

SUPPLEMENTATION OF GRAZING STEERS WITH COPRA MEAL

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SUMMARY

Pelleted copra meal was compared with cottonseed meal as a supplement for weaner steers grazing mature speargrass pastures. Steers fed either supplement at 0.5 kg/hd/d gained approximately 0.16 kg/d fasted live weight, compared with a loss of 0.02 kg/d for unsupplemented steers ( $P < 0.01$ ). Copra meal given at 1.0 kg/hd/d increased the gain a further 0.14 kg/d ( $P < 0.01$ ).

Pelleted copra meal was very palatable and convenient to use. Although copra meal contains only approximately half as much protein as cottonseed meal, it promoted similar improvements in liveweight gain. Copra meal appears to have a useful role in the cattle industry, provided it can be made available at a cost comparable to that for cottonseed meal.

INTRODUCTION

Cattle grazing native pastures in much of northern Australia normally lose live weight (LW) or make very slow LW gains (LWG) during the dry season. Where there is an adequate supply of poor-quality forage, the major nutritional deficiency is usually protein, and supplementary nitrogen/sulphur can be used to promote animal growth (Winks 1984). When feed quality is poor cottonseed meal (CSM) consistently increases the LWG of cattle (Lindsay *et al.* 1982).

CSM contains 35-44% crude protein and is a readily obtainable, effective source of supplementary protein (Hennessy *et al.* 1981; Lindsay *et al.* 1982; Hennessy and Williamson 1988). CSM supplies undegraded proteins for digestion in the intestines, as well as degradable proteins which produce ammonia to stimulate the synthesis of microbial protein in the rumen. Pelleted copra meal has recently become available from Papua New Guinea. Although copra meal contains only 21% crude protein, it may be a useful alternative protein supplement (Hennessy *et al.* 1989). Both copra meal and CSM (expeller extracted) contain approximately 11 MJ of metabolizable energy per kilogram of dry matter. Copra meal currently costs about \$360-400/tonne, and is in large, easily-handled pellets.

This experiment compared feeding isoenergetic and isonitrogenous supplements of CSM and pelleted copra meal to weaner steers grazing speargrass pastures in the dry season at Brian Pastures Research Station, in sub-coastal south-east Queensland.

MATERIALS AND METHODS

Seventy-two weaner steers were randomly allocated to four groups of 18 steers (mean LW  $180 \pm$  SD 12.6 kg) after stratification on the basis of fasted LW (24 h without feed, 12 h without water). The four groups then grazed abundant, mature speargrass pastures for 92 days from July to October, at a stocking rate of 1 hd/1.5 ha, and were given the following supplements:

- (i) Nil
- (ii) 0.5 kg/hd/d CSM
- (iii) 0.5 kg/hd/d copra meal pellets
- (iv) 1.0 kg/hd/d copra meal pellets

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The supplements were given twice weekly in open troughs, The steers were mustered fortnightly, except for the final interval of 8 days, and were weighed immediately. Treatment groups were rotated amongst paddocks each weigh-day.

LWG's and fasted LWG's were measured from the differences between final and initial full LW's and final and initial fasted LW's respectively. Growth rates were calculated from the linear regression of LW's against time for the experimental period. Results were compared by analysis of variance.

#### RESULTS

The steers accepted the supplements readily and ate their rations within half an hour of receiving them.

The three measures of LW change showed similar responses to the supplements although actual fasted LWGs were considerably less than the LWGs and growth rates (Table 1). However, the mean initial fasting loss of LW was 6.2 kg, and the mean final fasting loss was 15.1 kg.

Unsupplemented steers grazing speargrass pastures made only small gains in LW during the experimental period of 92 days, and all supplements significantly increased the performance of the steers. When given at 0.5 kg/hd/d, CSM and copra meal were converted to extra LWG with efficiencies of at least 0.34 kg LWG/kg supplement. When fed at 1.0 kg/hd/d the copra meal increased LWG further ( $P < 0.01$ ), and the overall conversion efficiency was 0.32 kg LWG/kg copra meal, indicating a slightly lower marginal response.

Table 1 Liveweight changes of grazing steers fed supplements of cottonseed meal (CSM) and pelleted copra meal

Supplement	LWG (kg/d)	Fasted LWG (kg/d)	Growth rate (kg/d)
Nil	0.04 <sup>a</sup>	-0.02 <sup>a</sup>	0.11 <sup>a</sup>
0.5 kg/d CSM	0.28 <sup>b</sup>	0.17 <sup>b</sup>	0.30 <sup>b</sup>
0.5 kg/d copra	0.26 <sup>b</sup>	0.15 <sup>b</sup>	0.31 <sup>b</sup>
1.0 kg/d copra	0.40 <sup>c</sup>	0.30 <sup>c</sup>	0.41 <sup>c</sup>
s.e. (mean)	0.015	0.015	0.017

Within columns, means with different superscripts are significantly different ( $P < 0.01$ ).

#### DISCUSSION

Supplements of CSM and copra meal both produced the same large improvements in the performance of weaner steers grazing mature speargrass pasture.

Unsupplemented steers barely maintained LW during the experimental period. Maintenance or loss of LW is common on native pastures during autumn and winter in northern Australia (Winks 1984). Crude protein levels in native pastures are normally very low during this period.

It is well known that undegraded dietary proteins, ruminally degraded proteins and non-protein nitrogen increase the intake of forages with a protein content less than 4% (Leng et al. 1977). The increase in feed eaten generally results in an increase in animal performance. The pastures on which our steers grazed have no known mineral deficiencies. It is likely that the unsupplemented steers suffered a severe protein deficiency but there was never any shortage of dry matter. Therefore, it is probable that much of the response achieved from

both the copra meal and CSM supplements was to the protein contained in the supplements. However, other factors must also have been important.

In this study, approximately isoenergetic supplements of 0.5 kg/hd/d of CSM and copra meal supported similar increases in LW change of the grazing steers, even though copra meal contains only half the protein content of the CSM. When compared at levels which are approximately isonitrogenous, copra meal was superior to CSM (fasted LWG 0.30 v 0.17 kg/d). Therefore, the responses cannot have been solely due to the quantity of supplementary protein supplied, but must have been related to the overall balance of available nutrients.

Most early studies with supplementary CSM have attributed the growth responses largely to the by-pass protein content of the supplement (Winks 1984), but the role of degradable protein is also clearly important (Hennessy et al. 1989). Our results suggest that the total protein content in the supplementary CSM may have been excessive, and that additional amino acids could have been metabolised as energy substrates. It is also possible that the extra response at the higher level of feeding with copra meal was due to the additional energy it supplied.

Hennessy et al. (1989) have shown that copra meal is more highly protected than CSM against degradation in the rumen. They suggest several possible reasons for this, including the relatively high oil content of copra meal compared with CSM (6% v 1.2%). It is also likely that the pelleting process has reduced the degradability of proteins in copra meal. Because of the relatively low rumen ammonia levels they measured, Hennessy et al. (1989) suggest that, at moderate feeding levels, urea should be included with copra meal supplements to ensure that the intake of forage remains high.

Despite the lower degradability of the proteins in copra meal, the data of Hennessy et al. (1989) show that, when fed at the same level, CSM still supplies a larger quantity of by-pass protein for digestion in the small intestine. However, it is possible that the by-pass protein supplied by the copra meal has a higher biological value than the by-pass protein from CSM.

The efficiencies of conversion of protein meal to extra LWG measured in this experiment are similar to those commonly reported in northern Australia for weaner cattle on very low quality roughage diets (Leng et al. 1977 ; Gulbransen and Standfast 1988). Responses such as these appear highly profitable, but compensatory gains in LW later in the animal's life often erode the advantage (Winks 1984).

The copra meal pellets were very palatable, and were readily accepted by the cattle. Their pelleted form made them convenient to handle and feed out, widening their potential role in supplementary feeding. Pelleted copra meal also proved to be a very effective supplement, being comparable with CSM on a weight for weight basis. It should be a useful addition to the list of supplements available for the cattle industry, subject only to cost and availability. The fact that copra meal gave similar responses to CSM, despite widely disparate protein levels, is particularly interesting and warrants further investigation.

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