4 was taken at the conclusion of this project. All that remained in the tank was settled solids.

Mold analyses are incomplete. Yeasts were consistently isolated from the assayed samples, but very few colonies of filamentous fungi (molds) were recovered. In fact, in most samples mold colonies were not detected. In some samples, there were a few colonies of Penicillium or Aspergillus, but no Fusarium was recovered. Although fresh CCDS wouldn't be expected to have viable mold colonies, it was expected that the CCDS would become colonized by these three genera and probably others after it was placed in the lick tanks. This did not occur in this study, which is good news. It's uncertain if yeast growth has any detrimental effects, but there were none from a mycotoxin standpoint. Mycotoxin analyses were non-detectable for aflaxotins (<10 ppb), vomitoxin (<1 ppm), T-2 toxin (<2 ppm), zearalenone (< 1ppm) and zearalenol (< 1ppm). Fumonisins (Chart 2) were detectable at low levels in all of the CCDS samples. It's likely that the fumonisins in the CCDS came from the original corn, considering there was little or no Fusarium growth in the CCDS itself.

Data gathered to-date suggest that lick tanks may be used to deliver CCDS to summer grazing cows, if carefully

managed. In this project the cows had access to ample quantities of pasture and corn silage. Further research with limited quantities of additional feedstuffs is needed to determine possible animal health effects.

Table 1. Temperature Data for May 16 – August 9.

Month	Average High Temperature	Average Low Temperature	Normal Average High Temperature	Normal Average Low Temperature
May	77	53	76	52
June	84	60	83	59
July	89	64	86	63
August	84	67	85	63

Table 2. Precipitation Data for May 16 – August 9.

Month	Observed Precipitation, in.	Normal Precipitation, in.
May	2.62	2.01
June	2.70	3.61
July	2.19	3.30
August	2.21	0.90

Table 3. Average Daily Dry Matter and Sulfur Intake (Dry Matter Basis).

Paddock Number	Pasture, lbs	CCDS, lbs	Silage, lbs	Trace Mineral, lbs	Total Dry Matter, lbs	Sulfur, % of diet
6	19.3	3.4	0.0	.17	22.87	.62
1	27.8	4.3	6.8	.17	39.07	.52
5	37.7	5.7	6.8	.17	50.37	.49
4	40.0	3.8	6.8	.17	50.77	.43
3&5	27.7	6.1	6.8	.17	40.77	.50
6&5	27.1	7.0	6.8	.17	41.07	.54

Chart 1. Daily Temperatures When CCDS was Sampled.

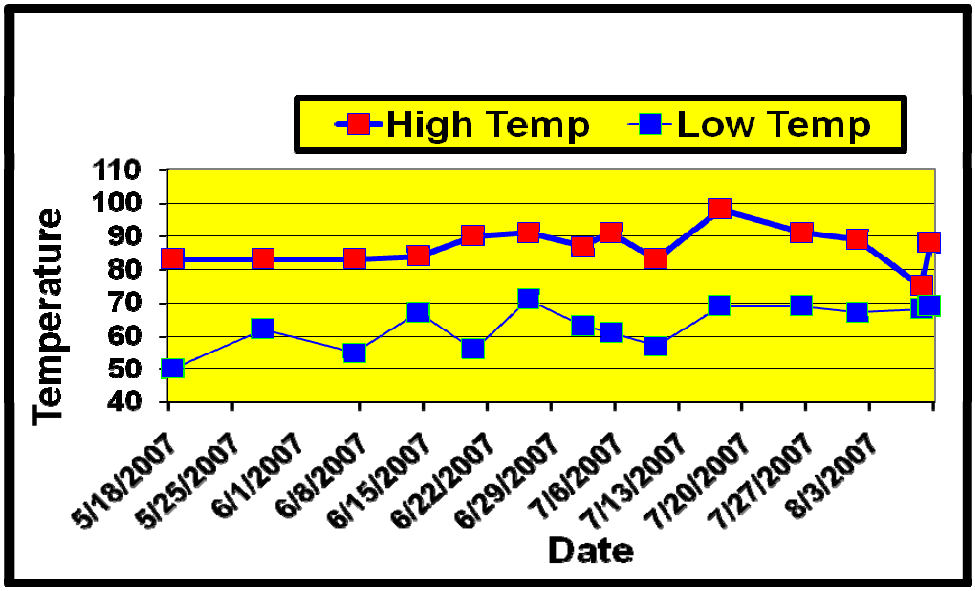
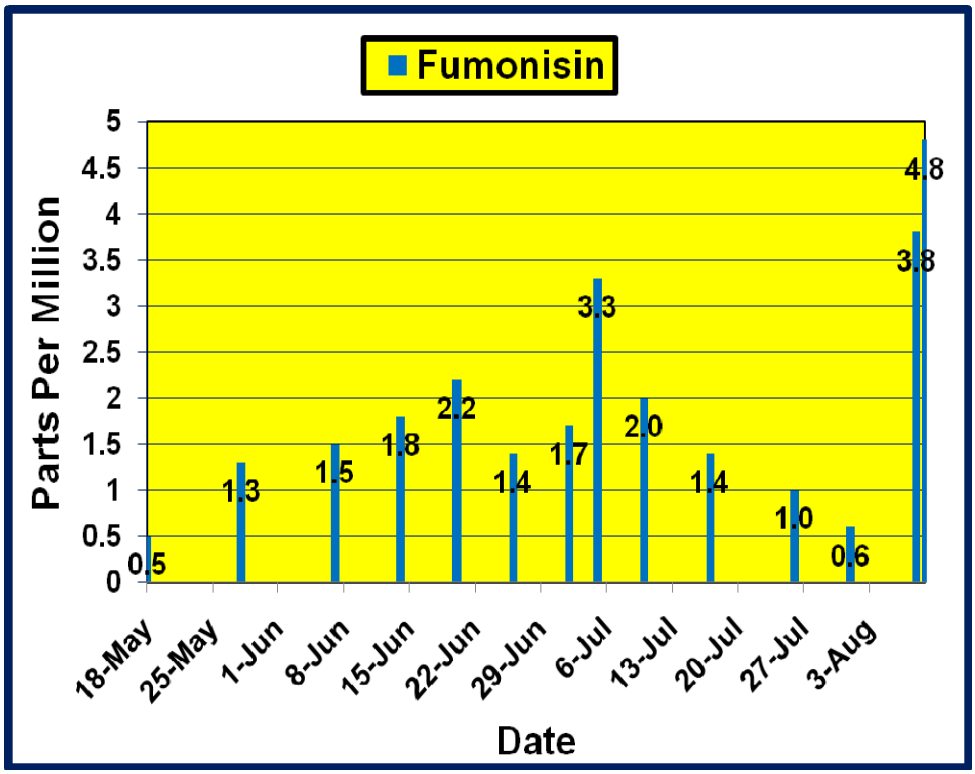


Chart 2. Fumonisin Levels in CCDS Samples.



Picture 1. CCDS in Lick Tank (June 7 – 83 degrees – ¾ full).

Picture 2. CCDS in Lick Tank (July 5 – 93 degrees – ¾ full).

Picture 3. CCDS in Lick Tank (August 8 – 75 degrees – ¼ full).

Picture 4. CCDS in Lick Tank (August 9 – 88 degrees – empty).

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