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Effect of Stocking Rate on Animal Performance and Diet Quality While Grazing Cornstalks

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Summary

Four treatments were used to evaluate levels of corn residue removal on nutrient quality and cattle performance over time. Treatments included no removal of residue, stocking rates of one or two animal unit months/acre (AUM/acre), or baling. Residue samples were taken before and after grazing from all treatment paddocks to determine residue amounts, and were analyzed for OM, CP, NDF, and in vitro *organic matter digestibility (IVOMD). Cattle weights and BCS scores were recorded prior to and at the conclusion of the trial. Cattle consumed husk and leaf material first, followed by cobs at a lesser rate. Husk and leaf material had greater digestibility and CP than stem or cob material. A decrease in cattle performance was observed in the 2 AUM/acre treatment group.*

Introduction

Grazing cornstalks offers producers an inexpensive feed source and helps minimize purchased feed costs during the winter. Cornstalk grazing is unique because all forage for consumption is available at the beginning of grazing. Cattle prefer to eat the corn grain first, followed by the highly digestible husk and leaf material (*2004 Nebraska Beef Cattle Report,* pp. 13-15). Stem and cob residues are consumed at a much lower rate.

Demand for corn grain increases supply of corn residue, but weather and demand by cattle producers for grazing may reduce availability; therefore, producers may increase stocking rates. Increasing the stocking rate limits the amount of highly digestible forage available to each animal; therefore, digestible residue decreases at an increasing rate. The decreasing quality of forage available for consumption also leads to decreased animal performance.

The objectives of this study were to 1) evaluate animal performance by measuring BW and body condition score (BCS) change, and 2) compare changes in nutrient quality of residue at two different levels of residue removal by increasing the stocking rate of cattle.

Procedure

Fifteen non-lactating, crossbred, beef cows (1,250 ± 199 lb) in the third trimester of pregnancy, and 63 first-calf, crossbred, beef heifers (879 ± 82 lb), also in the third trimester of pregnancy, were assigned randomly to treatment paddocks. Paddocks were assigned randomly to one of four treatments with 2 replications per treatment.

Treatments included no removal (CON), light grazing (LG), heavy grazing (HG), and baling (BALE). The grazing treatments were designed to provide stocking rates of 1.0 and 2.0 animal unit months per acre (AUM/ac) for the light and heavy grazing paddocks respectively. Treatments were applied to eight 16.25-acre paddocks, on a 130-acre center pivot irrigated field of corn residue for 55 days from December to February.

Residue samples were collected prior to grazing at 10 locations within each paddock using a 1/2 m^2 quadrat. Ten samples were collected after grazing from the LG and HG paddocks, as well as three samples from the CON and BALE paddocks. After collection, samples were sorted by plant part (leaf, stem, husk, cob, and grain) and composited into one sample of each part per paddock and per date. Leaf, stem, husk, and cob samples were analyzed for DM, OM, CP, and *in vitro* organic matter disappearance (IVOMD).

Animals were weighed and assessed for BCS prior to trial initiation and after grazing. Cattle were supplemented with a 28% CP distillers grain cube at a rate of 1 lb/cow daily. Supplement was formulated to provide 80 mg/lb of Rumensin.

Data were analyzed as a randomized complete block design, with treatment group as the experimental unit and paddock as random.

Results

Proportions and nutrient values of residues available before and after grazing are summarized in Table 1. Previous reports indicate cattle

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Table 1. Proportions and nutrient values of residue available and consumed.[1]

	Plant Parts					
Item	Leaf	Husk	Stem	Cob	SEM	*P*-value
Before grazing						
Percent of residue (OM basis)	34	10	42	14		
OM lb/ac	2144	620	2666	898	121	<0.001
CP, %	5.8	3.9	3.3	4.2	0.2	0.002
NDF, %	73.2	88.5	82.4	88.0	1.1	<0.001
IVOMD %	54.2	57.3	49.6	48.6	0.7	<0.001
After grazing						
Percent of residue OM	29	4	50	16		
OM lb/acre	1478	180	2595	567	135	<0.001
CP, %	5.4	5.0	3.0	3.4	0.2	0.002
NDF, %	79.5	85.9	84.8	89.0	1.1	<0.001
IVOMD %	51.7	58.1	47.2	46.9	0.7	<0.001

[1]All values are expressed on a % of OM basis.

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remove less than 1/3 of the organic matter available from the field, and baling removes approximately 80%. In this trial, cattle removed 17-24% of the available organic matter, and baling removed 2.7 tons of OM/acre or 82%. Grazing removed between 1,065 and 1,480 lb OM/acre ($P < 0.01$). Of the residue removed by grazing, leaf and husk material were consumed in the greatest amount, approximately 1,100 lb OM/acre (71-88%), followed by cobs at approximately 330 lb OM/acre, or 23%. Proportions of residue removed by grazing in this trial are consistent with past research.

Crude protein content of the plant parts was also influenced by time ($P < 0.01$). Protein content of leaf, stem, and cob material was greater before grazing than after grazing. Husk material increased slightly in CP content from 3.9 to 5.0% on a DM basis. The increase could be attributed to insufficient sample collection or microbe activity during decomposition. Decomposition of plant material is characterized by a microbial breakdown of organic matter. Microbes consume the plant cell solubles first, decreasing the amount of organic matter. Crude protein is expressed as a percentage based on OM content, therefore with less OM, the CP percentage will increase.

No significant interactions were observed for NDF content of plant parts across treatments ($P > 0.05$). However, differences in NDF content between individual plant parts were observed ($P < 0.01$). Husk and cob material had a greater NDF content than leaf and stem material, both before and after grazing. Numerically, NDF content was greater at the end for leaf, stem, and cob material. Higher NDF content could be attributed to insufficient sample collection or microbe activity during decomposition. Neutral detergent fiber content is also expressed as a percentage of organic matter, so although the NDF content of the material may not change, the NDF percentage increases.

No significant interactions were observed for IVOMD ($P > 0.05$). Differences between individual plant parts and time points were observed ($P < 0.01$). Digestibility for husk and leaf (57% and 54% respectively) material was greater than stem and cob material (49% and 48%, respectively) at trial initiation. Digestibility values were slightly decreased at the conclusion of the trial. Digestibility of leaf and cob material in this trial was greater than values observed in previous research (*2004 Nebraska Beef Cattle Report,* pp. 13-15). Past research observed greater digestibility for husk and stem material.

In retrospect, treatment groups were stocked at 1.39 and 2.78 AUM's for the LG and HG treatments, respectively. Cattle performance was affected by treatment ($P < 0.01$; Table 2). Mature cows lost BW on both the LG and HG treatments. Heifers in the LG treatment groups gained 10 lb on average while heifers in the HG treatment group maintained their weight prior to trial initiation. The body condition score of the cows and heifers changed less than one-half of a body condition score across treatments.

Table 2. Cow and heifer performance grazing cornstalks at two stocking rates.

	Treatment		*P*-value	Cattle Type		*P*-value
	LG[1]	HG[2]		Cows	Heifers	
BW change, lb	-11	-68	0.05	-68	-12	0.05
BCS change	0.10	-0.20	0.01	-0.21	-0.04	0.71

[1]Light grazing, 1.39 AUM/acre.
[2]Heavy grazing, 2.78 AUM/acre.

This study indicates cattle will consume husk and leaf material before cobs and will rarely consume stems. Husk and leaf material have greater digestibility and CP content compared to stem and cob material. Grazing cornstalks removes less than one-third of the residue material available while baling removes approximately 80%. Cattle performance data indicate that beef cows can successfully be maintained on corn residue when leaf and husk digestibility is between 50% and 58%.

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