PROTEIN SUPPLEMENTATION AND GROWTH ENHANCER STRATEGIES IN SUCCESSIVE YEARS TO MAXIMISE GROWTH OF BRAHMAN CROSS STEERS GRAZING SOWN GRASS PASTURES ON BRIGALOW LANDS

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SUMMARY

A strategy comprising a winter/spring protein supplement, rumen modifier and hormonal growth promotant (Compudose 400) was used in either the first year (T1), second year (T2), or in both years (T1+2) following weaning in Brahman cross steers as a means of increasing liveweight gain up to 2.5 years of age. T2 produced the heaviest final liveweight (544.7 kg) and highest overall liveweight gain (366.7 kg), but these were not significantly different from T1 (538.6 kg; 360.9 kg), or T1+2 (528.7 kg; 349.3 kg). However, final liveweight and overall liveweight gains of T1 and T2 but not T1+2 were significantly greater than for untreated (C) steers (504.9 kg; 325.2 kg, both $P < 0.05$). Regardless of the strategy imposed, liveweight and liveweight gain were enhanced, however final liveweights in each treatment were below the preferred minimum target liveweight (570–580 kg) for premium export markets. Treatment in both years gave no benefit over treatment in 1 year only.

Keywords: supplements, growth enhancers, Brahman cross.

INTRODUCTION

In northern Australia there is a trend towards the production of export beef from younger animals, with a proposed optimum turnoff age of 2.5 years. The minimum hot standard carcass weight proposed for premium markets at this turnoff age is 300 kg (570–580 kg liveweight). Annual liveweight gains of 190 kg (0.52 kg/head.day) or more between weaning and turnoff are required to meet these market specifications. The Brigalow region of central and southern Queensland produces approximately 43% of Queensland's beef (J. Clewett pers. comm.). Mean annual liveweight gains of steers grazing sown grass pastures in this region range from 160–180 kg (Walker *et al.* 1987; Loxton et al. 1991).

The winter–spring is usually a period of poor animal liveweight gain in the Brigalow region relative to the summer period because of frost and dry weather. Liveweight gains over winter–spring fall in the range of 35 to 100 kg depending on the season, approximately 46–65% of summer gains (Loxton *et al.* 1991; Mayer *et al.* 1972). In an average season this converts to around 65 kg, which is lower than the 75 kg winter–spring target gain considered necessary to achieve at least 190 kg liveweight gain annually.

Loxton *et al.* (1991) have shown that a strategy comprising protein supplements, rumen modifier and a long term hormonal growth promotant (HGP), or a HGP alone imposed during the winter–spring following weaning, will boost postweaning growth and produce mean annual liveweight gains of 190–200 kg in steers grazing sown grass pastures. The initial studies by Loxton et al. (1991) looked only at responses to treatment in the first year postweaning. The experiment in this paper investigated the effect of the supplementation and HGP strategy in either the first or second or both years post weaning in an effort to reduce turnoff age of Brahman cross steers (50–75% Brahman).

MATERIALS AND METHODS

In August 1989 at Brigalow Research Station, Theodore, Queensland, 120 Brahman crossbred weaners (approximate age 8 months) weighing 179.1 ± 4.4 kg (± s.d.) were randomly allocated by stratified randomisation, based on their fasted liveweight to 4 treatments: C, control — pasture only; T1, pasture + Compudose 400 (Elanco Products Australia) in August 1989 and a supplement of 500 g/head.day cottonseed meal and 2 g/head.day Avotan (Cyanamid, Australia) fed for 94 days from August to November 1989; T2, pasture + Compudose 400 in July 1990 and a supplement of 1 kg/head.day cottonseed meal and 2 g/head.day Avotan fed for 135 days from July to November 1990; T1+2, combination of T1 and T2.

The 4 treatments were replicated in 3 blocks in a randomised block layout of 12 paddocks. In year 1

Table 1. Mean liveweights (LW) and liveweight changes (kg) in year 2 of steers untreated (control) or treated with protein supplement, rumen modifier and hormonal growth promotant in the first year (T1), second year (T2) or both years (T1+2) of the experiment

Within each column, means followed by a different letter are significantly different (P = 0.05)

Treatment	Liveweight (July 1990)	Supple-mentation period (July–Nov 1990)	LW change post supple-mentation (Nov 1990–June 1991)	LW change in Year 2 (July 1990–June 1991)	Overall LW change (Aug 1989–June 1991)	Final LW (June 1991)
Control	380.2b	64.6b	57.6b	123.0b	325.2b	504.9b
T1	401.3a	47.3c	89.9a	137.2b	360.9a	538.6a
T2	374.5b	83.2a	87.0a	170.2a	366.7a	544.7a
T1+2	398.2a	71.1ab	59.3b	130.5b	349.3ab	528.7ab
l.s.d. (P = 0.05)	15.0	14.5	23.6	23.3	26.2	26.2

(August 1989 to July 1990) there were 10 animals per paddock. At allocation, 3 animals per paddock were assigned to be removed at the end of year 1, allowing a reduction in the stocking pressure as animal liveweight increased. This left 7 animals per paddock in year 2 (July 1990 to June 1991).

The pastures grazed were predominantly buffel (*Cenchrus ciliaris*) and Rhodes (*Chloris gayana*) grasses, with some green panic (*Panicum maximum* var. *trichloglume*) grass. Supplements were presented as a dry mix 2 or 3 times a week. From August 1989 to July 1990, the stocking rate was 1 weaner/2 ha. In July 1990 this was reduced to 1 steer/2.9 ha. Following cessation of supplementation in November 1990, all steers were run together (1 steer/2.5–3 ha) until June 1991. Rainfall over the year 1 (1989) supplementation period above was average (263.8 mm), but below average (66.8 mm) over the year 2 (July 1990 to June 1991) supplementation period.

Analysis of variance (ANOVA) was used to test treatment effects in each year. In year 1, there were only 2 distinct treatments, C and T1, as the C and T2 groups were the experimental controls and the T1 and T1+2 groups received the supplement plus HGP treatment; so the ANOVA model was for a randomised block design, with 2 treatments in 3 blocks with 2 duplicates per block. The year 2 ANOVA model was for a randomised block with 4 treatments replicated in 3 blocks. The paddock was the experimental unit in these ANOVA models.

RESULTS

In year 1, treated groups gained significantly ($P < 0.05$) more liveweight over the supplementation period than untreated groups (70.8 *v*. 46.9 kg, l.s.d. ($P = 0.05$) = 5.3) but not in the post supplementation period (149.3 *v*. 149.8 kg, l.s.d. (P = 0.05) = 5.3). This effect was reflected in significantly higher ($P < 0.05$) annual liveweight gains (220.1 *v*. 196.8 kg, l.s.d. (P = 0.05) = 12.0) and liveweight in July 1990 (399.1 *v*. 375.9 kg, l.s.d. (P = 0.05) = 11.5) compared with C. In year 2, treatments T2 and T1+2 gained more weight than C during the supplementation period (Table 1), these differences being significant only for T2 ($P < 0.05$). In the same period, C gained significantly more weight than T1 ($P < 0.05$). In the post supplementation period, T1 and T2 had significantly higher gains than C or T1+2 (both $P < 0.05$).

The total gain in year 2 was significantly higher in T2 than in any other treatment ($P < 0.05$), with the gains in remaining treatments being similar (Table 1). Final liveweight and overall (over 2 years) liveweight gain for T1 and T2 were significantly greater (both $P < 0.05$) than for C with T1+2 intermediate.

DISCUSSION

Regardless of the strategy, whether in the first or second or both years postweaning, liveweight and liveweight gain were enhanced by the provision of protein supplements and growth enhancers. While all treatments improved liveweight at 2.5 years of age, animals were still below the target liveweight of 570–580 kg needed for the current chilled beef 'fullset' product required for the Japanese grassfed market. However more steers were suitable from treatments T1 and T2 for another Japanese grassfed market, the chilled beef '3 cut' product. This also attracts a premium price over the manufacturing market, albeit at a lower premium than the chilled beef 'fullset' product. The actual proportions of steers from each treatment that would have been suitable for the '3 cut' product, which has a minimum carcass weight of 270 kg (about 520 kg liveweight), were 29% for C, 67% for T1, 76% for T2 and 52% for T1 + 2.

The liveweight change advantage to treatment at completion of the year 1 supplementation period (24 kg) was less than previously recorded by Loxton *et al.* (1991) in steers (32 to 42 kg). This difference is most probably due to seasonal effects.

The C group performed similarly to the T1 group in the year 1 post supplementation period suggesting the HGP negates the compensatory gain normally experienced after supplementation (Winks 1984). However, treating with a HGP in both years gave no benefit over treating in 1 year only. This poor performance of the sequentially treated T1+2 treatment particularly in the year 2 post supplementation period supports the results of Knights and Venamore (1985) who found that a diminished response in liveweight gain of steers occurred with sequential implantation of HGP. Sawyer and Barker's (1988) review of HGP use in Australia indicated an animal's capacity to respond is limited and when this capacity is reached a diminishing response occurs.

Our observations in this experiment show *Bos indicus* cross steers grazing sown grass pastures on Brigalow lands in Central Queensland cannot achieve the same level of growth in their second year following weaning, as they can in their first year when given similar treatment. Even in untreated animals, growth is greater in the first year postweaning (Loxton *et al.* 1991). Therefore, for the second year, alternative management strategies to improve the growth of heavier steers are required.

The inability of steers in this experiment to reach the target weight for premium markets may be due to a low commencement liveweight, or that nutritional treatments were not robust enough to improve growth markedly in this environment. At commencement, the weaners were considered to be of an industry average liveweight. Often, heavier weaners have a greater potential to meet target liveweights before much lighter weaners.

For growing steers in an export-oriented system, combinations of protein supplements, rumen modifiers and HGP may not be economically viable. A single long term HGP administered at weaning has been shown (Loxton *et al.* 1991) to be the most economically viable option for producing younger cattle at turnoff for premium export markets (benefit:cost of 6.44:1). However, the combination of supplements, rumen modifier and HGP improves growth, this introduces greater flexibility into the marketing strategies of producers targeting store steer or Australian domestic markets.

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