FEATHER MEAL IN WINTER SUPPLEMENTS FOR BEEF COWS

T.M. Murphy[1], K.S. Lusby[2] and R.P. Wettemann[3]

Story in Brief

Seventy six spring calving and 65 fall calving Hereford and Hereford x Angus cows were blocked by age, breed, and weight within calving season and allotted to four groups to compare performance when 7.5 or 15% hydrolyzed feather meal replaced isonitrogenous amounts of soybean meal in winter supplements. Cows were maintained by calving group on native range and individually fed supplements in covered stalls 6 days/week. The supplementation period for spring calving cows was November 14 to April 17 and for fall calving cows was November 28 to March 20. Supplements, CP% and pounds CP/day were: (1) Negative control 23% CP, .69 pounds; (2) Soybean meal, 40% CP, 1.2 pounds; (3) 7.5% feather meal, 40% CP 1.2 pounds and (4) 15% feather meal, 40% CP 1.2 pounds. For spring calving cows, weight losses precalving and for the total winter period were less for soybean meal cows than for negative control cows. Precalving weight gains were similar for 15% feather meal and soybean meal. Cows fed 7.5% feather meal tended to gain less weight precalving compared to cows fed soybean meal or 15% feather meal. Fall calving cows fed feather meal tended to lose less weight than soybean meal fed cows when hay was fed but lost more weight when hay was not provided. Five percent of spring calving cows offered 7.5% feather meal and 10.5% of cows offered 15% feather meal refused to eat supplement and were removed from the study. Feather meal may be more appropriate for supplementing on hay than on dormant range.

(Key Words: Feather Meal, Soybean Meal, Protein, Beef Cow Supplements.)

Introduction

Hydrolyzed feather meal is a byproduct of the poultry industry. The American Association of Feed Control Officials in 1965 defined it as "the product resulting from the treatment under pressure of clean undecomposed

[1]Graduate Assistant [2]Professor [3]Regents Professor

feathers from slaughtered poultry, free of additives and/or accelerators. Not less than 75% of its crude protein shall consist of digestible protein by the pepsin digestibility method". The crude protein content of feather meal (FM) ranges from 80 to 90%, however most of this protein is undegradable within the rumen thus FM is considered a bypass or escape protein. Large variations exist in the quality of FM between sources. These variations are due to the processing techniques used and the amounts of blood and offal contained in the meal. The objective of this study was to evaluate the performance of spring and fall calving beef cows grazing dormant native range and receiving protein supplements containing FM.

Materials and Methods

The value of FM as a supplemental protein source for beef cows grazing winter range was evaluated in two trials. Supplements, CP% and lb CP/day were: 1) Negative control (NC), 23% CP, .69 lb; 2) Soybean meal (SBM), 40% CP, 1.2 lb; 3) 7.5% FM, 40% CP, 1.2 lb; and 4) 15% FM, 40% CP 1.2 lb. Supplements provided equal amounts of calcium, phosphorus, potassium, and Vitamin A. Complete supplement formulations are given in Table 1. Cows in each trial were maintained in the same pasture for the entire supplementation period. The trials were conducted at the Lake Carl Blackwell Range Cow Research Center approximately 12 miles west of Stillwater, OK. All cows were wintered on dormant standing range forage (2.5% CP) with big bluestem, little bluestem, indiangrass and switchgrass as the predominant species. Cows were gathered off pasture 6 day/week and individually fed 3 lb of pelleted supplement (3/16 in) in a covered stall barn.

Trial 1

Seventy-six spring calving Hereford and Hereford x Angus cows were fed protein supplements from November 14, 1989 until April 17, 1990. During the supplementation period cows were given access to prairie hay (6% CP) when snow or ice covered the ground or when extreme cold was encountered (29 days).

Cow weights were taken after overnight withdrawal from feed and water every 28 days until two weeks prior to the first expected parturition date (avg date March 5). Weights of cows and calves were then taken every 14 days until the end of supplementation. The closest weight prior to parturition was recorded as the final pregnant weight.

Cow body condition scores (BCS) were evaluated (score of 1 = very thin to 9 = very fat) every 56 days. After the end of the supplementation period, cow and calf weights were collected every 28 days until weaning

Table 1. Composition of supplements and daily feeding rates (DM basis) used in Trials 1 and 2.

	NC	SBM	FM 7.5%	FM 15%
Ingredients, %				
Soybean meal	43.32	90.08	73.59	58.35
Feather meal			7.50	15.00
Milo	48.32	3.98	12.11	19.03
Molasses	4.19	4.18	4.19	4.21
Dicalcium phosphate	2.50	1.75	1.95	2.32
Potassium chloride	1.62		.56	1.07
Vitamin A[a]	.1	.1	.1	.1
CP, %	26.32	44.87	44.74	44.71
Feeding rates[b]				
lb/day	3.0	3.0	3.0	3.0
Daily CP supplied, lb	.69	1.2	1.2	1.2

[a]30,000 IU/g.
[b]7 day basis expressed as is.

(September 5) and cow BCS were taken every 56 days. On May 5, three Hereford x Angus bulls were placed with all cows for 74 days and pregnancy was determined by rectal palpation on October 18.

Estimates of milk production were obtained using the weigh suckle weigh technique on May 22 and July 17. Cows and calves were separated for two 12 hour periods. Calves were weighed, allowed to nurse until satisfied, then reweighed to determine pounds of milk produced per 12 hour period.

Trial 2

In the second study, 65 two to six year old Hereford and Hereford x Angus fall calving cows were fed protein supplements from November 28 to March 20. The average calving date for the fall calving cows was September 17. Cows and calves were weighed every 28 days and cow BCS was evaluated every 56 days for the entire supplementation period.

Ad libitum access to prairie hay (6% CP) was given from December 6 until January 15 and also in February and March when snow and ice cover restricted grazing or when extremely cold temperatures occurred.

Cows were bred by natural service from November 27 to February 1. Pregnancy was determined by rectal palpation on April 26. Date of conception was estimated by subtraction of 280 days from the subequent calving date.

A milk production estimate was conducted as described in Trial 1 on March 20. All calves were weaned from the cows on May 1.

Results and Discussion

Trial 1

Palatability problems were experienced and 1 out of 19 of the spring calving cows receiving 7.5% FM and 2 out of 19 of those receiving 15% FM refused to eat supplements. One cow in the 15% FM group which refused to eat would only smell the supplement. This suggests that an odor is detectable even when a small percentage of FM is included. All cows were given two weeks to become accustomed to protein supplements and the feeding program. After this period the cows refusing to eat were given access to the SBM supplement to determine if feed refusals were because of protein source or if it was an environmental effect due to feeding in individual stalls. All cows that refused FM readily accepted the SBM supplement so it was determined that refusals were the result of the FM additions.

Cows consuming the NC supplement lost significantly more weight (Table 2) to calving than did the SBM or 15% FM supplemented cows. Weight changes for the 7.5% FM group tended to be less ($P<.16$) than the NC group but were not statistically different than either the SBM or 15% FM supplemented cows. During the lactational phase of the trial, weight changes were not statistically different between supplemental groups.

For the entire winter supplementation period the NC cows lost significantly more weight than did the SBM group. The weight changes of the FM supplemented cows tended to be less than the NC cows ($P<.15$ and $P<.22$ for the 7.5% and 15% groups respectively). Cows fed FM and SBM performed similarly.

Rebreeding rates of cows were not statistically different between treatment groups. However, pregnancy rates ranged from 86 to 77% and were the least for the cows receiving FM.

Cow BCS changes tended to reflect cow weight changes during the pre and post calving periods. Milk production, calf birth weights, weaning weights and gains were not affected by the supplement fed to cows (Table 3).

Table 2. Weight and body condition changes and pregnancy rates of spring calving cows in Trial 1 (least squares means).

	NC	SBM	FM 7.5%	FM 15%
Number of Cows				
Initial	19	19	19	19
Final	17	19	17	16
Initial Weight, lb				
11/14/89	1009	1012	1011	1007
Initial condition score	5.96	5.94	6.00	5.91
Precalving:				
Weight change, lb				
11/14/89 to calving	-10.3[a]	20[b]	9.8[ab]	18.5[b]
Condition change				
11/14/89 to calving	-.64	-.45	-.49	-.48
Postcalving:				
Weight change, lb				
Calving - 4/17/90	-141	-136	-139	-150
Condition change				
Calving - 4/17/90	-1.14[a]	-.83[b]	-1.01[ab]	-1.13[ab]
Winter weight change, lb				
11/14/89 - 4/17/90	-152[a]	-117[b]	-130[ab]	-132[ab]
Condition change				
11/14/89 - 4/17/90	-1.55[a]	-1.12[b]	-1.30[ab]	-1.33[ab]
Pregnancy rates %[c]	84	86	82	77

[a,b]Means on the same line with the same superscript do not differ significantly ($P < .05$).

[c]Includes data only from cows weaning a calf.

Table 3. Calf birth weights, weaning weights, gains and milk production of cows, Trials 1 and 2 (least squares means).

			FM	
	NC	SBM	7.5%	15%
<u>Trial 1</u>				
Spring calving cows				
Calf				
Birth weight, lb	84.4	87.4	86.5	87.1
Gains, lbs				
Birth to 4/17/90	61.2	64.5	58.9	64.8
4/18/90 - 9/5/90	294.9	284.2	285.0	289.0
Weaning weight, lb	440.5	436.1	430.4	440.9
Cow				
Milk production, lb				
5/22/90	17.1	16.8	17.0	20.0
7/17/90	13.8	12.3	11.5	13.5
<u>Trial 2</u>				
Fall calving cows				
Calf				
Initial weight, lb	173.7	173.6	173.7	173.6
Gains, lbs				
11/28/89 to 3/20/90	92.4	100.2	88.3	101.6
3/21/90 - 5/01/90	48.4	43.8	47.9	48.7
Weaning weight, lbs	314.5	317.6	309.9	323.9
Cow				
Milk production, lb				
3/20/90	5.9	5.5	6.4	5.8

Trial 2

Fall calving cows fed NC lost significantly more weight while ad libitum access to hay was provided than did cows receiving either of the FM supplements and tended to lose more weight (Table 4) than the SBM fed cows ($P<.12$). Cows receiving 15% and 7.5% FM tended to gain faster than the SBM fed cows during this period ($P<.16$ and $P<.24$, respectively).

During the second period of this trial, when ad libitum access to hay was no longer provided, the SBM supplemented cows lost significantly less weight than cows fed any other supplement group. The weight changes for the 7.5% FM group tended to be less than the NC group ($P<.12$).

Total weight loss for the entire winter supplementation period was greatest for the NC supplemented cows. Thus protein was a limiting factor in the diet. Weight loss tended ($P<.07$) to be greater for the 15% FM than for the SBM supplemented cows. Weight loss for cows fed 7.5% FM was not different than that for cows fed 15% FM.

Rebreeding rates ranged from 99% to 70%. As in the first trial, type of protein supplement did not significantly influence cow rebreeding. However, mean pregnancy rates reflect the weight changes observed, with the cows losing the most weight having the lowest pregnancy rates.

Similar to the first trial, treatment did not affect calf weaning weight, gain or cow milk production (Table 4). Although treatment did not significatly influence BCS, the BCS reflected weight losses that occurred during each period.

It is possible that supplements containing FM had too much protein bypass the rumen with insufficient nitrogen for ruminal needs. The FM used in these studies was only 61% pepsin digestible, suggesting that much of the bypass protein may have been indigestible. Variability between batches of FM may be an important factor in determining utilization.

Based on our studies, ruminal protein requirements should be considered if the forage is very low in degradable protein. Hydrolyzed feather meal may be more appropriate for supplementing on hay than on dormant range because of poor rumen degradability of some batches of feather meal.

Table 4. **Weight and body condition changes and pregnancy rates of fall calving cows, Trial 2 (least squares means).**

	NC	SBM	FM 7.5%	FM 15%
Number of cows	16	16	17	16
Initial weight, lb				
11/28/89	943	948	941	946
Initial condition score	5.0	5.4	5.3	5.4
Weight change, lb				
Hay, ad libitum				
11/28/89 - 1/23/90	-16.5[a]	-.9[a]	10.6[ab]	13.4[ab]
Condition changes				
Hay, ad libitum				
11/28/89 - 1/23/90	-.35	-.33	-.19	-.16
No hay				
1/24/90 - 3/20/90	-91.5[a]	-57.6[b]	-76.8[a]	-88.2[a]
Condition changes				
1/24/90 - 3/20/90	-.71	-.38	-.61	-.55
Total weight change:	-108[a]	-58.5[b]	-66.2[b]	-74.7[b]
Condition change:				
11/28/89 - 3/20/90	-1.05	-.71	-.80	-.71
Pregnancy rates, %	79	99	70	77

[a,b]Means on the same line with the same superscript do not differ significantly ($P < .05$).