Proc. Aust. Soc. Anim. Prod. (1972) 9: 253

UREA, PHOSPHORUS AND MOLASSES SUPPLEMENTS FOR GRAZING BEEF WEANERS

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Summary

An experiment with grazing weaner cattle was conducted in which supplements of molasses, phosphoric acid and urea were compared with no supplement during wet and dry seasons. No responses to urea supplementation occurred until faecal protein levels fell below 8.0 per cent, when liveweight responses to a molasses-urea supplement occurred, initially with increased rate of gain then reduced 'rate of loss. A molasses supplement increased wet season gains, and a phosphoric acid supplement fed with either molasses or molasses-urea significantly increased dry season weight loss. No significant differences in post-supplementation growth rate were observed between treatment groups, and, at the final weighing, urea-supplemented groups were significantly heavier than those which received no urea.

Final carcase weight and dressing percentage were significantly higher following urea supplementation.

Measurements of faecal output indicated that urea groups consumed more dry matter than non-urea groups, from late autumn onwards.

I. INTRODUCTION

Pasture growth in tropical Australia is markedly seasonal, and following maturity of pasture, digestible protein and phosphorus levels are low (Arndt and Norman 1959). This situation can be complicated further by low phosphorus levels in the available pasture during the growing period, resulting from low soil phosphorus status (Underwood 1966). In general, soils of the Townsville-Bowen region have low phosphate contents (Christian *et al.* 1953).

Winks, Alexander and Lynch (1970) obtained improved liveweight performance in weaners fed a molasses-urea supplement during the dry season. Liveweight responses to phosphorus supplements in steers grazing pastures on phosphorus deficient country have been obtained by Bisschop (1964). However, there is little information on the time of year at which nitrogen and phosphorus supplements should be fed.

In the experiment described in this paper, molasses, urea, and phosphorus were offered as supplements to grazing to beef weaners through wet and dry seasons.

II. MATERIALS AND METHODS

The experiment was carried out at the "Swan's Lagoon" Cattle Research Station, Millaroo, near Townsville. The climate, pastures and soils have been described by Winks, Alexander and Lynch (1970). Levels of available phosphorus in the soil lie in the range 5-15 p.p.m. (Moir 1966; Winks, unpublished).

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The area had been stocked at a rate of 1 weaner/2 ha since August, 1968. Pasture available to the animals during the dry season was measured on September 2 and November 16, 1970. Material from 25 x 0.4 m^2 quadrats, randomly located along the diagonal in each paddock, was cut to ground level, oven-dried and weighed, and treatment mean yields calculated.

The cattle used in the study were Brahman-Shorthorn crossbred steers, approximately 50 per cent Brahman blood, aged nine to fifteen months. They were allocated to ten groups of 16 by stratified randomization on the basis of liveweight. The groups were randomly assigned to the following treatments so that there were two replications of each treatment:

Treatment	Supplement
I	Nil
II	Molasses
III	Molasses plus phosphorus
IV	Molasses plus urea
V	Molasses plus phosphorus plus urea

Molasses was fed at a level of 0.23 kg/head/day, the phosphorus supplement at 5 g phosphorus/head/day and urea at 56 g/head/day through roller-lick feeders (Mutch 1966). The source of phosphorus was commercial black phosphoric acid (63 per cent H_3PO_4). An attempt was made to maintain these levels of intake by twice weekly adjustment of the amount of water added to the mixture.

On July 22, 1970, a random selection of 5 animals/replication, based on initial liveweight, was made from the control group. The corresponding animals from the initial allocation were selected on the other treatments. These animals continued on the treatments while the remaining animals were removed to allow a draft of weaners to be introduced for a dry season supplementation study. Stocking rate was unchanged.

Supplementation commenced on January 6, 1970 and continued until October 16, 1970. During the supplementation period and the post-supplementation period until May 13, 197 1, unfasted liveweights were recorded at four-weekly intervals using a standardized procedure of mustering and weighing. Initial and final liveweights were the mean of weighings on three consecutive days.

Faecal nitrogen and phosphorus levels were determined on a four-weekly basis on bulked faecal samples from the control group (Moir 1960).

On six occasions during the supplementation period, the mean 24 h faecal output of the first replicate of each treatment group was determined by the method of Winks, Alexander and Lynch (1970).

Data from the 10 animals per treatment which remained on the trial throughout were statistically analysed, as well as those for 32 animals per treatment from January 5 to June 9, 1970. Analyses quoted in this paper relate to the 32 animals for the period January 5 to June 9, 1970 and for 10 animals from June 9, 1970 to May 13, 197 1. An analysis of variance of a balanced factorial design was used.

III. RESULTS

Yields of available pasture determined on September 2 were comparable for all groups ranging from 818-947 kg/ha. By November, these yields had declined to a level of 553-763 kg/ha, but no relationship existed between decline in yield and supplementation treatment.

Consumption of supplements was below the desired level, being 0.21 kg/head/day molasses, 4 g/head/day phosphorus and 51 g/head/day urea.

The protein level of the faeces from the control group declined progressively from 11 .0 per cent in January to 8.0 per cent in May with the lowest level of 5.7 per cent protein occurring in October.-Faecal phosphorus level declined from 0.35 per cent to 0.19 per cent phosphorus during the supplementation period.

The changes in liveweight (Table 1) show a period of gain from January-June, followed by weight losses from June-October. From January-May, rate of gain on Treatment II (molasses group) and Treatment III (molasses-phosphorus group) was significantly greater than on Treatment I (control group) and Treatment IV (molasses-urea group) ($P < 0.05$). From May-June, the rate of gain on Treatment IV was significantly greater than on all other treatments ($P < 0.01$) .

TABLE 1

Weight changes of cattle during the supplementation and post-supplementation period and carcase data

Supplementation treatments	Mean weight changes during supplementation period (kg/day)			Mean live-weight (kg) 16 x.70	Mean live-weight (kg) 13.v.71	Mean dressing percentage (hot weight basis)
	5.i.70-1.v.70	1.v.70-9.vi.70	9.vi.70-16.x.70			
Nil	0.65	0.13	—0.23	230.9	365.4	50.62
Molasses	0.70	0.17	—0.25	238.1	366.8	50.59
Molasses plus phosphorus	0.70	0.13	—0.33	228.0	353.6	50.03
Molasses plus urea	0.64	0.35	—0.01	274.3	391.5	52.05
Molasses plus phosphorus plus urea	0.68	0.18	—0.08	258.8	383.8	50.73
STANDARD ERROR OF MEAN	0.02	0.03	0.02	4.8	8.4	0.40

During the June-October period, weight loses on Treatments IV and V (molasses-phosphorus-urea group) were significantly lower than on the remaining three treatments ($P < 0.01$) , and Treatment IV lost less weight than Treatment V ($P < 0.05$). Weight losses on Treatment III were greater than on Treatment I ($P < 0.01$) and Treatment II ($P < 0.05$). Liveweights at the end of the supplementation period were higher on Treatments IV and V than on the remaining three treatments ($P < 0.01$) , and animals on Treatment IV were heavier than on Treatment V ($P < 0.05$).

Gains during the 7 months after supplementation ceased were not significantly affected by treatment. Final liveweights in May 197 1, and hot dressed carcase weights (Table 1) were significantly greater on Treatment IV than on Treatments

I and II ($P < 0.05$) and Treatment III ($P < 0.01$) . Corresponding weights from Treatment V were higher than from Treatment III ($P < 0.05$). Dressing percentage of animals on Treatment IV was higher than on Treatments I, II and V ($P < 0.05$) and Treatment III ($P < 0.01$).

Initially, mean daily faecal output of all groups was similar at approximately 1700 g, increasing to 1900 g in April. Output continued at this level on Treatments I, II and III for the remainder of the supplementation period, but increased progressively to 2400 g on Treatment IV, with Treatment V intermediate at 2200 g.

IV. DISCUSSION

The failure of a molasses-urea supplement to produce a liveweight response until faecal protein levels decreased below 8.0 per cent is in agreement with the results of Kreft (1963), where responses to urea feeding failed to occur until autumn. At this stage, control animals were making gains of 0.15 kg/day, which supports the suggestion of Alexander, Sullivan and Stokoe (1970) that liveweight responses to supplementation cannot be expected in cattle grazing native pasture if gains exceed a certain level, postulated as between 0.15 and 0.50 kg/day. Increased gains from May to June are similar to those reported by Winks, Alexander and Lynch (1970), but the failure to produce weight gains during the final 4 months of the supplementation period is in-contrast to the findings of those authors. It is possible that limitation in the availability of dry matter was the factor which prevented positive gains in the urea group at this stage.

Faecal output data suggest that the feeding of a molasses-urea supplement caused an increase in intake of roughage in this group relative to the other treatment groups at about the same time that liveweight responses occurred. Increases are of the order of those recorded bv Winks, Alexander and Lynch (1970).

The failure of a molasses-phosphoric acid supplement to produce a liveweight response during the productive period suggests that animals were obtaining sufficient phosphorus from the pasture. Serum inorganic phosphorus levels in the control group (Winks, unpublished) were of the order of those regarded as adequate by Bisschop (1964) in this class of cattle. However, the lack of a wet season response and the depressions in liveweight performance during the dry season are possibly due to an upset in rumen acid-base balance (Theiler, Green, and Du Toit 1924), although phosphoric acid has been shown to be an acceptable source of supplemental phosphorus (Menzies ***et al.*** 1955).

The liveweight advantage of the urea groups at the end of the study was reflected in increased carcase weight, indicating that it is possible to capitalize on the weight advantage from supplementary feeding.

V. ACKNOWLEDGMENTS

The assistance of colleagues in the conduct of the experiment, and for constructive comment is acknowledged. The work was supported by the Australian Meat Research Committee.

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