CHANGES IN THE RELATIVE PERFORMANCE RATINGS FOR GROWTH OF BELMONT RED BULLS FROM WEANING TO 32 MONTHS OLD

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SUMMARY

The weight for age (W/A) performance of four groups of Belmont Red bulls was measured at weaning (W/A.w), at 20 months (W/A.20) and at 32 months (W/A.32). In three out of four years W/A.w was significantly correlated with W/A.20 but there was a significant correlation of W/A.w with W/A.32 in only one year. W/A.20 was significantly correlated with W/A.32 in three of the four years and a pooled r=0.65 (P < 0.01) was derived. However, changes in the relative performance ratings of bulls between 20 and 32 months old occurred with sufficient frequency and magnitude to suggest the need for further research to determine the most appropriate age for final selection of sires whose progeny are to be marketed at ages of 2 1/2 years or more.

INTRODUCTION

The commercial beef industry is becoming more aware of the benefits that can be achieved from the use of performance tested bulls, especially those animals selected for high growth rate. Obviously, progress will be most rapid if an accurate assessment of the genetic worth of a breeding animal can be made. Also, the type of performance test and the basis on which animals are rated will be of utmost importance in indicating the true relative genetic worth of the animals under test. A number of workers, including Martin et al. (1970) and Carter (1971) concluded that selection for weight at yearling or older ages, rather than gains, would be the most rapid means of improving growth rate. This conclusion was strongly supported by Seifert (1975) who concluded that weight per day of age (W/A) at 18 months appeared to be the most efficient and practical single trait to select beef cattle for increased growth rate.

Throughout most beef cattle areas in Queensland, cattle are generally marketed at ages well in excess of 18 months so that weight at 18 months may represent only 40-70% of final market weight. Since it is not unreasonable to assume that growth patterns of genetic origin vary among individuals, the question arises as to whether selection of bulls at 18-20 months of age is the most appropriate for a system where cattle are marketed at much greater ages. In order to assess the magnitude of this potential shortcoming, data were collected on the weight for age performance of groups of Belmont Red bulls up to an age of about 32 months (i.e. two full years post-weaning). This paper reports the results of that study.

MATERIALS AND METHODS

The data were collected from the Narayen Research Station (Lat.25° 41'S, 180° 53' E) in sub-coastal, sub-eastern Queensland. The climate is sub-tropical with a mean annual rainfall of 722mm. The climatic features result in satisfactory weight gains during the summer growing season but cattle lose weight, or at best maintain weight, during the winter, even on improved pastures.

The test bulls were selected from the progeny of a Belmont Red cow herd of 400-600 breeders. Within paddock selection at weaning (mid-April) was based on...
daily gain from birth to weaning adjusted for age-of-dam (Anon. 1978). Following weaning all bulls were run together for two years on mixed Rhodes grass (Chloris gayana), green panic (Panicum maximum var. trichoglume) pasture growing on brigalow soils. Birthdates were estimated when calves were first identified early in life, and unfasted liveweights at weaning (8 months), at 20 months and at 32 months were recorded. Data were collected from four groups of bulls born from 1977 to 1980. The maximum age difference between animals within any group was 78 days.

Weight for age at weaning (W/A.w), at 20 months (W/A.20) and at 32 months (W/A.32) were calculated for each animal. W/A.w was adjusted for age-of-dam effect according to the adjustment recommended in the National Beef Recording Scheme (Anon. 1978). Within group phenotypic correlations were determined for W/A values for all age combinations. For any particular combination, if group correlations did not differ significantly (P > 0.05), a pooled correlation coefficient was determined by the method of Sokal and Rohlf (1969). In addition, weight ratios (WR), i.e. individual W/A over the group mean W/A expressed as a percentage, were calculated for each animal under test.

RESULTS AND DISCUSSION

Correlation coefficients for W/A comparisons at different ages for each group are shown in Table 1, together with pooled correlation coefficients since there were no significant differences between years (P > 0.1). The correlation of W/A.20 with W/A.w was significant in three of the four years. The absence of a significant correlation in year 2 was unexpected. We believe this was almost certainly due to the much narrower W/A.w range of this group compared with the others. The pooled correlation coefficient of r = 0.39 is lower than similar phenotypic correlations reported by Koch et al. (1973) and Seifert (1975) but again, this probably resulted from the bulls being selected from a limited upper range of W/A.w.

On average, weaning weight accounted for about 60% of liveweight at 20 months and only 40% at 32 months. It is noteworthy that W/A.32 was significantly correlated with W/A.w in only one year out of four.

TABLE 1 Phenotypic correlations between weight for age at weaning (W/A.w), at 20 months (W/A.20) and at 32 months (W/A.32)

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<thead>
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<tr>
<td>1977</td>
<td>27</td>
<td>0.966-1.330</td>
<td>0.408*</td>
<td>0.249</td>
<td>0.654**</td>
</tr>
<tr>
<td>1978</td>
<td>17</td>
<td>1.026-1.224</td>
<td>-0.19*</td>
<td>0.190</td>
<td>0.263*</td>
</tr>
<tr>
<td>1979</td>
<td>24</td>
<td>0.850-1.319</td>
<td>0.643*</td>
<td>0.038</td>
<td>0.703**</td>
</tr>
<tr>
<td>1980</td>
<td>24</td>
<td>0.973-1.390</td>
<td>0.602**</td>
<td>0.484*</td>
<td>0.775**</td>
</tr>
<tr>
<td>Pooled</td>
<td>92</td>
<td>0.391**</td>
<td>0.253*</td>
<td>0.655**</td>
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</tr>
</tbody>
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*P < 0.05; **P < 0.01

The correlation of W/A.32 with W/A.20 was highly significant (P < 0.01) in three out of four years. We cannot offer an explanation for the lack of a significant correlation in year 2. It does, however, lend weight to the argument that selection at 20 months may not be appropriate for a production system where progeny are sold at much greater ages. Even at r = 0.655 (95% confidence limits 0.519 to 0.759) and accepting that the genetic correlation is
likely to be higher (Seifert 1975; Koch et al. 1982) the advantage of delaying final selection should at least warrant serious consideration. To gain some insight into the practical significance of changes in the relative W/A performance which occurred between 20 and 32 months we looked at the magnitude of WR changes. These are plotted in Fig. 1 which is a frequency distribution of the sizes of WR changes occurring between 20 and 32 months of age for each of the 92 bulls (i.e. WR at 32 months less WR at 20 months). We have also distinguished between the WR changes of bulls that were below average at 20 months on the one hand (hatched part of columns), and those that were above average at 20 months (unhatched).

Fig. 1. Change in weight ratio (WR) of 92 bulls between 20 and 32 months old.

- Bulls ranking above average at 20 months old.
- Bulls ranking below average at 20 months old.

Figure 1 illustrates a number of points of practical significance. First, the WR changes of the W/A.20 above average bulls differed significantly from those of the W/A.20 below average bulls (P<0.01). The WR rises were mainly from W/A.20 below-average bulls, while the WR falls were mainly from W/A.20 above-average bulls. Despite this tendency, the S.D. of WR did not change (4.9 and 5.1 for 20 and 32 months respectively). Secondly, a high proportion of bulls underwent large changes in WR. For example, 34% of animals had changes of 5 WR units or more (i.e. >1 S.D.). About 25% of W/A.20 above-average bulls had falls of 5 or more units while only 13% had rises of similar magnitude. Conversely, 25% of W/A.20 below-average bulls had rises of 5 or more units while only 6% had major falls. In addition, an analysis of WR data which is not presented revealed that 30% of W/A.20 above-average bulls finished up below average at 32 months and vice versa. These changes illustrate that the age adjusted liveweight rankings of bulls at 32 months cannot be confidently predicted from their rankings at 20 months. In fact, the relative WR ratings of pairs of bulls in our data sets changed by as much as 18 percentage units during the second year post weaning.

One obvious disadvantage associated with selection at 32 months compared with 20 months is the resultant increase in the generation interval in a closed herd situation. This consideration is of no relevance where bulls are offered for sale as 3-year-olds which is often the case in Queensland. In such cases, providing potential buyers with the performance rating of bulls at the older age would seem appropriate.
An understanding of the causes behind the changes in relative W/A performance which occur during the second year post weaning would be helpful. Seifert et al. (1980) reported that age-of-dam effects were present from weaning to and including 23 months of age for crossbred Brahman steers but suggested that disregarding age-of-dam adjustments at 17 months or older would probably not seriously reduce genetic gains for weight in a selection program. However, it is conceivable that the combined effects of general pre-weaning paddock nutrition and mothering ability, both of which have such a large effect on W/A,W, might last long enough to distort W/A,20 as an index of an animal's growth rate potential.

It is also possible that there are genetically controlled differences in growth patterns where early maturing animals may grow fast early in life and rank well at 20 months while the ranking of later developing animals may improve at later dates. In addition Vercoe and Frisch (1982) have shown that growth potential and adaptation to stress are negatively correlated. This may mean that if two successive growing seasons were characterised by grossly different levels of stress, some crossing over of the relative performance of growing animals might be expected. However, we have no reason to believe that this effect was a major contributor to the changes that occurred in our study.

In conclusion, we recognise that the data presented have been restricted to phenotypic correlations and changes in phenotypic measures of performance over time. We have no data from which to estimate genetic parameters and we do not attempt to predict comparative genetic gains from early versus late selection. However, we are conscious of the changes that occurred in the ranking of bulls within each group during the second year post-weaning and that the acceptance or rejection of bulls would depend partly on whether selection was applied at 20 months or 32 months. This latter consideration is likely to be of greater importance where the intensity of selection for growth rate is lowered because of the concurrent selection for other traits, e.g. tick resistance. On this basis we suggest that there is a need for further research to determine the optimum age of selection of sires for growth rate given the nutritional and production systems that operate in Queensland.

REFERENCES