

The Influence of Physical Modification and Supplementation Strategies of Grass Seed Straw on Beef Cattle Intake, Feed Efficiency, and Performance

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INTRODUCTION

Beef cattle producers in the Pacific Northwest are faced with numerous challenges that threaten their economic survival. Public land grazing has declined, and may continue to do so, forcing beef cattle producers to rely more intensively on private lands. In addition, winter feed demands of 1.5 to 2.5 tons of harvested forage place many producers at a competitive disadvantage relative to beef cattle producers in the Midwest and Southeast portions of the United States. Use of crop residues, such as grass straw, may provide alternatives to traditional winter feeds and free up private lands to assist producers with declining access to public land grazing.

The Eastern Oregon Agricultural Research Center has provided a wide range of research on supplementation, chemical modification, nutritional quality, and antiquality factors of grass seed residues fed to beef cattle during the winter period. Recent research has focused on evaluating chopping and pelleting of grass seed straw as a means to improve the intake and use of grass seed residues by beef cattle. The objectives of the following studies were 1) evaluate the value of chopping and pelleting of grass seed straw (Experiment 1), and 2) evaluate the influence of alfalfa supplementation frequency on the intake and use of pelleted grass straw (Experiment 2).

Experimental Design

Two experiments were conducted to evaluate the value of pelleted straw feed products and alfalfa supplementation strategies on the intake, feed efficiency, and performance of weaned heifers during the winter feeding period.

Experiment 1 (Union Station). Seventy-eight head of Simmental X Hereford weaned heifers were stratified by body condition and weight, and randomly allotted within stratum to two replications of the following three treatments:

1. Long Stem Tall Fescue Straw + Pelleted Alfalfa
2. Pelleted Tall Fescue Straw + Pelleted Alfalfa
3. Pelleted Tall Fescue Straw/Alfalfa Mixture

All diets were identical in composition with daily rations consisting of 75 percent tall fescue straw and 25 percent alfalfa. On a daily basis, all treatment groups were offered a diet consisting of 9.5 percent crude protein (CP) and .95 Mcal metabolizable energy (ME). Treatment differences related to the physical form of the straw (treatment 1 versus 2) and strategy of providing supplemental alfalfa (treatment 2 versus 3). All pens of heifers were fed once daily, whereas feed refusals were evaluated once weekly to evaluate pen intake and feed efficiencies. The study was initiated in early January and feeding of treatment rations

continued for an 84-day period.

Experiment 2 (Burns Station). Eight-four head of weaned Hereford x Angus heifers were stratified by body condition and weight, and randomly allotted within stratum to three replications of the following four treatments:

1. Pelleted Tall Fescue Straw + Pelleted Alfalfa every other day
2. Pelleted Tall Fescue Straw + Pelleted Alfalfa daily
3. Pelleted Tall Fescue Straw + Pelleted Alfalfa twice daily
4. Pelleted Tall Fescue Straw/Alfalfa Mixtures

All diets were composed of 75 percent Tall Fescue Straw and 25 percent alfalfa. Treatment differences related to the frequency of alfalfa supplementation versus mixing alfalfa directly into the pelleted straw diet. Nutrient compositions and feeding procedures were identical to the Union Station study.

Table 1. Weight and Body Condition Changes of Weaned Heifers Consuming Differing Forms of Fescue Straw During a Winter Feeding Period (Union Station).

Period	Straw hay + alfalfa	Straw pellets + alfalfa	Straw:alfalfa pellets	SE ^a
Initial				
weight, lbs ^b	530.9	541.9	548.7	8.20
body condition ^b	4.44	4.57	4.43	.09
0-42 days				
wt change, lbs ^b	12.2	51.6	47.7	3.01
condition change ^b	.21	.0	.0	.15
42-84 days				
wt change, lbs ^b	2.4	17.4	19.8	3.84
condition change ^b	-.38	.04	.0	.13
0-84 days				
wt change, lbs ^b	14.6	69.1	67.5	2.99
condition change ^b	-.59	.04	.0	.13
Total Feed Intake, lbs ^b	11.87	15.30	15.72	---
Straw Intake, lbs ^b	8.89	11.60	11.79	---
Feed:Gain Ratio, lbs feed/lb gain ^b	68.3	18.60	19.56	---
84-126 days				
wt change, lbs	23.8	26.2	28.0	8.29
condition change	.47	.11	.23	.12

a Standard Error of the means (N=2).

b Pelleted straw treatment diets differ from long-stem straw treatment diets (P<.01).

RESULTS AND DISCUSSION

Experiment 1. Heifers that received pelleted straw rations made greater gains and maintained body condition better than heifers consuming long-stem straw hay (Table 1; $P < .01$). Daily gains of the heifers consuming pelleted straw rations were .81 pounds per head per day, whereas heifers consuming straw hay gained only .17 pounds per head per day. Straw and total feed intake was increased by 30 percent in heifers receiving pelleted straw diets compared to straw hay diets. Likewise, feed:gain ratios were improved three-fold in heifers consuming pelleted straw diets relative to heifers consuming long-stem straw hay diets.

Experiment 2. Weight gain and body condition changes tended to improve over the 84-day feeding period with increasing frequency of alfalfa supplementation (Table 2; $P = .12$). Differences in weight and body condition across treatments were biologically similar, with gains of approximately 1.39 pounds per head per day. No benefit was realized when the alfalfa hay was mixed directly into the straw diets compared to pelleted straw diets where the alfalfa was hand-fed separately. Feed efficiency was similar across treatments ($P > .10$), with all treatment groups needing 11.2 to 12.3 pounds of feed to produce 1 pound of gain.

Table 2. Weight and Body Condition Changes of Weaned Heifers Consuming Pelleted Grass Products with Differing Frequencies of Alfalfa Supplementation (Burns Station).

Period	Frequency of Alfalfa Supplementation			Straw/ Alfalfa Mix	SE ^a
	.5X Alfalfa	1X Alfalfa	2X Alfalfa		
Initial					
weight, lbs	435.2	432.0	440.9	431.9	3.34
body condition	4.07	4.00	3.90	4.12	.08
0-42 days					
wt change, lbs	66.7	68.2	69.7	69.4	3.89
condition change	.38	.40	.50	.29	.12
42-84 days					
wt change, lbs	45.6	55.6	50.7	41.2	2.91
condition change	-.05	.06	.07	-.13	.17
0-84 days					
wt change, lbs ^b	112.3	123.8	120.6	110.6	3.67
condition change ^b	.33	.46	.57	.15	.11
Total Intake, lbs/hd	15.05	16.49	16.28	16.22	-----
Straw Intake, lbs/hd	11.45	12.31	12.16	12.16	-----
Feed:Gain Ratio					
lbs feed/lb gain	11.26	11.19	11.34	12.32	-----

^a Standard Error of the means (N=3).

^b Treatment means tended to differ with increasing frequency of alfalfa supplementation ($P = .12$).

DISCUSSION

Averaged across location, heifers on the pelleted straw rations gained greater than 1 pound/head/day. Using the National Research Council (NRC, 1984) recommendations, a 500 pound yearling heifer gaining 1 pound/day should receive a diet with at least the following minimum characteristics:

DM Intake	11.8 lbs
Crude Protein	9.4% or 1.1 lbs
Metabolizable Energy	1.02 Mcal/lb or 2.25 Mcal/kg
TDN	62%

The rate of gain reported for growing heifers in these studies is very impressive. For instance, early-bloom alfalfa hay would not have the nutrient composition to support the above NRC recommendations.

Conversions (feed:gain ratios) are 33 percent better in the Burns Station study relative to the Union Station study. This difference can be attributed to a number of factors. Specifically, the Union herd is composed of higher-producing (heavier milking) Hereford x Simmental cattle that may require higher nutrient demands relative to the Hereford x Angus cattle which compose the Burns research herd. In addition, previous nutritional management of the heifers, prior to the start of these studies, may have had an impact on efficiency of feed conversion across locations.

Previous research has shown that supplementing grass seed straw (without physical modification) will only support the nutritional requirements of mature cattle that are nonlactating during the winter feeding period. In contrast, this research indicates that pelleting long-stem straw dramatically improves its utility in growing rations of weaned heifers during the winter feeding period. This type of nutritional approach would provide adequate gains with growing animals during the winter feeding period. The final decision to utilize pelleted grass seed straw products for winter nutrition programs will depend on the cost of these pelleted straw products relative to traditional feed resources which could promote a similar level of weight gain response.