EFFECT OF TIME OF CALVING AND SIRE TYPES ON GROWTH OF PROGENY TO WEANING

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SUMMARY
Between 232 and 283 cows in each of autumn (March-April) or winter (June-July) calving treatments were artificially inseminated by sires with high estimated breeding values (EBVs) for either retail beef yield (RBY) or intramuscular fat (IMF) in each of two years in the south-west of Western Australia. Calves were raised to weaning in January the following year at approximately 9 and 6 months of age for the autumn and winter calves respectively. Calves by high RBY sires had higher (P<0.001) weaning weight (319.2 vs 308.8 kg) and liveweight gain per day (1.15 vs 1.11 kg) and lower ultrasonically scanned P8 fat thickness (4.44 vs 5.47 mm) than calves by IMF sires. Autumn calves were heavier and fatter (P<0.001) at weaning than winter calves but winter calves grew at a faster rate to weaning (P<0.001) than autumn calves.

Keywords: time of calving, retail beef yield, intramuscular fat, liveweight, fat thickness

INTRODUCTION
Beef farm profitability is strongly related to the suitability of the product to market requirements. Intramuscular fat (IMF) content or marbling is a highly sought-after characteristic, particularly in beef destined for the Japanese and Korean markets (Hart 2001). Systems based on feeding of high grain rations for extended periods have been developed to meet these demands (Pethick et al 2001). As well, much research has been devoted to understanding the factors that influence marbling and in particular in identifying cattle with the marbling trait (Johnston 2001). Estimated breeding values (EBVs) are now available for IMF on many sires both within Australia and in overseas countries as the demand for marbled beef continues (Parnell 2001).

Another factor that has an important influence on value of the beef carcase is the proportion that is saleable as beef or retail beef yield (RBY). EBVs for yield have been available since 1990 and were initially calculated using ultrasound scans of fat thickness and eye muscle area (Sundstrom 2002). Recent developments such as those reported by Reverter et al (1999) have improved the accuracy of RBY estimates by using bone-out data. However these data are not often available and estimates still rely on live animal or carcase measurements.

In the south-west of Western Australia the traditional calving time is late summer and autumn months between February and May. This region has a Mediterranean climate which means that calving occurs when the quantity and quality of the pasture is at its worst and large quantities of supplementary feed are required to maintain a sufficient level of nutrition to the cow to enable satisfactory lactation and reduce excessive weight losses. The reliance on large quantities of supplementary feed imposes a major cost on the beef production system.
This paper reports on the growth characteristics to weaning of progeny of sires with high EBVs for either IMF or RBY that calved in either autumn or winter.

MATERIALS AND METHODS
The cows and experimental area for this experiment were provided by Alcoa Farmlands on its properties located at Wagerup (155.55 E, 32.52 S) and Pinjarra (115.52 E, 32.28 S) in the south-west of Western Australia.

There were between 320 and 360 cows in each calving group in each of the two years of the data reported. In the autumn calving treatment there were 3 groups of cows at Wagerup and 2 at Pinjarra in the first year. In the second year, the number of groups of autumn calving cows was reduced to 3, with two groups at Wagerup and one at Pinjarra. In the winter calving cows there were 6 groups (2 Wagerup, 4 Pinjarra) in the first year and 4 groups (1 Wagerup and 3 Pinjarra) in the second year. These properties are approximately 30 km apart.

The cow groups were selected by the management of the Alcoa properties and ranged in size from 38 to 137. Cows were of predominantly Angus or Murray Grey breed. Within each group, cows were the same age and most had previously had either 1 or 2 calves. The animals were stocked on improved pasture at the rate of approximately one cow and calf per ha.

In the autumn calving groups, cows were mated in early June by artificial insemination (AI) using a standard protocol using CIDRs. The same procedures were used for winter calving groups, which were mated in September. Between 232 and 283 cows were inseminated in each of the 4 calving time x year groups. A total of 23 sires were used, 12 with high EBV’s for RBY and 11 with high EBV’s for IMF.

Cows were pregnancy tested between 4 and 5 months after mating and any cows that were found to be non-pregnant were culled from the herd. During the calving period, birth date and the dam of the calf were recorded and the calves were identified using ear tags. Both autumn and winter calves were weighed when they were approximately 2-3 months of age and at weaning in January. Fat thickness at the P8 site was measured using ultrasound scanning at weaning. Sires of calves were determined using a combination of date of calving and DNA testing.

Statistical analyses were conducted using the Genstat REML variance component analysis, with main effects of sire type, sex, time of calving, year and location, accounting for variation between groups within years and for variation between animals at different locations and in different years. A probability level of P<0.01 was chosen because P values are underestimated using the Wald test.

RESULTS AND DISCUSSION
Of the cows inseminated in the various groups, between 41% and 57% of the progeny were determined to be from the AI sires. The relatively low percentage in winter calving cows in the first year of the experiment was attributed to their low weight and fatness at mating (Read et al 2004).
There was a significant (P<0.01) difference between sire type in weaning weight (Table 1) with high RBY sired progeny being about 10 kg heavier at weaning. The difference in weight at weaning was reflected in a significantly (P<0.01) faster growth rate between the first weighing at between 2-3 months of age and weaning. These results were consistent with the EBVs for 200day weight for the different sire types which were, on average approximately 8kg higher for the high RBY sires. However Irwin et al (2004) used some of the same sires and found no significant difference in 200 day weight and growth rate to weaning between RBY and IMF sires. The growth rates (0.7-0.8kg/d) and 200 day corrected weights (approx 190 kg) were much lower than in our experiment.

Even though the progeny from RBY sires were heavier than those from IMF sires in our study, they had significantly (P<0.01) less fat cover at the P8 site (Table 1). The difference between the two sire types was consistent with the EBVs for P8 fat thickness which were higher for IMF sires. The method of estimating the EBV for RBY is based on measurements of fat thickness so that higher RBY is estimated when fat thickness is reduced (Sundstrom 2002). Pethick et al (2001) indicated that IMF or marbling is associated with increased fatness through increased filling of fat cells as the animal fattens. There is therefore a conflict between the desirable traits of IMF, and RBY via the fatness of the animal and Koots et al (1994) and Johnston (2001) reported negative genetic correlations between IMF and RBY. In view of this antagonism it would appear imperative that breeders choose their sires according to their target market. However Johnston (2001) believed that if both IMF and RBY are recorded it would be possible to simultaneously improve both traits.

**Table 1. Least squares means (LSD) for growth characteristics to weaning in progeny from sires with high EBVs for RBY or IMF, for steers and heifers from either autumn or winter calving**

<table>
<thead>
<tr>
<th>Main effect</th>
<th>Weaning Liveweight (kg)</th>
<th>Weaning P8 fat scan (log mm)</th>
<th>Liveweight gain per day (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sire type</td>
<td></td>
<td></td>
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<tr>
<td>RBY</td>
<td>319.2 (a)</td>
<td>1.490 (a)</td>
<td>1.15 (a)</td>
</tr>
<tr>
<td>IMF</td>
<td>308.8 (b)</td>
<td>1.699 (b)</td>
<td>1.11 (b)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steers</td>
<td>323.6 (a)</td>
<td>1.466 (a)</td>
<td>1.16 (a)</td>
</tr>
<tr>
<td>Heifers</td>
<td>304.4 (b)</td>
<td>1.723 (b)</td>
<td>1.10 (b)</td>
</tr>
<tr>
<td>Time of calving</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn</td>
<td>353.6 (a)</td>
<td>1.813 (a)</td>
<td>1.09 (a)</td>
</tr>
<tr>
<td>Winter</td>
<td>274.3 (b)</td>
<td>1.375 (b)</td>
<td>1.16 (b)</td>
</tr>
<tr>
<td></td>
<td>(5.2)</td>
<td>(0.070)</td>
<td>(0.021)</td>
</tr>
</tbody>
</table>

\(a,b\) Means with different superscripts differ significantly (P<.01)

Steers were significantly (P<0.01) heavier at weaning, had higher growth rate and were leaner than heifers (Table 1). This result was expected in view of the well established relative growth rates and fattening patterns of steers and heifers.
The significant (P<0.01) differences in weaning weight between autumn and winter calves of approximately 80 kg was a result of a 3-month difference in birth date combined with the constant weaning time. Autumn calves were also significantly (P<0.01) fatter at weaning. Winter calves however, grew at a significantly (P<0.01) faster rate than autumn calves between the time when the calves were first weighed at 2-3 months of age and weaning. Autumn calves are born during a period where seasonal pasture is declining in both quantity and quality whereas winter calves are born into high quality green pasture. Hence the performance of autumn calves may have been limited to some extent by the poorer nutrition available to the cow in the early stage of growth.

In the south west of Western Australia, winter calving has been shown to be a profitable alternative to traditional autumn calving system on the basis of reduced requirement for supplementary feed, higher stocking rate and similar reproductive performance (Della Bosca, 2004). The greater growth rate of the lighter weaner calf represents further advantage of winter calving. Winter calving also provides a supply of animals with different age, weight and fat characteristics from those produced from the traditional autumn calving system. This should enable the production of high quality beef to be spread more evenly throughout the year so that the industry is able to capture year round high quality export and domestic markets.

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REFERENCES