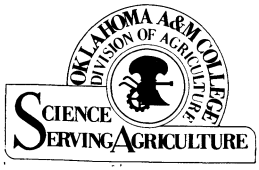
Bulletin B-460 September, 1955

Supplements of Different Protein and Vitamin-Mineral Content

for Wintering Bred Yearling Heifers

By
A. B. Nelson, R. W. MacVicar,
W. D. Campbell and O. B. Ross



Agricultural Experiment Station

The Story in Brief

Providing supplemental winter feed is one of the major costs of maintaining a commercial cow herd under Oklahoma range conditions. The operator of such a herd needs information concerning the effect of using various supplements both for cows in the herd and for replacement heifers. Studies on supplements for mature cows and heifer calves have been reported previously in publications from this Station. This report deals with the effect of various supplements on the growth and performance of bred yearling heifers intended for herd replacements.

The results of the study showed that:

- Bred yearling heifers fed a 40 percent protein supplement gained 56 pounds more during the winter than similar heifers fed a 20 percent protein supplement. Yearly gains and calving data were essentially the same for both treatments (Experiment I).

- The addition of a vitamin and mineral supplement failed to show conclusive evidence of any beneficial effect on the performance of bred yearling heifers (Experiment II).

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Supplements of Different Protein and Vitamin-Mineral Content for Wintering Bred Yearling Heifers[1]

A. B. Nelson, R. W. MacVicar, W. D. Campbell, and O. B. Ross[2]

An adequate and efficient program for wintering beef cattle provides for adequate roughage and proper supplementation of this roughage to correct any deficiencies in the nutrients it contains. Throughout much of Oklahoma, the common roughage is cured native grass or prairie hay. These roughages provide adequate energy for wintering cattle. However, they are deficient in some other nutrients required by livestock. The nutrient nearly always lacking in non-legume roughages, such as prairie hay and mature native grass, is protein. It should be supplied in a supplemental feed. Other nutrients lacking are certain vitamins and minerals. These are more deficient in mature range grass than in early-cut prairie hay.

Providing supplemental winter feed is one of the most important items of expense in maintaining the cow herd. The cattleman needs to know which supplements containing different amounts of protein, minerals and vitamins can be fed at the lowest cost to replacement heifers during the winter without interfering with the animal's productivity.

This bulletin reports the results of feeding trials at the Lake Carl Blackwell Experimental Range Unit near Stillwater, Oklahoma. These trials were designed to study (Experiment I) the relative value of supplements containing approximately 20- and 40-percent protein, and (Experiment II) the addition of a commerical vitamin and mineral supplement to each of the supplements of different protein content, for wintering bred yearling heifers on mature native grass.

PROCEDURE

The experimental animals consisted of grade Hereford yearling beef heifers which had been produced in the Animal Husbandry department's experimental herd. A different group of heifers was used in

[1] This study was partially supported by Dawe's, Inc., Chicago, Illinois.

[2] Respectively: Associate Animal Husbandman, Nutrition; Head, Department of Agri. Chem.; Technician, Beef Cattle; formerly Animal Husbandman, Nutrition. Others associated with the work for brief periods as graduate assistants were O. G. Daniel, J. P. Fontenot, and T. M. Jones.

in each of four years (1950-51, 1951-52, 1952-53, 1953-54). The heifers were bred starting in late May of each year previous to their use in the study so that the first calves would be born in early March when the heifers were approximately two years old.

In November of each year the heifers were divided into four lots according to weight. They were allowed to graze the native grass pastures year-long at a rate of approximately 10 acres per head. During the winter feeding period the cattle of each lot were fed approximately 2.5 pounds of protein supplement per head daily. These supplements were fed every other day. During the first test the cattle were fed an average of 2 pounds of protein supplement per day until January 13 when the amount fed was increased to 2.5 pounds. All cattle had access to a mineral mixture composed of two parts salt and one part steamed bonemeal.

The same supplements were fed to the four lots of heifers during three years of the test (1950-51, 1951-52, 1953-54). All supplements were fed in a pelleted form. The heifers in Lot 1 were fed a supplement containing 20 percent protein plus added vitamins and minerals. This pellet was 34 percent cottonseed meal and 66 percent yellow corn with a commercial vitamin and mineral supplement added at the rate of one pound per 100 pounds of feed. The content of this commercial supplement is given in footnote 3 of Table III. The pellets fed to Lot 2 were a 20 percent protein supplement without the added commercial vitamin and mineral supplement. The heifers of Lot 3 were fed a 40 percent protein supplement (cottonseed meal) plus the commercial vitamin and mineral supplement. Those in Lot 4 were fed the 40 percent protein supplement without additions. The calcium and phosphorus contents of the supplements fed during all except the first year of the tests were approximately equalized by the inclusion of steamed bonemeal and/or ground limestone. The average chemical composition of the native grass and the composition of the protein supplements fed in 1951-52, which are similar in content to the pellets fed in the other tests, are given in Table I.

During the 1952-53 season the commercial vitamin and mineral supplement was not included in the ration. Instead, two lots of heifers were fed the simple 20 percent protein pellets and two lots were fed the simple 40 percent protein pellets.

The cattle were weighed at approximately monthly intervals throughout the experiment. The lots of heifers were rotated frequently between the pastures to minimize differences in forage available.

The calves were weaned and the experiment terminated in October of each year.

RESULTS

Experiment I —Supplements Containing 20- and 40-Percent Protein for Wintering Bred Yearling Beef Heifers

Production data are summarized in Table II. The values for each lot represent an average of eight values—two lots per year in

each of four years—regardless of whether or not a commercial vitamin and mineral supplement was fed.

The heifers fed a supplement containing 40 percent protein gained 34 pounds each from the beginning of the winter feeding period until the last weight recorded before any calves were born in early March. Heifers fed equal amounts of a supplement containing 20 percent protein lost 22 pounds in the same period. This difference of 56 pounds indicates that protein was a limiting nutrient in these tests. The results are in agreement with other tests on the value of various protein supplements for wintering heifer calves.[1] The heifers that gained the least during the winter gained the most during the subsequent summer, and there was a difference of only 11 pounds in yearly gain.

The birth weights of the calves were slightly different, 64 pounds for those whose mothers were fed the 20 percent supplement and 67 pounds in the 40 percent protein supplement group. Weaning weights were practically the same in both groups.

These weaning weights are low when compared to the average weights in most of the experimental cow herds, but it should be emphasized that in these tests the calves were the first calves produced by two-year-old heifers.

Weight data were included only for those cows which successfully raised a calf. As yearlings the heifers had been bred to different types of bulls of the Aberdeen-Angus and Hereford breeds. Although a total of 252 heifers were started on the tests, the losses at time of calving were considerable. Only 178 calves (88 in Lot 1 and 90 in Lot 2) were raised to weaning.

Using costs of feeds prevailing at the time the tests were conducted, the supplemental feed cost for the year was $2.16 more for those fed the 40 percent protein pellet than those fed the 20 percent protein pellet.

These data indicate that when adequate native grass is available, such as during the mild winters and excellent growing seasons during this test, heifers fed 2.5 pounds of a supplement containing 20 percent protein will produce as heavy calves at weaning and will weigh nearly the same at the end of the summer grazing period as heifers fed 2.5 pounds of a 40 percent protein supplement. However, the heifers fed the 20 percent protein pellet gained considerably less (56 pounds) from the beginning of the winter feeding period until the last weight recording before calving began in early March. Although much of this difference was recovered by the following fall, the effect of repeated low winter gains is not known. The heifers fed the 20 percent protein pellet were very thin and unthrifty in appearance, especially after calving when they were lactating while consuming only dry grass and the protein sup-

[1] Nelson, A. B., J. P. Fontenot, O. B. Ross, Robert MacVicar and A. E. Darlow. 1954. The value of 20-, 30- and 40-percent protein supplements for wintering heifer calves. Okla. Agr. Exp. Sta. Bul. B-437.

plement. A test is now in progress to evaluate various protein supplements when fed for several successive winters to the same beef cattle, from weanling calves until they are cows that have produced several calves.

Experiment II—Supplements of Different Protein and Vitamin-Mineral Content for Wintering Bred Yearling Beef Heifers

Three years of tests on the value of including commercial vitamin and mineral supplement in the rations of beef heifers wintered on dry native grass are summarized in Table III.

Winter gains from November to March were only slightly different in the various groups. The addition of the vitamin and mineral supplement to the 40 percent protein pellet had no effect on winter gains. However, there was an advantage of 22 pounds from adding the vitamin and mineral supplement to the 20 percent protein pellet. Whether or not this difference would occur in additional tests is unknown. It is interesting to note that in 1952-53, when two lots were fed a simple 20 percent protein pellet, there was a difference of 25 pounds in winter gain of the two lots treated alike. This indicates some of the variation which might be expected.

Yearly gains of all lots of heifers were nearly equal. Whether or not this would be true during years of severe winters and poor summer grazing season is unknown.

Birth weights of the calves apparently were not affected by the addition of the vitamin and mineral supplement. Weaning weights of the calves in the groups fed the 20 percent protein supplement were practically equal. However, weaning weights of the calves whose mothers were fed the 40 percent protein pellet including the special supplement was 25 pounds greater than the calves in the other 40 percent protein group. The significance of this difference is not understood, especially when two groups of cattle treated alike (fed 40 percent protein pellet) in 1952-53 weaned calves differing 23 pounds in average weight.

The cost of the vitamin and mineral supplement was approximately $1.50 per heifer for the winter season.

When the average of Lots 1 and 3 (groups fed the vitamin and mineral supplement) was compared to the average of Lot 2 and 4, the difference in winter gain was 10 pounds and the difference in weaning weight was 11 pounds in favor of the special supplement. The yearly gains and birth weights were nearly equal.

SUMMARY

Feeding tests with bred, yearling, grade, Hereford heifers were conducted over a period of four years. The heifers were fed supplements of different protein level and vitamin and mineral content during the winter while grazing in native grass pastures. The heifers calved in early spring when they were approximately two years old.

Heifers fed a 40-percent protein supplement gained an average of 56 pounds more during the winter than similar heifers fed equal amounts of a supplement containing 20 percent protein. Differences in yearly gain of the heifers and birth and weaning weights of the calves were small.

When additional vitamins and minerals were added to the 20- and 40-percent protein supplements, winter gains were not sharply affected. Under Oklahoma range conditions in mild winters, the data fail to provide conclusive evidence of beneficial effects on the performance of bred yearling heifers.

Table I.—Chemical Composition of Supplements and Grasses.

	Percent dry matter	Percentage composition of dry matter						
		Ash	Crude protein	Ether extract	Crude fiber	N-free extract	Ca	P
Supplements fed in 1951-52								
20% protein + vitamin-mineral	90.31	7.37	22.10	4.25	6.70	59.58	1.57	1.29
20% protein	90.69	7.23	21.83	4.12	6.91	59.90	1.54	1.22
40% protein + vitamin-mineral	92.96	9.12	42.32	5.12	14.16	29.27	1.40	1.18
40% protein	93.00	9.30	41.50	4.28	13.99	30.92	1.39	1.20
Native grass (3-year average)*								
October		6.8	3.9	2.2	35.4	51.7	.35	.05
January		5.9	2.6	1.6	40.9	49.0	.31	.04
June		7.3	12.0	2.6	27.2	50.9	.30	.16
August		6.6	6.7	2.6	32.6	51.5	.23	.06

* Average, by species, of the four predominant grasses: big bluestem, little bluestem; switch, and Indian.

Table II.—Supplements Containing 20- and 40-Percent Protein for Wintering Bred Yearling Beef Heifers, Four-Year Average.[1]

	Lot 1 20	Lot 2 40
Total number of heifers[2]	88	90
Average daily winter ration (lbs.)[3]		
20% protein pellet	2.5	
40% protein pellet		2.5
Mineral mixture[4]	.14	.15
Native grass[5]	ad lib.	ad lib.
Average weight per cow (lbs.)		
Beginning, November 19	710	704
Before calving, March 11[6]	688	738
End of summer, October 16	758	763
Change to calving	—22	34
Yearly change	48	59
Calf data (lbs.)		
Average birth weight[7]	64	67
Average weaning weight[8]	372	379
Average feed costs		
Supplements[9]	15.93	18.09
Grass	21.88	21.88

[1] Tests were conducted during 1950-51, 1951-52, 1952-53 and 1953-54.

[2] Includes only those heifers which successfully raised a calf. Total number of heifers per lot at the start of the tests was 126.

[3] During the 1950-51 season, 2 pounds of protein supplement per head daily was fed until January 13, at which time the amount fed was changed to 2.5 lbs. per head. All pellets were fed every other day. The 20% protein pellet was 34 percent cottonseed meal and 66 percent ground yellow corn. The 40 percent protein pellet was pelleted cottonseed meal. In 1952-53 there were two lots fed each pellet. In the other three years, approximately one-half the cattle were fed supplements to which had been added a commercial vitamin and mineral supplement. During the last three years of the test the calcium and phosphorus content of the pellets was approximately equalized by the addition of ground limestone and/or steamed bonemeal where necessary.

[5] Adequate forage was available. The stocking rate was approximately 10 acres per cow.

[6] Weight recorded before any calves were born.

[7] Corrected for sex and includes all calves born.

[8] Corrected for sex and age.

[9] The four-year average costs of supplements per ton were: 20% protein pellet, $76.80; 40% protein pellet, $87.85; mineral mixture, $42.05.

Table III.—Supplements of Different Protein and Vitamin and Mineral Content for Wintering Bred Yearling Beef Heifers, Three-Year Average.[1]

	Lot 1 20B	Lot 2 20	Lot 3 40B	Lot 4 20
Total number of heifers[2]	32	31	30	33
Average daily winter ration (lbs.)[3]				
20% protein pellets plus vit. and min.	2.5			
20% protein pellet		2.5		
40% protein pellet plus vit. and min.			2.5	
40% protein pellet				2.5
Mineral mixture[4]	.16	.16	.17	.17
Native grass[5]	ad lib.	ad lib.	ad lib.	ad lib.
Average weight per cow (lbs.)				
Beginning, November 16	699	710	706	702
Before calving, March 13[6]	694	683	740	740
End of summer, October 15	758	758	760	762
Change to calving	—5	—27	34	38
Yearly change	59	48	54	60
Calf data (lbs.)				
Average birth weight[7]	63	64	66	68
Average weaning weight[8]	363	365	391	366
Average feed cost (dollars)				
Supplements[9]	16.58	14.99	18.15	16.55
Grass	20.83	20.83	20.83	20.83

1 Tests were conducted during the 1950-51, 1951-52, and 1953-54 seasons.

2 Includes only those heifers which successfully raised a calf. Total number of heifers at the start of the tests was 43 per lot.

3 During the 1950-51 season, 2 lbs. of protein supplement per head daily were fed until January 13, at which time the amount fed was changed to 2.5 lbs. per head. All pellets were fed every other day. The 20% protein pellet was 34 percent cottonseed meal and 66 percent ground yellow corn. The 40% protein pellet was pelleted cottonseed meal. A commercial vitamin and mineral supplement was added to the rate of one pound per 100 pounds of feed to each of the pellets containing 20 and 40 percent protein and these have been designated as 20B and 40B. The vitamin and mineral supplement was manufactured by Dawe's Laboratories, Inc., Chicago, Illinois and contained approximately the following kinds and amounts of nutrients per pound of supplement: Vitamin A, 995,000 I. U.; Vitamin D., 299,000 I. U.; Riboflavin, 32.23 mg.; Pantothenic acid, 40.29 m.; Choline, 3074 mg.; Niacin, 1260 mg.; Potassium iodide, 0.10 gm.; Cobalt Sulfate 25.0 mg.; Iron, 5600 mg. In addition, during the last two years of the test the calcium and phosphorus content of the pellets was approximately equalized by the addition of ground limestone and/or steamed bonemeal where necessary.

4 Mineral mixture was two parts salt and one part steamed bonemeal.

5 Adequate forage was available. The stocking rate was approximately 10 acres per cow.

6 Weight recorded before any calves were born.

7 Corrected for sex and included all calves born.

8 Corrected for sex and age.

9 The three-year average costs of supplements per ton were: 20% protein pellet plus vitamins, $77.26; 20% protein pellet, $69.54; 40% protein pellet plus vitamins, $84.80; 40% protein pellet, $77.46; mineral mixture, $39.94.