The carcass grades of the lot 3 steers were slightly lower than the grades in the other lots but this difference was not reflected in dressing percentage.

The return was related to the level of wintering in that the steers fed corn both winters (lot 4) lost $3.43 per head, those fed corn the second winter only (lot 3) returned $14.14, and those not fed corn returned $19.36. These results are in agreement with results of the 1955 test but not the 1954 test. Although there were only small differences in return during the 1956 summer period only, differences in previous wintering costs resulted in greater return for the lower levels of wintering. The average consumption of corn during the entire test was 945, 1491, and 2001 lbs. for the steers in lots 2, 3, and 4, respectively.

Lot 4 (full-fed on grass) vs. Lot 5 (3 lbs. corn on grass).

It was more profitable (although the difference was only $2.85 per head) to feed 3 lbs. of corn per head daily than to full-feed corn on grass to steers that had been fed at a "high" level for two winters. This is in agreement with the 1955 test, but in 1954 the results were in favor of full-feeding. The lot 5 steers had gained only 12 lbs. less in the 657 days than those in lot 4. The packer buyers preferred the lot 4 cattle as indicated by the $1 per cwt. difference in selling price but this was not reflected in differences in carcass grades and dressing percentage.

Summary

In this test it was most profitable to winter two successive winters at a "low" level and sell two-year-old steers after full-feeding on grass during the summer. When steers were sold after full-feeding corn on grass the return was related to the level of wintering in that the least profit was realized when steers had been wintered at the high level, the greatest profit resulted from the low level of wintering, and the return from wintering at the "low" level the first year and "high" level during the second year was intermediate. Limited feeding on grass after wintering at a high level was more profitable than full-feeding similar cattle on grass. It was more profitable to full-feed corn on grass than to allow grazing only after wintering at the "low" level.

Phosphorus Supplements for Beef Cattle

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Steamed bone meal is recognized as one of the chief sources of supplemental phosphorus for livestock. At present, however, the demand for supplemental phosphorus has far exceeded the supply of steamed bone meal. This has led to the use of inorganic sources, such as defluorinated rock phosphate, dicalcium phosphate, Curacao Island phosphate and colloidal clay. Of the latter three sources, only colloidal clay has failed to produce good results in recent tests at this station.

This experiment was designed to (1) compare the value of defluorinated rock phosphate and feeding grade dicalcium phosphate as sources of supplemental phosphorus for growing beef cattle and (2) compare these feed grade materials with two purified sources of phosphorus, reagent grade dicalcium phosphate and nomosodium phosphate.

Procedure

The experiment was divided into three periods. During Period 1 the experimental animals, 15 grade Hereford steers and 25 grade Hereford heifers, were self-fed the low-phosphorus basal ration shown in Table 1. At the end of this 56-day depletion period the animals were divided into five lots on the basis of sex and weight. During the second and third periods the cattle in Lot 1 were continued on the basal rations as a negative control. Lots 2, 3, 4 and 5 were self-fed the rations shown in Table 1, which contained supplemental phosphorus from reagent grade dicalcium phosphate, defluorinated rock phosphate, feed grade dicalcium phosphate and monosodium phosphate, respectively.

Table 1.—Composition of experimental rations (lbs.)

Ingredients[1]	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5
Cerelose[2]	22.10	22.10	22.10	22.10	22.10
Cottonseed hulls	37.48	37.48	37.48	37.48	37.48
Beet pulp	27.10	27.10	27.10	27.10	27.10
Alfalfa meal	9.10	9.10	9.10	9.10	9.10
Corn gluten meal	3.70	3.70	3.70	3.70	3.70
Urea	.35	.35	.35	.35	.35
A&D supplement[3]	.17	.17	.17	.17	.17
Reagent dicalcium phosphate	--	.18(.32)[4]	--	--	--
Deflourinated rock phosphate	--	--	.25(.44)	--	--
Feed grade dicalcium phosphate	--	--	--	.21(.37)	--
Monosodium phosphate	--	--	--	--	.17(.31)
Calcium carbonate[5]	--	.34(.56)	.25(.41)	.31(.51)	.47(.79)
P from supplement %	--	.04(.07)	.04(.07)	.04(.07)	.04(.07)
P from basal %	.08	.08	.08	.08	.08

[1] In addition, salt was fed free-choice.
[2] Corn sugar.
[3] Supplied 2724 I. U. of vitamin A and 340 I. U. of vitamin D per lb. of ration. Trade name is "Quadrex"—Supplied gratis by Nopco Chemical Co., Harrison, N. J.
[4] Figures in parenthesis indicate amount of supplemental phosphorus added during Phase 3.
[5] Calcium carbonate was added to maintain a constant Ca:P ratio in all rations.

Blood samples for the determination of plasma inorganic phosphorus were taken by jugular puncture at 14-day intervals. The animals were weighed and feed consumption was determined at the end of each 14-day period.

During Periods 2 (56 days) and 3 (56 days) the level of supplemental phosphorus was .04 percent and .07 percent, respectively. The level of supplemental phosphorus was increased to .07 percent at the end of the first 56 days because the weight gains and plasma phosphorus values were not as great as in previous tests. Also, some stiffness and lameness was observed indicating that the level of supplemental phosphorus may have been too low. Measures of the value of the various supplements were weight gain, plasma inorganic phosphorus and feed consumption.

Results

Weight Gain:

As shown in Table 2, the basal ration containing .08 percent phosphorus did not support normal growth. The provision of supplemental phosphorus resulted in greater gains. However, the cattle fed .04 percent additional phosphorus from monosodium phosphate (Lot 5) did not gain as much as the other supplemented cattle in Period 2. The gains in Lot 5 were considerably greater during Period 3 and when Periods 2 and 3 were combined the gains of all supplemented cattle were considerably greater than those fed the basal ration. The low gain in Lot 5 during Period 2 is probably related to the low feed consumption until near the end of the period. At this time feed consumption started to increase and continued to increase throughout Period 3.

Table 2.—Weight gain of cattle fed different amounts and sources of phosphorus (lbs.)

Lot number	1	2	3	4	5
Animals per lot	8	8	8	7[1]	8
Source of supplemental phosphorus	None	Reagent grade dicalcium PO_4	Deflourinated rock PO_4	Feed grade dicalcium PO_4	Monosodium PO_4
Period 2 (56 days)					
Initial wt.	455	475	469	467	465
Final wt.	478	537	528	510	493
Gain	23	62	59	43	28
Period 3 (56 days)					
Initial wt.	478	537	528	510	493
Final wt.	478	568	578	605	571
Gain	0	31	50	95	78
Periods 2 & 3 (112 days)					
Initial wt.	455	475	469	467	465
Final wt.	478	568	578	605	571
Gain	23	93	109	138	106

[1] One steer died, cause unknown.

No one supplement was consistently superior, although the total gain of cattle consuming feed grade dicalcium phosphate was considerably greater than the gains of any of the other lots. As measured by weight gain, defluorinated rock phosphate and the two relatively purified sources of phosphorus were approximately equal.

Plasma Inorganic Phosphorus:

During Period 2 the increase in plasma inorganic phosphorus values was approximately the same in Lots 2, 3 and 4 (Table 3). The reason

Table 3.—Plasma inorganic phosphorus (mg/100 ml) of experimental cattle.

Lot number	1	2	3	4	5
Source of supplemental phosphorus	None	Reagent grade dicalcium PO_4	Deflourinated rock PO_4	Feed grade dicalcium PO_4	Monosodium PO_4
Period 2 (56 days)					
Initial phosphorus	2.70	2.74	2.83	2.89	2.75
Final phosphorus	2.05	3.28	3.36	3.40	2.39
Change	—.65	.54	.53	.51	.36
Period 3 (56 days)					
Initial phosphorus	2.05	3.28	3.36	3.40	2.39
Final phosphorus	1.96	3.62	4.26	4.64	4.49
Change	—.09	.34	.90	1.24	2.10
Periods 2 & 3 Combined (112 days)					
Initial phosphorus	2.70	2.74	2.83	2.89	2.75
Final phosphorus	1.96	3.62	4.26	4.64	4.49
Change	—.84	.88	1.43	1.75	1.74

for the failure of a similar increase from feeding monosodium phosphate (Lot 5) during this period may have been reduced feed consumption during much of the period. The greatest increase in plasma phosphorus values during Period 3 was in Lot 5, and when Periods 2 and 3 are combined the greatest increases occurred in Lots 4 and 5. Plasma inorganic phosphorus is apparently a satisfactory indicator of the state of nutrition of phosphorus in the animal body. In this test the inclusion of supplemental phosphorus in the ration increased plasma phosphorus levels. However, the smallest increase resulted from the feeding of reagent dicalcium phosphate.

Feed Consumption:

The average feed consumption for each lot during Periods 2 and 3 is shown in Table 4. During Period 2 feed consumption was approximately equal in Lots 1, 2, 3 and 4, but was considerably less in Lot 5.

In Period 3 feed consumption was greatly increased in all lots fed supplemental phosphorus. However, feed consumption decreased in the lot fed the basal ration. The feed consumption in Lot 5 remained

Table 4.—Feed consumption of experimental cattle (lbs.)

Lot number Source of supplement phosphorus	1 None	2 Reagent-grade dicalcium PO_4	3 Deflourinated rock PO_4	4 Feed grade dicalcium PO_4	5 Monosodium PO_4
Avg. daily feed consumption Period 2	9.1	9.2	9.6	9.4	7.8
Avg. daily feed consumption Period 3	8.5	14.4	14.9	15.0	13.8

below that in Lots 2, 3 and 4, but this lower intake was sufficient to promote apparently normal plasma inorganic phosphorus levels.

Summary

Feed grade dicalcium phosphate, deflourinated rock phosphate, reagent grade dicalcium phosphate and monosodium phosphate are apparently satisfactory sources of supplemental phosphorus for beef cattle as measured by weight gain, plasma inorganic phosphorus and feed consumption. The results indicated that the feed grade sources of phosphorus were equal or superior to the relatively purified sources of phosphorus.

Apparently rations containing .12 percent phosphorus are suboptimum with respect to this element and .15 percent phosphorus more nearly approached the minimum requirement of these animals.

Some Factors Influencing Ewe Conception During Late Spring

JOE V. WHITEMAN, RICHARD S. PITTMAN and K. I. BROWN

Much of the commercial sheep production in Oklahoma is unique because it involves breeding the ewes during an unnatural season (spring). Problems involved with breeding during spring, gestation during the summer, lambing during the fall and lactation during the winter have not been studied by experiment stations to an appreciable extent. The commercial breeding ewe project at Ft. Reno was started in order that we might study some of the problems inherent in this system of milk lamb production. Among these problems are the following:

1. What is the best kind of a ewe to buy?
2. How should ewe flocks be culled?
3. Should one buy or raise replacements?
4. What management practices will cause an increased lamb crop?