THE EFFECT OF AGE ON STEER LIVEWEIGHT GAIN ON CONTINUOUSLY STOCKED TROPICAL PASTURES

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SUMMARY

The annual liveweight gain of steers of different ages (grazing together the same paddocks), was compared in 3 grazing experiments at the CSIRO Lansdown Research Station, near Townsville. With both native pasture and legume-based sown pastures, the consistent ranking in liveweight gain was: weaners > yearlings > 2-year-old steers ($P < 0.001$). In 2 stocking rate experiments, the difference in liveweight gain of steers of different ages was maintained at all stocking rates with no significant age x stocking rate interaction. The magnitude of the effect of age was generally large, with differences between weaners and 2-year-olds up to 86 kg/year and between weaners and yearlings of up to 55 kg/year. Possible reasons for these large differences are considered, but no fully adequate explanation can be given.

Keywords: steers, liveweight gain, age, tropical pasture.

INTRODUCTION

The implications of any marked differences in the liveweight gain (LWG) of grazing steers due to their initial weight or age are of obvious importance in relation to the assessment of pastures for beef production in grazing experiments, to modelling annual production from grazed pastures, and to commercial decisions regarding the optimum age or weight of turnoff. Most published reports indicate that even large variations in the initial weight or age of growing cattle have little effect on the annual LWG made on experimental pastures (Matches 1970; 't Mannetje *et al.* 1976; Winter 1988), but this view is not universally accepted (Rickert *et al.* 1988). On tropical pastures in the high rainfall zone of North Queensland, Wilson and O'Rourke (1990) showed that average daily liveweight gains of steers between introduction and turn-off increased with initial liveweight. However, the same authors reported a decrease in LWG/day as steers fattened. These apparently conflicting results may well be associated with seasonal factors prior to date of entry of steers to the fattening pastures and during the variable fattening period.

In a grazing experiment where paddocks were stocked with steers of different ages, it was observed that the weight gain of weaner steers was much higher than that of older steers. The opportunity was therefore taken to examine more closely the effect of steer age on seasonal and annual LWG on this experiment as well as 2 other grazing trials stocked with steers of different ages.

MATERIALS AND METHODS

This paper examines data from 3 grazing experiments that were established for other purposes. All were located at the CSIRO Pasture Research Station at Lansdown, 50 km south of Townsville, Queensland, and all were continuously stocked with Droughtmaster steers bred on the research station. Steers were weighed every 4 weeks.

Experiment 1

The area was a woodland with a mixed native grass understory consisting of *Bothriochloa decipiens, Heteropogon contortus, Themeda triandra, Chrysopogon fallax, Sorghum nitidum* and *Eulalia fulva* as the main species. The soil type was a solodic-solodized-solonetz (Typic Natrustalf) with an available soil P concentration of 7.5 mg/L. In 1988, half of the area was oversown with *Bothriochloa pertusa* (Indian couch). The aim of the experiment was to compare animal production on native grasses with that on Indian couch at 3 stocking rates (SR) of 0.3, 0.6 and 0.9 steers/ha with 2 replicates. From July 1989 to June 1990, each paddock was stocked with steers of 2 ages, 1 weaner (starting age about 8 months) and 2 yearlings (starting age about 20 months). In July 1990, an older steer was replaced with a new weaner so that steers of 3 ages (weaner, yearling and 2-year-old) were present throughout 1990-91. In March 1990, 1 yearling was temporarily removed from each paddock due to drought. Therefore, in 1989-90 the effect of age x SR was studied for the period July-March. In 1990–91 the age x SR effect was studied for the whole year.

Experiment 2

This was established in 1977 on a yellow earth-yellow podsolic intergrade soil (Haplustalf) with an initial available soil P concentration of about 4 mg/L. Treatments were: 3 grasses x 3 SR (0.65, 0.95 and 1.25 steer/ha) factorially combined in a fully randomised design with 2 replicates. A common legume mixture of *Macroptilium atropurpureum* cv. Siratro, *Stylosanthes hamata cv.* Verano (Verano) and *S. viscosa* CPI 34904 was sown, but most of the legume present in the period 1990-91 was Verano. Originally the grasses compared were *Urochloa mosambicensis cv.* Nixon, *Chloris gayana* cv. Callide and native pasture *(Heteropogon contortus* dominant). By 1989, most paddocks, except for those sown to *Urochloa*, were dominated by the invading Bowen strain of Indian couch. Single super-phosphate at 100 kg/ha was applied every second year from 1977. By 1989 the soil had an available soil P concentration of 7 mg/L. Before July 1990, paddocks were stocked with steers of the same age. Data for the July 1990–June 1991 period were analysed when paddocks were stocked with 2 yearlings and 1 weaner.

Experiment 3

This experiment was immediately adjacent to experiment 2. It was sown to stylo based pasture in December 1986 and comprised twenty 4 ha paddocks which were stocked with 3 steers per paddock from August 1989. Phosphorus supplement was fed to steers in half the paddocks at 5-7 g P/head.day. A comparison of age of steer was made in the period 1 August 1990 to 3 1 July 1991 when there was 1 weaner, 1 yearling and one 2-year-old steer in each paddock.

In all experiments the different age groups were analysed as a subplot treatment of a split-plot factorial design to assess statistical effects of age on the measured LWG.

RESULTS

Experiment 1

Significant differences in LWG occurred between steers of different ages *($P < 0.001$)* for both years. In year 1, weaners gained a mean of 170 kg v. 115 kg for yearlings. In year 2, there was a very short growing season and annual LWG's were lower overall, but age differences were large. Most of the difference occurred during the period of main weight loss at the end of the long dry season and the break of the wet season (Table 1). The older, heavier steers did not compensate during the short growing season when gains were similar for all age groups. Age x SR (Fig. 1) or age x grass species interactions were not significant in either year *($P > 0.05$).*

Table 1. Experiment 1. Liveweight changes (kg/steer) of weaner, yearling and 2-year-old steers of during 1990-91

Periods were determined according to points of inflection along the cumulative liveweight gain curve

	Weaner	Yearling	2-year-old
Initial liveweight (kg)	239	354	489
Liveweight gain			
Annual (19. 7.90–18. 7.91)	96	61	10
Period 1 (19. 7.90–11.10.90)	37	34	14
Period 2 (11.10.90–31. 1.91)	–8	–31	–60
Period 3 (31. 1.91–24. 4.91	77	79	80
Period 4 (24. 4.91–18. 7.91)	–10	–21	–23

Experiment 2

Weaners gained 140 kg compared with 106 kg for the yearlings *($P < 0.001$)*. There was no significant interaction between age x SR or age x grass species *($P > 0.005$)*. Most of the difference (70%) associated with age occurred at the end of the 1990 dry season when yearlings lost weight while, in contrast, small gains were made by weaners.

Experiment 3

The pattern of weight change noted in experiments 1 and 2 was repeated in experiment 3. Overall, the mean LWGs for the 3 age groups were: 120, 65 and 45 kg respectively for supplemented steers and 52, 36 and 32 kg for unsupplemented steers.

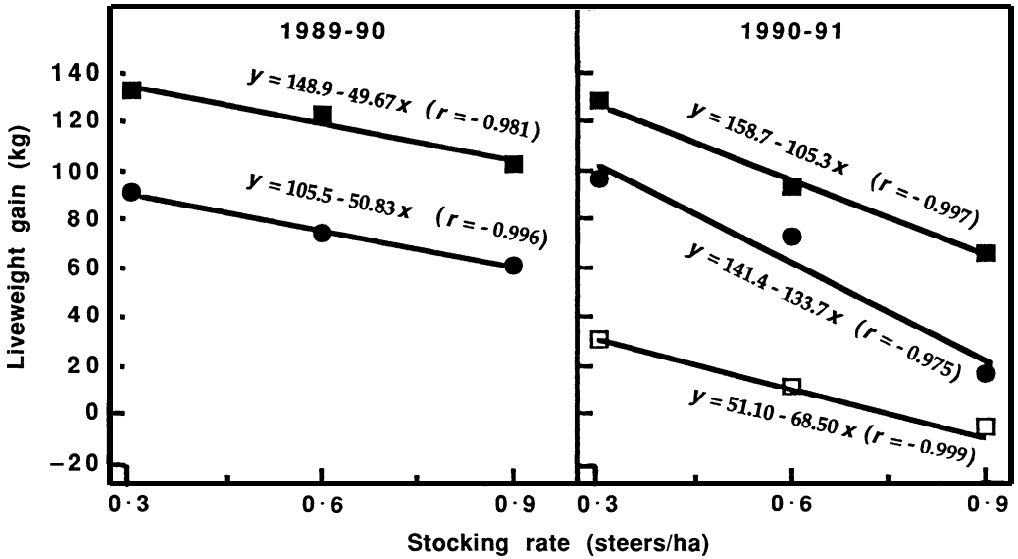

Fig. 1. The effect of stocking rate and steer age (■ weaner, ● yearling, □ 2-year-old steer) on LWG for experiment 1 for 1989-90 (July-March) and 1990-91 (July-June). Values are means for the 2 pasture treatments.

DISCUSSION

The results clearly show an effect of age (or weight) of steers on their LWG when grazing tropical pastures in northern Australia. This is in contrast to the reports of Matches (1970) and 't Mannetje *et al.* (1976). It also contrasts with the observation by T. R. Evans (pers. comm.) that there was no effect of age (or initial weight) on the annual LWG of native cattle grazing improved pasture in the wet tropics of Malaysia.

Most of the LWG difference associated with steer age occurred during stress periods when weight losses were recorded (Table 1). This was consistent across the 3 experiments examined. Winter (1988) also observed that older, heavier steers grazing Verano based pastures near Katherine in northern Australia, lost more weight in the dry season than younger, lighter steers. However, he observed that the older steers gained more in the wet season so that there was usually no overall age effect on annual LWG. In our experiments, gains during the wet season were similar across age groups (Table 1, period 3) so that a substantial LWG advantage was maintained by the younger steers. Higher weight losses during times of inadequate nutrition are to be expected in older, heavier steers with higher maintenance requirement (Robinson 1967). However, with the improvement of pasture quality in the wet season, compensatory gains could also be expected in these older animals. Thus, the unexpected observation in our experiments was the lack of any difference in wet season gains between age groups.

The differences in LWG in our experiments were probably due to low forage intake by the older steers. Low intakes can be associated with mineral deficiencies or toxicities in the herbage and low pasture availability. However, it seems unlikely that weaners would be less affected than older steers except where a gradual deficiency may develop over time. The classic example is where sodium replete animals gradually become deficient on low sodium pastures (Winter and McLean 1988). Although all grasses in experiment 1 were sodium deficient, salt blocks were provided in all paddocks. Apart from the unsupplemented steers in experiment 3 which were P deficient, the steers in our experiments appeared to be healthy. In experiment 3, the effects of age on LWG were noted in both supplemented and unsupplemented steers.

The lack of an age x SR interaction (Fig. 1) shows that steers of all ages responded to SR in a similar way. Had there been some deficiency or toxicity limiting production of the older steers a positive response in growth to the lower SR would not have been anticipated. In addition it is difficult to believe that low feed availability could have occurred at low SR since there was 4 t/ha DM yield or more than 1·2 t/forage.steer. Yet the age effect was just as pronounced.

While we propose that the observed differences in LWG due to age or initial weight were probably the result of a lower than expected forage intake by the older steers, the reasons are not readily apparent.

Further work to assess intakes of the different groups is necessary. The effect may have been associated with particular seasonal influences on pasture growth and quality. Certainly, the 1990-91 season was atypical, with a very short but intense wet season in which twice the average annual rainfall fell in a 2-month period from late December to late February with very little rain outside that period. The results from this year, the only 1 in which 3 age groups were studied, therefore need to be viewed with caution. If such seasonal conditions contributed to the effect, the mechanisms involved are not readily identified. Also it does not explain the occurrence of the effect in experiment 1 in the previous year when very good gains were recorded.

Provided all paddocks in an experiment are balanced as far as steer age is concerned, comparisons of imposed treatments would be valid. However, comparisons of gains from such experiments with others where only single aged steers were used would need to be made with caution. The use of mean data (which are normally published) for modelling animal production could also give biased results if applied to cattle of different ages.

If the age effect demonstrated in our experiments is a common occurrence in the semi-arid tropics of northern Australia, the economic and management implications would be of great importance, especially with differences of the magnitude seen in experiment 1.

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