INFLUENCE OF FEED AND WATER DEPRIVATION ON THE DETERMINATION OF BODY WEIGHT IN MATURE BEEF COWS

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Story in Brief

Range beef cows were used to determine the effect of feed and water deprivation (shrinking) on the variation in body weight, the effect of protein supplementation on variation in body weight, and the effect of shrinking cows on blood constituents. When cows were shrunk 19 hours before weighing, the variation in body weight was significantly reduced. Shrinking also reduced the weight change caused by increased forage intake in response to protein supplementation. Deprivation of feed and water increased the hematocrit and concentrations of nonesterified fatty acids in plasma. Depending on the diet cows will lose about 6% of their body weight during an 18 hour shrink. We recommend that cows should be deprived of feed and water (for approximately 19 hours) before weighting to determine the effects of treatments on body weight. Blood constituents may need to be evaluated at another time.

(Key Words: Body Weight, Range Cows, Shrink.)

Introduction

The effect of feed and water deprivation on body weight loss, or shrink, in feeder cattle has been evaluated (Self and Gay, 1972; Harman et al., 1989) and factors affecting shrink during transit of young cattle have also been determined (Cole and Hutcheson, 1987). However, the effect of deprivation of feed and water on body weight loss and the ability to assess the effect of nutritional treatments on weight changes in mature cows has not been adequately evaluated. The objectives of this experiment were: to determine if withdrawal from feed and water decreases the variation in body weight of range cows; to determine the effect of protein supplementation on variation in body weight of cows; and to determine the effect of withdrawal from feed and water on the hematocrit, plasma protein and nonesterified fatty acids (NEFA) in range beef cows.

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Materials and Methods

One hundred and three Hereford and Angus x Hereford mature cows were used to determine the effect of shrinking cows before weighing on the variation in body weight. The experiment was conducted in mid October and cows had access to good quality native grass pasture. At 0200 h on day 1, cows were gathered from the pasture and confined in a dirt lot without feed and water. One hour after the cows were confined, body weight and body condition score (BCS; 1=emaciated, 9=obese) were determined. After 19 h without feed and water, body weight was determined on day 2. After weighing the cows on day 2, all cows were returned to a native grass pasture with access to water. At 0200 h on day 5, cows were gathered and body weights were determined 1 h after confinement. After confinement without feed and water for 19 h, cows were weighed on day 6.

Blood samples were obtained from twelve of the cows to determine the effect of withdrawal from feed and water on concentrations of red blood cells, protein, and NEFA in blood. Samples were taken at 1 h after confinement on day 1 (non-shrunk) and after a 19 h shrink on day 2. EDTA was added to blood samples and plasma was obtained by centrifugation. Plasma was stored at -20 C until analyzed. Total plasma protein was determined with a refractometer[4] and hematocrit was determined by centrifugation in microhematocrit tubes.[5] Nonesterified fatty acids were quantified by a modification of a colorimetric procedure[6].

To determine the effect of protein supplementation on the variation in body weight, eighty-three of the cows were paired based on body weight and BCS on day 6 and divided into two groups. One group (nonsupplemented, n=41) was allowed to graze native pasture and the other group (supplemented, n=42) grazed a similar native pasture and received 3 lb/d of a 40% crude protein supplement (prorated and fed 6 days per week). After 15 days of supplementation treatment, cows were gathered at 0200 h and confined to a drylot. Within 1 hr of confinement, body weight and BCS were determined. After 19 h without feed and water, the cows were weighed.

Differences between full weights on days 1 and 5 and shrunk weights on days 2 and 6, blood constituents in full and shrunk cows, and the effect of protein supplementation on body weights were determined by analyses of variance. The effect of shrinking cows on the variance in body weight was determined by using a t-test to evaluate the variances of the differences between full-full and shrunk-shrunk weights.

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[6] Wako Chemicals, Dallas, TX.

Results and Discussion

Body weights were not significantly different when either the nonshrunk weights were compared at the 4-day interval or shrunk weights were compared (Table 1). After the 19 h of feed and water deprivation, the cows lost 6.4% of their BW in period 1 and 6.7% in period 2. Although the mean full and shrunk weights were similar on the two weighing periods, the variances were different ($P<.01$). The distribution of the weight differences for nonshrunk and shrunk cows at the two weighing periods are depicted in Figure 1. The differences between the two weights were greater when the nonshrunk weights were compared than when shrunk weights were compared. For instance, the difference between the two shrunk weights was 20 lb or less in 74% of the cows, whereas the difference between the two nonshrunk weights was 20 lb or less in only 68% of the cows.

Deprivation of feed and water also influenced plasma constituents (Table 2). Blood samples were obtained at 1 h after confinement and at 19 h. The hematocrit was increased from 31.4% to 33.1% ($P<.08$) by shrinking the cows. Plasma protein concentrations were slightly ($P>.10$) increased after shrinking the cows. This increase is associated with water loss from the body and reduced plasma volume. Withdrawal of cows from feed and water for 18 hours resulted in a 52% increase in plasma concentrations of NEFA. A small part of this increase could be related to the decreased plasma volume that occurred, however the dramatic increase in NEFA is associated with the mobilization of body fat to supply needed energy while the cows were fasted. The cows in this study had a BCS of 5.3, so they had fat reserves that could be mobilized.

Feeding a protein supplement for 15 days did not influence the BCS of the cows (Table 3). The nonshrunk body weight of the cows fed the protein supplement was greater ($P<.09$) than the weight of nonsupplemented cows. When cows were weighed after withdrawal of feed and water for 19 hours, body weight was not influenced ($P>.10$) by supplementation. The nonshrunk weight of the supplemented cows was 42 lb greater than the nonsupplemented cows. When shrunk weights were used, the supplemented cows only weighed 28 lb more than the nonsupplemented cows. Feeding a protein supplement will likely increase forage intake of cows consuming dry grass. Thus supplementation probably increased rumen fill in the cows, and shrinking the cows reduced weight differences between the treatments that were probably caused by fill. This experiment illustrates the importance of shrinking cows when evaluating the effect of nutritional treatments on weight gain.

Cows lost about 6% of their body weight during 18 hours without feed and water. When marketing cull cows this should be considered since it will greatly influence the weight of cows at time of sale.

We conclude that range beef cows should be deprived of feed and water before determining body weight to reduce the variance in weight. Shrinking of cows before weighing may be even more important when treatments might influence forage intake. Deprivation of feed and water might influence blood constituents since plasma volume may be reduced and mobilization of fat may occur, so evaluation of blood constituents should be done at a time when cows are not shrunk.

Literature Cited

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Table 1. Influence of withdrawal from feed and water for 19 h on body weight (BW) of mature beef cows.

	Period[1]		
Criteria	1	2	Difference
Nonshrunk BW, lb	1214	1219	+5
Shrunk BW, lb	1136	1137	+1
Nonshrunk-Shrunk, lb	-78	-82	
Nonshrunk-Shrunk, %	-6.4	-6.7	

[1]Periods 1 and 2 are 4 d apart.

Table 2. Blood and plasma constituent in cows before withdrawal from feed and water (nonshrunk) and after deprivation of feed and water for 19 h (shrunk) cows.

	Treatment	
Constituent	Nonshrunk	Shrunk
Hemotocrit, %	31.4 ± .6[a]	33.1 ± .5[b]
Plasma protein, %	6.78 ± .43	7.73 ± .50
NEFA, mEq/ml	283 ± 22[c]	429 ± 23[d]

[a,b] $P < .08$;
[c,d] $P < .002$

Table 3. Influence of feeding a protein supplement for 15 d on body weight (BW) and body condition score (BCS) of cows before withdrawal from feed and water (nonshrunk) and after deprivation of feed and water for 19 h (shrunk).

	Supplement treatment	
Criteria	None	3 pounds of 40% CP/d
Cows, no	41	42
BCS	5.35 ± .07	5.25 ± .07
Nonshrunk BW, lb	1214 ± 17[a]	1256 ± 17[b]
Shrunk BW, lb	1156 ± 17	1184 ± 17
Nonshrunk-Shrunk, lb	58	72
Nonshrunk-Shrunk, %	-4.8	-5.7

[a,b] $P < .09$

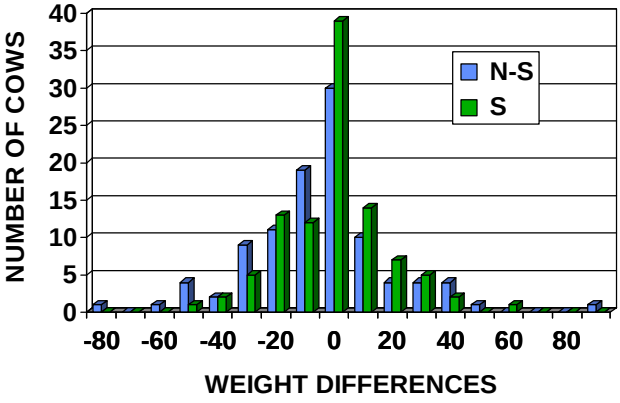

Figure 1. Number of cows with various weight changes between weights taken before withdrawal from feed and water (D1; nonshrunk) and after deprivation of feed and water for 19 h (D2). The nonshrunk and shrunk weights were taken at 4 d intervals.