PHOSPHORUS SUPPLEMENTATION OF BEEF CATTLE IN THE VICTORIAN MALLEE

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SUMMARY

Two experiments investigated the effects of phosphorus supplements on beef cattle production in the Victorian Mallee. In the first experiment, a daily supplement of Boneflour (13% phosphorus) produced a small, but significant response in the growth of steers grazing good spring feed.

The second experiment, conducted over three years involved two groups of autumn-calving Hereford cows. Management of the two groups was identical, except that one group was provided with a continuous supplement of about l0g of phosphorus per cow per day. Phosphorus supplementation had no significant effect on growth of either the cows or calves, nor on fertility of the cows.

INTRODUCTION

The Mallee is a major cereal-growing area with sheep and beef production being of less importance. On average, the growing season extends from May to October. Over the years there have been many confirmed reports of cattle suffering from phosphorus deficiency (Dodson, 1972; Reed, 1973).

It is known that poor phosphorus nutrition of beef cattle can restrict growth but there is no conclusive evidence that it has any special function in reproduction or lactation (Cohen, 1975). Both experiments reported here aimed to establish whether phosphorus supplementation alone might boost the production of beef cattle grazing under typical Mallee conditions. The work was conducted at the Mallee Research Station at Walpeup.

MATERIALS AND METHODS

Experiment 1

Forty-four yearling steers of various British breeds and their crosses were weighed after a 24 hour fast from feed and water and then allotted to two groups at random. The two groups were grazed on very similar adjacent plots, each of 15ha. The predominant forage species were Jemalong Barrel Medic (*Medicago trunculata*) and wheat regrowth with various volunteer species such as Barley Grass (*Hordeum leporinum*). The experiment was conducted in the spring of 1973 and at no time did feed become limiting.

One group of steers was fed an average daily supplement of 14g of phosphorus as sterilized boneflour. It was fed mixed with a 200g per head per day of whole wheat grain and molasses. The same amount of the wheat and molasses was fed to the control group of steers. The supplements were fed daily for 100 days from mid August to late November.

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The two groups of steers were rotated after 50 days in an attempt to reduce any plot differences. All steers were weighed after a 24 hour fast from feed and water at the end of the 100 day experimental period.

Experiment 2

For the years 1975, 1976 and 1977, two groups each of 25 young Hereford cows were grazed in adjacent paddocks of similar size and feed availability. Each year the cows calved in autumn, were mated to Hereford bulls in winter (for 8 weeks) and the calves were weaned and sold in summer. The initial allocation was such that the two groups were as similar as possible with respect to age, weight and calving-time of the cows.

For the duration of the experiment, one group of cattle received a continuous phosphorus supplement, and the other group was the control. The phosphorus supplement (monosodium phosphate) was dissolved in water to form a concentrated solution which was then automatically dispensed into the water trough. The dispenser was set to maintain a concentration of 263 ppm of phosphorus in the trough, which assuming a daily water consumption of 38 1 per cow would provide a 10g daily supplement of phosphorus for each cow.

The forage grazed by the cattle was typical. of that on Mallee farms. Pasture comprised Barley Grass *(Hordeum leporinum)*, Bromus spp; numerous species of weeds and certain amounts of Lucerne *(Medicago sativa)* and other medics *(Medicago minima, Medicago trunculata* and *Medicago littoralis*). When forage was limited, the cattle were supplemented with hay and/or grain. The cattle grazed cereal stubble during the summer/autumn period each year.

All cows and calves were weighed monthly and birth dates and birth weights of calves were recorded. All feeds were analysed for calcium and phosphorus.

RESULTS

Experiment 1

Both groups of steers had an average fasted weight of 332 kg at the start of the experiment. The liveweight gains for the two groups are shown in Table 1. Liveweight gains for the phosphorus supplemented group were significantly greater than for the control group.

TABLE 1 Liveweight gains for yearling steers grazed on spring forage for 100 days

Treatment	Liveweight gain (kg)	S.E. (Standard Error)
With phosphorus	100	±10
Without phosphorus	88	13
L.S.D. P = 0.01	11	

At the end of the 100 day experimental period all cattle were in prime condition and were sold for slaughter.

Experiment 2

The rainfall in two of the three years of this experiment was below average (1975-375mm; 1976-271mm; 1977-202mm; long-term average 340mm). Consequently, the cattle only grazed green feed for brief periods each year and some hand feeding with hay and wheat was necessary in the winter/spring for 3 months in 1975, 5 months in 1976 and 4 months in 1977.

There were no significant differences between the phosphorus-supplemented and the control cattle in calf birth weights, calf weaning weights, calving percentage or calving interval (Table 2), nor in the monthly weights of the cows and calves at any stage over the 3 years.

TABLE 2 Calf birth weights, weaning weights, calving percentage and calving intervals for 1975-1977

	1975		1976		1977	
		S.E.		S.E.		S.E.
a) Calf birth weights (kg)						
Phosphorus-supplemented	31	±5	31	±5	35	±6
Control	35	5	34	5	35	4
LSD (P = 0.01)	5		5		5	
b) Calf weaning weights (kg)						
Phosphorus-supplemented	173	33	172	22	226	26
Control	189	27	179	37	223	29
LSD (P = 0.01)	31		32		18	
c) Calving percentage						
Phosphorus-supplemented	95		86		92	
Control	85		90		88	
LSD (P = 0.01)	27		29		24	
d) Calving interval						
Phosphorus-supplemented	364	23	353	11	350	8
Control	363	11	353	10	350	10
LSD (P = 0.01)	18		10		7	

Analyses of various feeds available during the experiment are presented in Table 3.

TABLE 3 Calcium, phosphorus and calcium:phosphorus ratios of feeds consumed in Experiment 2

Feed	Calcium %	Phosphorus %	Ca:P ratio
Pasture	0.58	0.21	2:8:1
Stubble	0.23	0.07	3.3:1
Wheat	0.08	0.33	0.24:1
Hay	0.24	0.18	1.3:1
National Research Council, 1970 Standards:			
Cows, 400 kg liveweight	0.26	0.21	1.2:1
500 kg liveweight	0.28	0.23	1.2:1

DISCUSSION

The significant response to phosphorus in the growth of steers in Experiment 1 is consistent with findings of Bisschop (1964) and Van Schalkwyk and Lombard (1969). Bischopp (1964) reported that supplementing with phosphorus all year was no more effective than supplementing only during the period of active, pasture growth.

For the three years of Experiment 2, at no stage was there any response in growth or fertility to phosphorus-supplementation in the breeding herd. In a review, Cohen (1975) concluded that there was no firm evidence that phosphorus alone plays any special role in reproduction or milk production in the beef cow.

In Experiment 2, over the dry, summer/autumn periods when the cattle grazed cereal stubbles (0.07% phosphorus) with no hand-feeding, there was never any indication of a liveweight response to phosphorus. This occurred despite the claim of phosphorus deficiency being a problem in Mallee cattle under dry or drought conditions (Reed, 1973).

The liveweight response to phosphorus in cattle grazing green feed demonstrated in Experiment 1, was not evident in Experiment 2. Below average rainfall during Experiment 2 limited the availability of green feed and also supplementation with wheat grain during the winter/spring periods increased the phosphorus available to all cattle, thus reducing the likelihood of a response to phosphorus.

The general conclusion of Experiment 2 agrees with that of Cohen (1972), that continuous supplementation with phosphorus did not improve the performance of beef cattle in an area where phosphorus deficiency had been reported as a problem.

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