GROWTH PERFORMANCE OF STEERS SIRED BY HIGH AND LOW MUSCLE SCORED BULLS

W.A. McKiernan[1] and G.E. Robards[2]

[1]NSW Agriculture, Scone, NSW 2337
[2]University of NSW, Kensington, NSW 2033

SUMMARY

Liveweight and growth performance from birth to slaughter of over 200 steers was studied. The steers were the product of a four year cattle breeding program utilising Angus bulls varying in muscle score (high and low) mated to a random selection of Hereford cows. Although there was a significant difference created in the muscle score of the steer progeny, no affect due to the sire's muscle score was observed on the growth rate of the steers to 15-18 months of age.
Keywords: Weight, growth performance, muscle score.

INTRODUCTION

There is some divergence of opinion within the Australian cattle industry as to the affect selection for increased muscle score will have on potential growth performance of steers, in particular, growth rate in feedlots. There is some suggestion that selection for muscularity will result in decreased growth rate of cattle (Sundstrom and Inglis 1994). Alternatively, there have been other reports (Koch *et al.,* 1995) which suggest a positive correlation between muscle score and liveweight gain.

The objective of this study was to examine the affect of selecting sires for differences in muscle score, on the resultant growth performance of their progeny both at pasture and in a feedlot.

MATERIALS AND METHODS

In 1991, 210 Hereford and Poll Hereford females, varying in age (1 to 8 years old), and in place of origin (4 different properties), were assembled at NSW Agriculture's Elizabeth MacArthur Agricultural Institute (EMAI) at Camden, NSW. Cow age and origin were recorded. These cows were stratified by age and origin and randomly divided into 2 groups and mated to either 4 high or 4 low muscle scored Angus bulls. The following year (1992), the cows were kept in the same groups and alternate mated ie. those cows mated to high muscle score bulls in the first year were mated to low muscle score bulls in the second. The same alternate mating of cows occurred for the next 2 years. The 280 male calves born to these matings formed the basis of this study.

The bulls were selected for high and low muscle score. Care was taken in their selection to select bulls of similar growth performance, either visually, by the use of on farm performance records, or by Breedplan figures when available. To assist with reasonable performance parity, when a high muscle score bull was selected from a bull breeding herd, a similar age and weight low muscle score bull was selected from the same herd.

Eight bulls were used each year, 4 high and 4 low muscle scored bulls. The bulls were mated in pairs of similar muscle score to approximately 50 cows/pair due to property paddock size constraints. Each year 2 bulls from each group were replaced with 2 new selections (4 new bulls per year). Except for the first mating, bulls were joined for 2 years. In total, 10 bulls were used to represent each muscle group (ie. 10 high and 10 low). The high bulls had an average muscle score of 11.4 pts (B muscle score) and the low bulls an average of 5.3 pts (D muscle score), on the basis of the visual "muscle score" system - a visual assessment of the thickness and convexity of the body relative to skeletal size of the animal, adjusting for subcutaneous fat depth (McKiernan 1990); 15 point scale, 15 highest = A+, 1 lowest = E-.

Calving occurred in September/October/November each year and weaning in March/April at approximately 7 months of age. Following weaning the steers were run together at pasture at EMAI till yearling (November - an average of 206 days from weaning). The 1992 and 1993 born steers were further grown out till the following January and then put into a feedlot. The 1994 born steers were put in a feedlot immediately after the November weight. All three groups were fattened on the same feedlot (AMH Caroona at Quirindi, NSW) and for a similar period (av. 87 days). The steers were then sent for slaughter - the 1992 and 93 born steers at AMH Aberdeen Abattoirs; the 1994 born steers were slaughtered at three different abattoirs in the area (all Ausmeat accredited).

The steers were individually weighed at the critical periods - birth, weaning, yearling, feedlot entry, feedlot finish and hot standard carcass weights were taken. They were visually assessed for muscling (muscle score) by an experienced assessor at weaning, yearling, feedlot start, feedlot finish and just prior to slaughter. They were also scanned for fatness (at the rump and 12th rib sites) and eye muscle area (at the 12th rib site) at weaning, yearling and at feedlot start, using a real time ultrasound machine. The carcasses of the steers were assessed for fatness (P8 and 10th rib), and eye muscle area at the 10th rib was measured on the chilled carcasses.

Statistical analysis. The GLM procedure of Systat (1992) was used to analyse the data. Muscle group was tested using "sire pair within muscle group" as an error term, because of the nested design of bull pairs within muscle group. The main effects tested were muscle group, sirepair within muscle group, year of birth, cow age and the two and three way interactions. Muscle group means were computed using a generalised linear model with year of birth and cow age as covariates.

RESULTS AND DISCUSSION

The analysis of four years data for steer birth weight indicated that male calves by high muscle scored bulls tended to have heavier birth weights than male calves by low muscle scored bulls. The difference was not significant (Table 1). With the 1992 born progeny half the dams were maiden heifers (two and three year old) and they experienced a substantial level of dystocia (27%), however there was no significant difference in dystocia due to the calves sire (McKiernan 1995). Later year's calving experienced no dystocia.

Liveweight at weaning, yearling, pre feedlot, feedlot end and carcass weight was not significantly affected by sire muscle group (Table 1). Liveweight gain, tested over three different periods of the steer's life, two at pasture and one on a feedlot, was also unaffected by sire muscle group (Table 2).

Table 1. Adjusted least squares means and standard errors for weight differences of steers derived from high or low muscle scored bulls at various ages from birth to slaughter

	Av.age (days)	By high muscle score bulls	By low muscle score bulls	
Birth weight(kg)		35.63	33.39	P=0.09
n = 290		± 0.45	± 0.43	
Weaning weight(kg)	230	189.68	189.18	ns
n = 274		± 3.1	± 3.0	
Yearling weight(kg)	439	260.92	260.36	ns
n = 226		± 2.63	± 2.56	
Feedlot entry weight(kg)	491	291.82	289.42	ns
n = 226		± 2.67	± 2.59	
Feedlot end weight(kg)	578	423.14	421.32	ns
n = 221		± 3.70	± 3.60	
Hot standard carcass weight	"	231.36	229.21	ns
n = 221		± 1.83	± 1.79	

Table 2. Adjusted least square means and standard errors for weight gain differences(kg) for steers sired by high and low muscled scored bulls

Weight gain period	No. of days ± sd	By high muscle scored bulls	By low muscle scored bulls	
Birth to weaning	229.0	0.65	0.65	ns
n = 273	± 50.4	± 0.01	± 0.01	
Weaning to yearling	206.3	0.34	0.33	ns
n = 225	± 15.9	± 0.01	± 0.01	
At feedlot	87.0	1.51	1.51	ns
n = 221	± 5.0	± 0.2	± 0.02	

The muscularity of the sires significantly affected the muscularity of their steer progeny when assessed as muscle score at weaning, yearling, feedlot entry and finish. Eye muscle area was also significantly different in steers scanned at yearling age, but not at other scanning times or when measured on the carcass. However, the trend was for those sired by high muscle scored bulls to have larger eye muscle areas than those steers sired by low muscled bulls (Table 3).

Table 3. Adjusted least squares means and standard errors for appraised muscle differences - muscle score (MS) and eye muscle area (EMA) - at various ages from birth to slaughter of steers derived from high or low muscle scored bulls

	By high muscle score bulls	By low muscle score bulls	Significance
Weaning MS(pts)	7.39	6.47	*
n = 281	± 0.16	± 0.16	
Weaning EMA(cm^2)	35.89	34.43	ns
n = 212	± 0.63	± 0.61	
Yearling MS(pts)	7.8	6.7	**
n = 226	± 0.16	± 0.16	
Yearling EMA(cm^2)	39.28	37.60	*
n = 226	± 0.46	± 0.45	
Feedlot entry MS(pts)	7.83	7.07	*
n = 226	± 0.15	± 0.15	
Feedlot end MS(pts)	8.14	7.73	*
n = 162	± 0.15	± 0.14	
Carcass EMA(cm^2)	64.0	61.32	ns
n = 221	± 0.7	± 0.69	

* $P<0.05$ ** $P<0.01$

From this experiment it can be concluded live muscle score is independent of liveweight gain and live- weight of steers up to two years of age. Hence selection for muscle score should not be detrimental to steer weight and weight gain. In practise selection of bulls with greater muscle score should be carried out in association with a consideration of other important economic traits, such as growth rate. The resultant progeny should not be disadvantaged in growth, however they should be superior in musculature and hence economic value. Recent saleyard reports in NSW and Victoria show an advantage per unit increase in muscle score of 10 to 20¢/kg relative to steers of similar weight and fatness but of lower muscle score, clearly demonstrating the economic advantage of selection for muscle score.

REFERENCES

Koch, R.M., Cundiff, L.V. *and Gregory, K.F. (1995) J. Anim. Sci. 73:2951.*
McKiernan, W.A. (1990) Proc. Aust. Assoc. Anim. Breed. Genet. **8**:447.
McKiernan, W.A. (1995) M.Sc. Thesis, University of New South Wales.
Sundstrom, B. and Inglis, S. (1994) BIAA Technote No. 94/3.
Systat for Windows (1992) Version 5, Evanston, IL.