WEIGHT GAIN OF WEANED HEREFORD STEERS IN THE SUBTROPICS DURING WINTER: THE EFFECT OF PROTEIN MEAL SUPPLEMENTS

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SUMMARY

Three groups of Hereford weaners (mean live weight ± s.e.m. 159±4 kg) were purchased in April, shortly after weaning, to study the effect of supplementation with protein meals in post-weaning growth. The weaners (7 per group) were rotated among 5 paddocks each 21 days from mid-May to November (174 days) and were supplemented with any of a mineral block, 1.75 kg cottonseed meal/steer or 2.63 kg cottonseed meal/steer twice weekly. Cottonseed meal significantly (P<0.01) increased liveweight change in those steers supplemented, compared with those offered a mineral lick with an apparent efficiency use of 2.3 g supplement/g liveweight change. Those steers offered a mineral lick lost 10 g/day of live weight, compared with gains in steers given the meal.

INTRODUCTION

Calving of cows in the subtropical north-east of New South Wales is, in general, between June and December from matings commencing in September of the previous year. This time has been chosen more for the convenience of marketing calves than appropriateness of season for conception, calving and lactation. Indeed, the digestibility of *pastures,* and the nitrogen (N) content of grasses, are lowest between May and October, being *ca* 50% and 8 g N/kg DM respectively. Cottonseed meal supplementation has been an important husbandry practice for improving production in steers (Hennessy et *al.* 1981) and fertility and calving rates in cows (Hennessy and Williamson 1988a).

The period between May and October is critical for growth and survival of calves weaned in March and April but there are no production data on their response to cottonseed meal supplementation. Plunkett and Ternouth (1988) demonstrated that by-pass protein (i.e. formaldehyde-treated casein) resulted in higher weight gains in early-weaned calves fed lucerne and sorghum grain. Therefore, in the experiment reported here supplementation with cottonseed meal was compared to a mineral lick for weaned Hereford steers to determine whether liveweight gains could be promoted in steers post-weaning and what implications this might have for weaner heifers selected for inclusion in the breeding herd.

MATERIALS AND METHODS

Weaner Hereford steers, approximately 6-months old in April and weighing (mean ± s.e.m) 159 ± 4 kg were stratified into three groups, according to live weight and allocated from these strata to three groups called 0, 1.75 and 2.63, These steers were placed into separate paddocks in mid-May after obtaining an initial liveweight, and shifted among a group of 5 paddocks every 21 days. The pastures consisted of Bahia grass (*Paspalum notatum), *carpet grass *(Axonopus affinus),* native grasses (e.g. *Eragrostis, Bothrichloa, Cymbopogon, Cappilipedium*), blady grass *(Imperata cylindica)* and the legumes, Bargoo jointvetch (*Aeschynomene falcata)* and Kenya clover (*Trifolium semipilosum).* Steers in each group were offered a mineral supplement, in a block, with the blocks replaced when necessary to ensure continual access of steers to minerals. Supplementary cottonseed meal was given twice-a-week to steers in meals of 1.75 or 2.63 kg/steer (equivalent to 500 and 750 g/day, respectively)

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over 25 weeks from May to November. Samples of pasture were taken in May, July and October for estimation of digestibility and N content. Samples were taken by plucking leaves from patches in the pasture where the steers had been observed grazing. Cattle were weighed each 21 days directly off pasture at 0730 h but the initial and final live weights of the study were made on cattle removed from feed and water for 15 hours.

Statistical analysis

Live weight and liveweight changes over 174 days were analysed by least square analysis in the programme GENSTAT (Alvey et *al.* 1980), with initial live weight included as a covariate. Both linear and quadratic contrasts were included as a function of level of supplementation in the analysis.

RESULTS

Digestibility (estimated from an *in vitro;* Alexander and McGowan 1961) changed from 62, 49, 55% and N content from 19, 8, 10 g/kg DM which reflected the change from late summer through winter to a poor spring, following heavy frosts in late-June (min. temp. $-4^{o}C$ at the site, and which is a typical seasonal pattern for this subtropical environment. Cottonseed meal significantly (P<0.01) increased liveweight change and the live weight of Hereford weaners over 174 days at grazing (Table 1).

Table 1 Live weight, liveweight change and efficiency of supplement use of weaner steers supplemented with two rates of cottonseed meal

Group	Final live weight (kg)	Liveweight change (g/day)	Efficiency of supplement (g CSM/g gain)
0	166	-10	-
1.75	203	203	2.24
2.63	223	316	2.30
s.e.m.	± 5**	±29**	-

**P<0.01

There was no significant effect of supplementation on weaner live weight during the first 30 days when pasture quality remained high, suggesting that some substitution effect on pasture intake may have occurred or alternatively, body composition changes were occurring which *were* not detected by weighing. However, following heavy frosting in late June, supplements reduced the rate of loss during July and significantly (P<0.01) improved gain during August through to October (Fig. 1) suggesting that the meal enhanced, rather than reduced pasture intake.

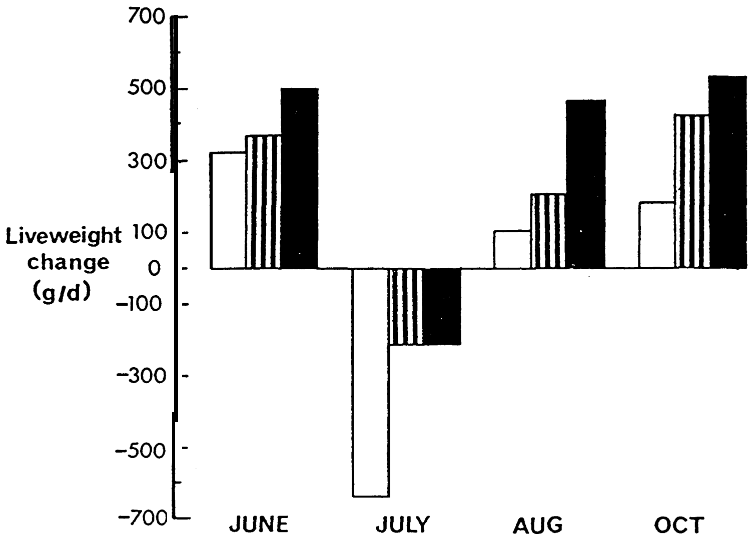

Fig. 1. Liveweight change of three groups of steers given no cottonseed meal or meal at 1.75 [vertical stripes] or 2.63 [solid] kg/steer/meal during monthly periods when grazing

The large weight losses which occurred in non protein-supplemented steers during July, reflects, primarily, the rapid drop in pasture *N* content from 19 to 8 g N/kg DM which is a feature of areas of the subtropics subjected to frosting. During August and September, rising soil temperatures presumably initiate pasture growth in the C4-grass species with a higher digestibility and N content than during frost periods. All steers were observed eating the cottonseed meal although amounts consumed varied between *steers* within a group. After three weeks, the consumption pattern remained constant between feeding times with the meal consumed within 30 min of offering.

DISCUSSION

Cottonseed meal was used, apparently, with a high level of efficiency for liveweight gain over the 174 days of the study. Assuming pasture intake was not increased, and by attributing the difference between the loss in unsupplemented steers and the gain in supplemented steers all to cottonseed meal, then the efficiency of use was 2.3 g/g gain. At the current price of cottonseed meal ($300/tonne) and liveweight prices of $130/kg live weight, the net benefit of 1 kg of cottonseed meal in this study was $0.58. However, cottonseed meal invariably increases the intake of low N tropical forages (Hennessy and Williamson 1988b) which would reduce the efficiency of the supplements use. However, subtropical pastures are used, in general, for extensive grazing by cattle and as such are low-quality feeds with low inputs of fertilisers maintaining only low stocking rates (1 cow/3 ha). Hence, a 10% increase in forage intake due to supplementation would not perceptibly reduce stocking rates nor reduce the net economic benefits below those suggested.

A second goal of the study was to use the response of the young weaner steers as a model for heifers selected for the breeding herd. Assuming heifers would respond similarly to steers then 50% should be showing oestrus activity when at a mean live weight of 223 kg (Cohen *et al.* 1980) if mating was delayed to early November. Oestrus activity may even be higher in supplemented cattle than in those described by Cohen *et al.* (1980) because of the supply of branched-chain amino acids from non-rumen-degradable cottonseed meal. Waghorn (1986) reported an association ($r = 0.45$) between ovulation rate and plasma concentrations of these acids in ewes supplemented with maize gluten. Nottle et *al.* (1987) suggested that the control of ovulation rate in ewes was sensitive to amino acid supply when he found higher rates in ewes supplemented with protected casein (high in essential amino acids) than in ewes supplemented with protected gelatine (low in essential acids), Higher calving rates occurred in heifers supplemented with cottonseed meal and early-mated (at 15 mo) compared with non-supplemented heifers (27 mo) in an earlier study nearby (Hennessy and Williamson 1988a) indicating the potential of protein meal supplementation to enhance growth of young stock and their fertility during winter and the ensuing dry early-summer in the subtropics.

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