



# BEEF CATTLE RESEARCH UPDATE

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## Interval Feeding of Supplements

Reducing winter feed costs for beef cows is important to cow-calf producers since Standardized Performance Analysis records have shown that feed costs account for more than 60% of beef producers' annual cow cost with over one-half of these costs attributed to winter feeding.<sup>1</sup> The labor and transportation expenses associated with supplement feeding contribute significantly to the fixed cost of cattle operations. Therefore, feeding supplements on alternate days or three times weekly (eliminate Sunday feeding) instead of daily is a common strategy to decrease cost of production.

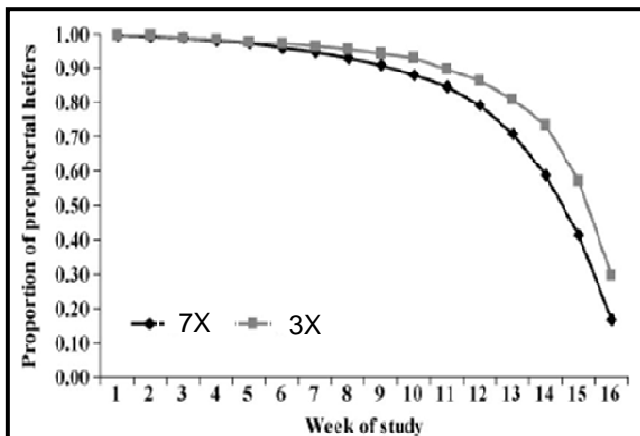
A 2000 research review of supplementation programs for beef cattle fed forage-based diets concluded that supplementing cattle with high protein supplements (cottonseed meal) three times or once weekly usually gives similar performance compared to daily feeding.<sup>2</sup> This same research review concluded that infrequent feeding (compared with daily feeding) of low-protein grain-based supplements usually reduces cattle performance probably due to disruption of ruminal function (due to starch) resulting in decreased forage intake and digestibility.

This review also suggested that grain-based supplements with intermediate protein levels (i.e. 20%) can be fed infrequently (3 times weekly) with little or only slight reductions in performance. It was noted that additional research evaluating infrequent supplementation of ~20% protein supplements was needed. In the studies reviewed these ~20% protein supplements were fed at rates of about 31 lb/weekly. This feeding rate is equivalent to about 0.4 to 0.45% and 0.95 to 1.05% of body weight per feeding for daily fed and 3 times weekly fed animals, respectively. The response to feeding such supplements at higher levels might be different. In addition, the negative associative effects associated with feeding energy based supplements should be minimized if the supplements are formulated with high-fiber ("digestible fiber") by-product feeds (wheat middlings, corn gluten feed, distiller's grains and soybean hulls) as compared to grains.<sup>3</sup> Research has generally shown that supplementation with digestible fiber energy sources might still reduce forage intake. However, forage digestibility is generally not reduced with these type supplements due to their low starch content.

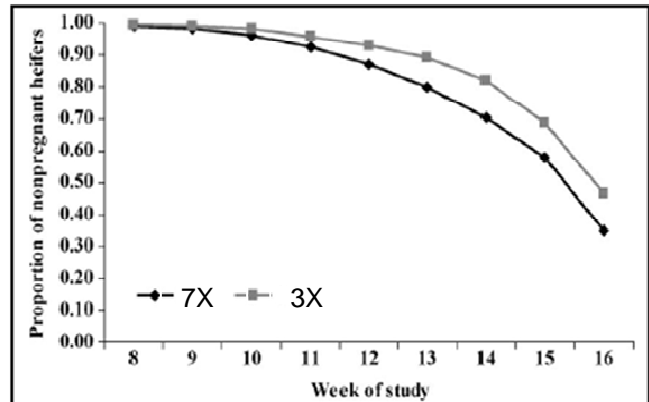
Recent research has evaluated the effects of supplementation frequency of high-fiber by-product based supplements on the performance of cattle fed forage. University of Florida researchers conducted two experiments to compare performance and metabolic responses of beef females consuming low-quality forages and offered a digestible fiber based energy supplement daily or three times weekly.<sup>4</sup> The supplement consisted of 66.7% wheat middlings, 26.9% soybean hulls, 3.8% molasses and 2.7% cottonseed meal and contained 22.2% crude protein on a dry matter (DM) basis (~20% on as fed basis).

In experiment 1, 56 Brahman X Angus heifers (503 lb initial weight) grazed bahiagrass pastures (8.8% crude protein, DM basis) and were fed the supplement either daily (7X) or three times weekly (3X) at a weekly rate of 40 lb of DM per heifer over a 109 day trial. The supplementation rates were equivalent to about 1 and 2.3% of body weight per feeding for 7X and 3X, respectively. On day 46 of the trial, the heifers were exposed to bulls for a 60-day breeding season. These researchers reported that heifers fed daily exhibited less daily variation in plasma concentrations of blood urea nitrogen, glucose, and insulin. Furthermore, daily supplementation positively affected the expression pattern of liver and muscle genes associated with nutrient metabolism and growth. These beneficial metabolic effects resulted in heifers fed daily gaining significantly faster than heifers

fed three times weekly (0.90 vs. 0.73 lb/day). In addition, daily fed heifers attained puberty (Figure 1) and pregnancy (Figure 2) significantly sooner than heifers fed three times weekly.



**Figure 1.** Proportion of prepubertal heifers by week. Curves represent heifers offered energy supplement daily (7X) or 3 times weekly (3X). Source: Cooke et al., 2008.



**Figure 2.** Proportion of non-pregnant heifers by week during the 60-d breeding season. Curves represent heifers offered energy supplement daily (7X) or 3 times weekly (3X). Source: Cooke et al., 2008.

In experiment 2, 12 mature non-lactating, non-pregnant Brahman X British cows (1219 lb) were fed the supplement daily or three times weekly at a weekly rate of 45 lb of DM per cow for a three week period. The supplementation rates were equivalent to about 0.5 and 1.2% of body weight per feeding for 7X and 3X, respectively. Stargrass hay (6% protein, DM basis) was offered in ad-libitum amounts to the cows. Both blood and liver samples collected during the trial indicated that daily supplementation improved the nutritional status of the cows.

In summary, these Florida researchers concluded that feeding an energy supplement based on digestible fiber by-products daily instead of three times weekly enhanced the nutritional and metabolic status of forage-fed Brahman-crossbred females, resulting in improved growth and reproductive performance of developing heifers. Based on the results of experiment 2, they also postulated that daily supplementation would improve performance and reproductive efficiency of mature cows.

North Carolina State University researchers evaluated the effect of supplementing hay with a 50:50 mix of soybean hulls and corn gluten feed (plus added calcium) daily or three times weekly at a weekly rate of 42 lb with growing steers over two consecutive years.<sup>5</sup> In both years, 40 steers (579 and 627 lb initial weights for year 1 and 2, respectively) were fed ad-libitum fescue hay (9.9% protein, DM basis). The steers were supplemented daily (7X: 6 lb/hd), three times weekly (3X: 14 lb/hd), or not supplemented (Hay). The supplement contained 16.3% protein on a DM basis (~15% on as fed basis). The supplementation rates were equivalent to about 1 and 2.3% of body weight per feeding for 7X and 3X, respectively.

These researchers reported that daily gains were greater in supplemented steers compared to non-supplemented steers but did not differ due to feeding frequency (0.33, 1.52, and 1.46 lb/day for Hay, 7X and 3X, respectively). Hay intake was reduced by supplementation and was higher for 7X than 3X (14.27, 13.47, and 11.11 lb/hd/day for Hay, 7X and 2X, respectively). The gain to feed ratio of supplemented steers was higher than that for steers fed hay only and 3X (0.19) steers tended to more efficient than 7X steers (0.17). In summary, the results of this study suggest that three times weekly supplementation of a digestible fiber based supplement will not reduce performance compared to daily supplementation.

Based on these two recent studies (Florida and North Carolina research), feeding digestible fiber based energy supplements three times weekly as compared to daily may have minimal effects on the performance of growing beef cattle. However, the Florida data suggest that daily feeding may enhance the nutritional and metabolic status of beef females fed low-quality forage resulting in improved reproductive performance and efficiency.

### **Implications of this Data**

In conclusion, frequency of supplementation is an important management and economic option to consider when designing supplementation programs for beef cattle fed forage-based diets. Numerous research studies have shown that supplementing cattle with high protein supplements (cottonseed meal) three times or once weekly usually gives similar performance compared to daily feeding.<sup>2, 6</sup> Low-protein grain- based supplements should be fed daily to reduce the disruption of ruminal function (due to starch) which results in decreased forage intake and digestibility. In general, the data suggests that energy supplements (grain- or digestible fiber-based) with intermediate protein levels (~20%) should be fed daily if the supplementation rate is 1% of body weight or greater per feeding.

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- <sup>1</sup> Miller, A. J., D. B. Faulkner, R. K. Knipe, D. R. Strohbehm, D. F. Parrett, and L. L. Berger. 2001. Critical control points for profitability in the cow-calf enterprise. *Prof. Anim. Sci.* 17: 295-302.
  - <sup>2</sup> Kunkle, W. E., J. T. Johns, M. H. Poore, and D. B. Herd. 2000. Designing supplementation programs for beef cattle fed forage-based diets. *J. Anim. Sci.* 77 (E-Suppl.): 1-11. Available: <http://jas.fass.org/cgi/reprint/77/E-Suppl/1-k>.
  - <sup>3</sup> Horn, G. W., and F. T. McCollum. 1987. Energy supplementation of grazing ruminants. Pages 125-136 in *Proc., Grazing Livestock Nutr. Conf.*, Jackson, WY.
  - <sup>4</sup> Cooke, R. F., J. D. Arthington, D. B. Araujo, G. C. Lamb, and A. D. Ealy. 2008. Effects of supplementation frequency on performance, reproductive, and metabolic responses of Brahman-crossbred females. *J. Anim. Sci.* 86: 2296-2307.
  - <sup>5</sup> Drewnoski, M. E., M. H. Poore, and G. A. Benson. 2008. Frequency of supplementation with a mix of soyhulls and corn gluten feed does not affect performance of growing cattle fed a hay based diet. *J. Anim. Sci.* 86 (E-Suppl. 3): 24 (Abstr.). Available: [http://www.asas.org/abstracts/2008sectional/Supplement\\_3-1.pdf](http://www.asas.org/abstracts/2008sectional/Supplement_3-1.pdf).
  - <sup>6</sup> Olson, K. C., and A. Harty. 2007. Delivery of supplements on rangelands. In *Proc., The Range Beef Cow Symp. XX*, Fort Collins, CO. Available: <http://www.rangebeefcow.com/2007/images/newsroom/proceedings/OlsonKen.pdf>.

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