Soya Bean Meal and Starea Blocks as Protein Supplements for Gestating Beef Cows on Weathered Range[1]

by

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SUMMARY

Fifty-two pregnant Hereford and Angus cows, divided according to weight and age into two equal groups, were compared as to their weight changes when grazed on weathered range and fed either soya bean or Starea blocks for 80 days. Weight changes were similar for cows on both protein supplements. As the trials progressed, consumption of Starea supplement declined; that of soya bean meal block remained constant. Cows fed Starea blocks had higher rebreeding rates than did those fed soya meal and their calves (when weaned) weighed more, though differences were not statistically significant.

INTRODUCTION

THE devastating effects of the recent drought on the beef and dairy industries in Nigeria have only aggravated decades of persistent energy and protein deficiencies experienced by Nigerian cattle, particularly during the dry period (lasting six to eight months) in the Northern States. For the most part, the cattle subsist on the bush of uncontrolled and unselected natural pastures, which rapidly decline in nutritive value; by the time the pastures are grazed by the animals, their crude protein content ranges from 2% to 4% (Oyenuga, 1966; de Leeuw, 1971).

The use of natural protein sources to supplement rations of cattle on weathered range is expensive. Non-protein nitrogen sources such as urea, however, are not well used by ruminants grazing dry grass (Clark, Oyaert and Quin, 1951). Recently Deyoe *et al.* (1968) developed an extruded grain urea product known commercially as Starea[3] that may be fed to ruminants grazing weathered range. Preliminary results indicated that during gestation (Tucker, Harbers and Smith, 1971) cows had similar weight and subsequently so did their calves (when weaned) (Tucker, Harbers and Smith, 1972), whether the cows had been fed soya bean meal or Starea — supplemented rations (in meal form).

To investigate further the use of Starea feed supplementation for gestating range cattle, rations were processed into blocks to regulate intake and eliminate daily feeding. The results of that study are reported here.

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3 Starea(R) — registered trademark (860255) of an extruded grain-urea product, U.S. patent No. 3642489, patented and assigned to K.S.U. Research Foundation.

EXPERIMENTAL PROCEDURE

Fifty-two pregnant Hereford and Angus cows were divided into two groups of 26 animals each. On the average, they were 5 years old and weighed 466 kg. Each group was placed into adjacent paddocks (90 hectares each) that had been lightly grazed in summer and thus contained abundant dormant grasses. The stocking rate was 3.5 hectares animal (rates for continuous grazing vary from 3.6 to 4.5 hectares). Each paddock contained approximately the same portions of three major range sites: loamy upland, limestone breaks, and clay pan (Anderson and Fly, 1955). Big and little Bluestem (*Andropogon gerardi*, Vitamin and *A. scoparius*, Michx) made up 50 to 60 % of the vegetation. Three other warm season grasses — switchgrass (*Panicum vigratum* L.), sideoats grama (*Bouteloua curtipendula* (Michx) Torr.) and Indiangrass (*Sorghastrum nutans* (L.) Nash) comprised another 10 to 20 % (Herbel and Anderson, 1959). Paddocks are burned annually in late April.

One group of cows received soya bean meal blocks; the other group had access to Starea blocks (Table 1). The 15 kg blocks were fed in open troughs and were replenished weekly. Extra minerals were available in mineral boxes. Native hay was provided only when heavy snow prevented grazing.

TABLE 1

Composition of Soya Bean and Starea Blocks

Ingredient %	*Soya bean meal block*	*Starea block*
Soya bean meal	48.0	—
Sorghum Starea (70% P.E.)[a]	—	50.0
Urea	5.0	—
Sorghum grain	17.9	19.9
Salt	12.5	12.5
Cane molasses	7.5	7.5
Dicalcium phosphate	6.0	7.0
Trace minerals,	1.0	1.0
Bentonite	2.0	2.0
Vitamin A, I.U./kg	81,400	81,400
Vitamin D, I.U./kg	26,400	26,400

[a] P.E. — Protein equivalent.

Every 28 days cows were weighed and paddocks switched to eliminate any differences in grazing sites. The trial was terminated just prior to calving.

Loss of block weight by weather conditions (wind, precipitation) was determined by subjecting two blocks from each treatment in small fenced areas within each paddock. Every 28 days, weight losses were determined and new blocks were placed in the fenced areas.

[4] Blocks supplied by Dr. L. G. Helmer, Far-Mar-Co, Hutchinson, Kansas.

The first afternoon cows were exposed to Starea blocks, they were visually observed for signs of ammonia toxicity (such as panting, salivation, excessive urination). In similar studies Tucker, *et al.*, (1971) had used a Starea mix containing 44% protein equivalent; this product contained 70 % protein equivalent (Table 1).

Temperatures and precipitation were normal except during the last 20 days of the experiment, when excessive rainfall produced extremely muddy conditions.

During lactation, all cows and calves were allowed access to either paddock. Calves on the average were weaned when 205 days old. Calf weights were adjusted for sex and age to determine the effects of gestation supplementation of their dams.

The effect of protein supplementation on date of conception was calculated by using the calving date of the follwing year.

Data were analyzed statistically by the least squares method as modified for computer by Kemp (1972).

RESULTS

Ammonia toxicity was not noticed in the Starea-fed group when observed visually. Cows licked blocks for 20 to 22 minutes before returning to grazing sites.

During the first 28 days (October 24th—November 21, 1972), both groups gained weight as indicated in Table 2. The

TABLE 2

Cow Weight changes and Protein Block Consumption

Variable	*Soya bean meal block*	*Starea block*
Number of cows	26	26
Average age, yrs	5.07	5.11
Average initial weight, kg	465.9	467.3
Average final weight, kg	448.6	445.0
Weight changes, kg/hd/period		
Oct. 24th-Nov. 21st, 1972	+5.0	+7.3
Nov. 21st-Dec. 19th, 1972	-16.8	-14.1
Dec. 19th-Jan. 11th, 1973	- 5.5	-15.5
Oct. 24th-Jan. 11th, 1973	-17.3	-22.3
Block consumption, kg/hd/day		
Oct. 24th-Nov. 21st, 1972	1.05	1.08
Nov. 21st-Dec. 19th, 1972	1.03	0.92
Dec. 19th-Jan. 11th, 1973	1.09	0.62

Starea-supplemented group gained an average of 0.27 kg per head per day and those on the soya bean block gained 0.19 kg. Consumption of the block supplements were similar (1.05 kg and 1.08 kg per head per day for soya bean meal and Starea-fed groups respectively.)

At the end of the second 28-day period (December 19th), weight losses were high in both groups: the group on soya bean meal supplement had lost 11.8 kg (0.21 kg/head/day); the Starea-fed group 7.1 kg(0.12 kg/head/day). For that 56-day period, consumption of soya bean meal blocks was similar to that observed at the end of the first period (1.05 vs. 1.03 kg). Starea-block consumption however, dropped from 1.08 kg to 0.92 kg per head per day during the second 28-day period.

Further weight losses were observed during the third period. Cows on soya bean blocks lost 5.5 kg each (–0.23 kg/head/day); those on Starea, 15 .5 kg (–0 .65 kg/head/day). Starea block consumption also dropped further to 0.62 kg; soya bean block consumption was similar to that for other periods. For the 0-day trial, cows on the soya bean supplement lost 17.3 kg each; Starea-fed cows lost 22.3 kg each.

Block weight losses (Table 3), though not consistentl, were not excessive. The smallest loss observed was for the Starea block during the third period; that might have been because of the adhesive characteristics of the extruded sorghum grain.

TABLE 3

Weight Loss of Blocks (Kg/Month) Exposed to Weather (1972-73)

	Nitrogen source	
Period	*Soya bean meal*	*Starea*
October 24th-November 21st, 1972	3.4	5.2
November 21st-December 19th, 1972.	0.6	0.5
December 19th-January 11th, 1973	3.6	0.2

Average weaning weights of calves were similar, whether their dams received soya bean or Starea Blocks ($P < .10$). Cow rebreeding rates were also similar for the two groups.

DISCUSSION

Cold weather during the second period of the trial resulted in weight losses for both groups. Continued cold and extremely wet weather led to further weight losses during the third period. Such losses probably could be expected under severe winter conditions on the Flint hills of Kansas (Tucker *et al.*, 1971; Tucker *et al.*, 1972). It was observed that as snow cover increased, the Starea blocks became stickier, which could have depressed intake as reflected in the progressive drop in consumption by the cows and their increased weight loss. A similar trial at the University of Illinois showed that consumption of soya bean meal and of Starea blocks was comparable when the supplements were fed in a covered area (Stiles, unpublished data).

Weights of caves when weaned and cow rebreeding rates did not differ significantly. Thus, apparently, at this preliminary stage, whether soya bean or Starea blocks are used as range supplements might depend upon the comparative costs of the supplements.

Under Nigerian range conditions, especially in the northern parts of the country where energy and protein shortages are critical during the dry season, the use of protein blocks as dry-season supplement should be considered. Fortunately, it has been found that soya beans can be

TABLE 4

Mean Calf Weaning weights and Cow rebreeding rates

Variable	Nitrogen source Soya bean meal	Starea
Calf weaning weight, kg	227.3(182.3-292.7)a	240.0(198.2-285.0)
Calf daily gain, kg	1.01(0.75-1.45)	1.06(0.90-1.23)
Rebreeding day of year	157.6 (June 6)	157.1 (June 6)

a (range).

grown widely in the southern and middle zones of Nigeria (FAO, 1966). Currently most soya beans produced in Nigeria are exported (FAO, 1966), leaving only a small amount to be sold locally at a very low price of ₦50 per ton (kay, Okoma. Onowu, Bello, and Ifenu, 1974). When the proposed urea plant in Nigeria goes into production, perhaps urea can be obtained cheaply enough for complexing with suitable starches. It is recognized, however, that an abundant starch source for the extruded starch-urea compounds might appear to be a limiting factor, because most of the grain and tubers produced are used for human concump tion. Nevertheless, if new lands are opened to cultivation and new crop varieties introduced to increase yields, those crops not frequently accepted by humans but suitable for this purpose could be used Cane molasses from Nigeria's sugar-manufacturing industries also could be used to supplement such starches in developing range protein blocks.

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