Use of Stockpiled Berseem Clover as a Supplement for Grazed Corn Crop Residues

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Summary

In the fall of 1994, mature Charolais cross cows in midgestation were allotted to duplicate 15 acre fields containing corn crop residues or a 2-to-1 mixture of corn crop residues and berseem clover planted in 3 strips at an allowance of 2.5 acres/cow for a 140 day wintering season. Similar cows were allotted duplicate drylots. All cows were fed hay as necessary to maintain a body condition score of 5. Cows grazing corn crop residues with or without berseem clover required 2596 pounds less hay per cow than cows maintained in a drylot. There was no difference in the amounts of hay required by cows grazing corn crop residues alone or with berseem clover. Initial organic matter yield of berseem clover was nearly that of corn crop residues and did not decrease as rapidly as corn crop residues. Berseem clover had a higher organic matter digestibility than corn crop residues at the initiation of grazing. Organic matter digestibility of berseem clover, however, decreased more rapidly than corn crop residues because of weathering during the winter.

Introduction

Because nearly one-third of the costs of cow-calf production are required for stored feeds to maintain cows during the winter, profitability of cow-calf enterprises may be improved by extending the grazing season. Corn crop residues are a valuable feed resource for winter grazing. Previous research has shown that grazing of corn crop residues at an allowance of 2.5 acres per cow reduced the amount of hay required per cow by nearly 1 ton compared to maintaining cows in a drylot. Corn crop residues are deficient in protein, phosphorus, vitamin A and trace minerals for cows in late gestation. Furthermore, nutrient losses caused by weathering of corn crop residues are considerable. Therefore, the nutritional value of corn crop residues is minimal when the nutrient requirements of cows in the last trimester are high. In contrast, stockpiled hay crop forages like tall fescue, smooth bromegrass or alfalfa contain higher concentrations of protein, vitamins and minerals and lower weathering losses than corn crop residues. Therefore, stockpiled hay crop forages may supplement nutrients that are deficient in corn crop residues, particularly in the mid- to late-winter grazing season.

Because it is an annual legume species, berseem clover is valuable in annual crop rotations requiring minimal N-fertilization and herbicide use. Furthermore, because like other legumes, berseem clover has a high nutritive value, it may be useful as a supplement to corn crop residues for maintaining beef cows. Since it is grown in crop rotations, berseem clover may be stockpiled to be grazed with adjacent corn crop residue fields to minimize hay feeding.

The objective of this experiment is to evaluate stockpiled berseem clover as a supplement for grazed corn crop residues to maintain beef cows during winter.

Materials and Methods

In the spring of 1994, "Bigbee" berseem clover and "Frank" forage oats were seeded at rates of 15 and 70 pounds per acre into duplicate 5-acre fields at the ISU Beef Nutrition Research Center. Later, corn was seeded into two 25-acre fields adjacent to the berseem clover/oat fields. Hay was harvested as large round bales from the berseem clover/oat fields in two cuttings yielding .9 tons dry matter per acre.

After grain harvest, duplicate 10-acre fields of corn crop residues were fenced with each berseem clover field, resulting in duplicate 15-acre fields containing only corn crop residues or a 2-to-1 mixture of corn crop residues and stockpiled berseem clover. Each of these fields was divided into 4 strips with electric fence. On November 3, mature Charolais cross cows in midgestation were allotted to each field at an allowance of 2.5 acres per cow. In addition, 14 similar cows were allotted to duplicate drylots. All cows were supplemented with hay as necessary to maintain a body condition score of 5 or if the forage available for grazing was limited by snow cover.

Cows were weighed monthly and condition-scored biweekly. Forage selected during grazing was collected from ruminally fistulated steers by ruminal evacuation after 43 days of grazing and analyzed for in vitro digestibility. Simultaneously, fecal output was determined from the passage kinetics of a pulse-dose of Cr-mordanted fiber (2% Cr) in two cows per field. Forage intake was estimated as (1-digestibility of selected forage)/fecal output. Forage samples were collected from four 4-m^2 locations in the corn crop residue fields and twelve .25-m^2 locations in the berseem clover fields monthly. In addition, to determine the effects of weathering, samples were collected monthly from four 4-m_2 exclosures in the corn crop residue fields and and four 1-m^2 exclosures in the berseem clover fields.

Results and Discussion

Although hay was limit-fed with 1 to 2 days of a clean feeder, cows maintained on hay in the drylot had greater gains in weight and body condition than cows grazing corn crop

residues with or without birdsfoot trefoil (Table 1 and Figure 1). These increases in body weight and condition score likely resulted from the greater forage intake of cows fed hay in a drylot. Changes in body weight did not differ for cows grazing corn crop residues with or without berseem clover. Cows grazing corn crop residues with berseem clover tended to have greater increases in body condition and forage intake than cows grazing corn crop residues without berseem clover. Cows grazing corn crop residues with or without berseem clover required 2596 pounds less hay per cow than cows maintained in a drylot. There was no difference in the amounts of hay required by cows grazing corn crop residues with or without berseem clover. However, because .9 tons of hay were harvested per acre of the oat/berseem clover fields, only 120 pounds of additional hay per cow were needed in the system grazing the corn crop residue-berseem clover mixture, while 1433 and 4118 pounds of additional hay per cow were required for cows grazing corn crop residues without berseem clover or fed hay in a drylot.

Table 1. Body weight change, condition score change, forage intake and hay feeding of cows grazing corn crop residues with or without berseem clover or maintained in a drylot (11/4/94-3/23/95).

Item	Wintering system		
	Cornstalks		Drylot
	without Berseem clover	with Berseem clover	
Weight, lb			
Initial	1395	1390	1410
Seasonal change	140	172	200
Condition score,[a]			
Initial	5.2	5.2	5.1
Seasonal change	.21	.88	1.13
Forage intake,[b]			
lb DM/day	13.6	18.4	46.0
% bodyweight	.95	1.35	3.25
Selected forage organic matter digestibility, %	48.8	50.1	51.8
Hay feeding, lb DM/cow			
Fed	1433	1612	4118
Balance[c]	-1433	-120	-4118

[a]9-point system.
[b]Determined after 43 days of grazing.
[c]Hay produced/cow-Hay fed/cow.

Organic matter yields of berseem clover at the initiation of grazing were 10.7% less than those of corn crop residues (Table 2). During the grazing season, however, organic matter yield decreased 5.3 times more rapidly from corn crop residues than from berseem clover. Because grazing did not affect the rate of organic matter yield, decreases in organic matter yield are primarily caused by weathering. In contrast to organic matter yields, the concentration of digestible organic matter decreased and that of neutral detergent fiber increased more rapidly in berseem clover than corn crop residues. As a result, although the digestibility of berseem clover was 15.8% greater than corn crop residues at the initiation of grazing, the digestibility of berseem clover was 4.8% lower than corn crop residues at the termination of grazing. Berseem clover contained 2.7 times more crude protein than corn crop residues at the initiation of grazing. Crude protein concentration of the corn crop residue and berseem clover forages changed little over the grazing season. The proportion of nitrogen as acid detergent insoluble nitrogen, however, increased by 13.5% over the grazing season, implying a loss in protein digestibility. The rate of the increase in acid detergent insoluble nitrogen was 2.2 times greater in grazed forages than from ungrazed forages, implying that cows were selectively consuming plant fractions containing more digestible crude protein. Rates of change in the concentrations of crude protein or acid detergent insoluble nitrogen did not differ between forage species.

Implications

Grazing corn crop residues reduces the amount of hay required to maintain cows by 2596 pounds per cow compared to maintaining on hay in a drylot. Although berseem clover provides hay and high quality stockpiled forage early in the winter grazing season, its loses its nutritive value quite rapidly when exposed to weather. As a result, stockpiled berseem clover did not supply adequate nutritive value to supplement corn crop residues late in the winter. The reason for this rapid nutrient loss may be due to the weakness in the stem of berseem clover, thereby, allowing it to lodge readily.

Acknowledgment

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Figure 1. Body condition score of cows grazing corn crop residues with or without berseem clover or maintained on hay in a drylot. The letters a, b, c refer to the date at which hay was first offerred to cows maintained in a drylot, grazing cornstalks and grazing cornstalks and berseem clover, respectively.

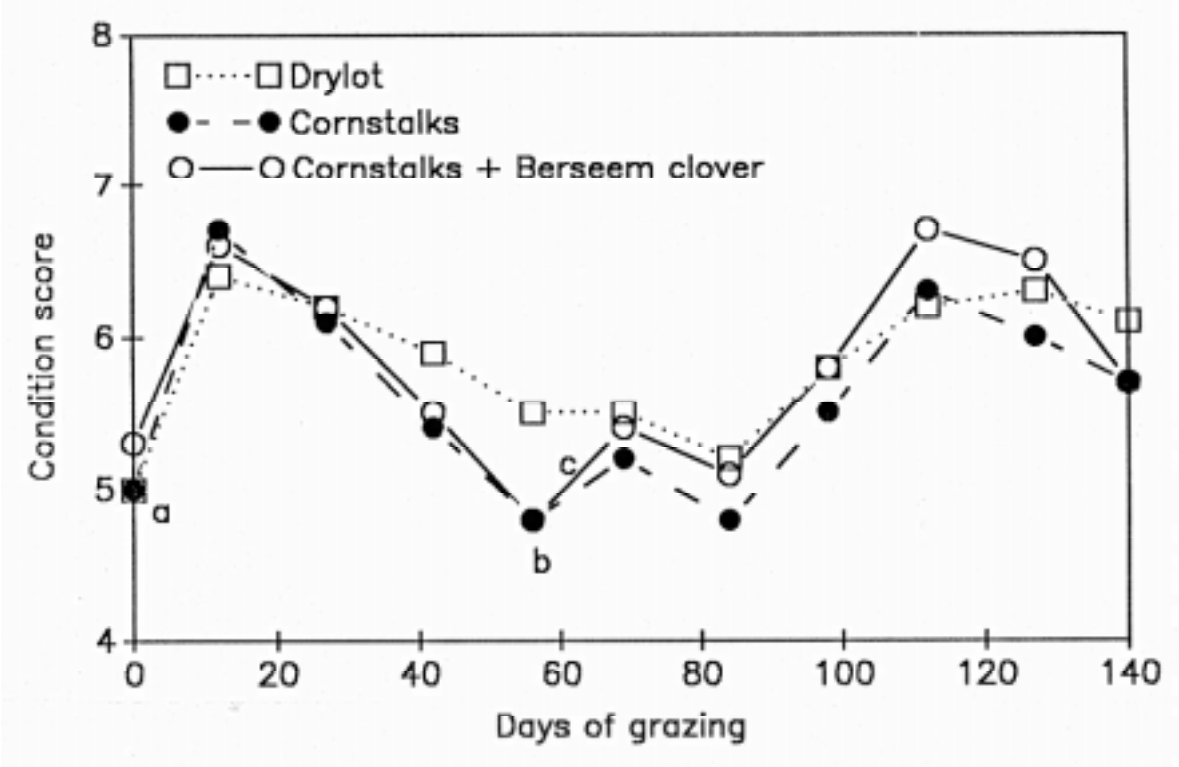

Table 2. Initial and daily change in the yield and composition of grazed and ungrazed corn crop residue and berseem clover forage.

		Winter forage species								
		Cornstalks		Cornstalk-Berseem clover				Significance[b]		
				Cornstalks		Berseem clover				
Item[a]	Sample	Initial	Change	Initial	Change	Initial	Change	F	G	FXG
OM yield, lb/acre	Grazed	5382	-13.4	5198	-15.2	4726	3.2	*		
	Ungrazed		-13.9		-6.3		1.7			
Digestible OM, %	Grazed	46.6	-.09	47.8	-.10	54.7	-.16	*		
	Ungrazed		-.09		-.09		-.16			
NDF, %OM	Grazed	76.6	.02	78.7	.01	60.1	.08	*		
	Ungrazed		-.01		-.01		.06			
ADF, %OM	Grazed	49.0	.06	50.0	.09	40.1	.11		*	*
	Ungrazed		.03		.03		.09			
CP, %OM	Grazed	5.3	0	5.1	.01	14.1	.02			
	Ungrazed		.01		.01		.02			
ADIN, %N	Grazed	24.8	.09	23.7	.19	16.9	.10		*	
	Ungrazed		.05		.07		.08			

[a]OM=organic matter; NDF=neutral detergent fiber; ADF=acid detergent fiber; CP=crude protein; and ADIN=acid detergent insoluble nitrogen.
[b]P<.05.