CROSS BREEDING BEEF CATTLE IN SOUTHERN AUSTRALIA

[1]RUTLEY, D.L., [2]DELAND, M.P.B. AND [1]PITCHFORD, W.S.

1 Department of Animal Science, University of Adelaide, Waite Campus, Glen Osmond, S.A. 5064.
2 Struan Research Centre, SARDI, Naracoorte, S.A. 5271.

SUMMARY

Preliminary results are presented for a 7 breed topcross trial set up to quantify genotypes to fit Australian markets for southern Australian producers. Angus, Belgian Blue, Hereford, Jersey, Limousin, South Devon and Wagyu sires were mated to purebred Hereford dams. Birth weight, weaning weight and weaning P8 fat depth results from the first calf drop have been reported. Birth weights ranged from 30±1kg for Jersey sired calves to 38±1kg for South Devon and Limousin cross calves. The fastest growing breeds were the leanest at weaning, Belgian Blue sired calves were 268±5kg with 2.4±0.4mm fat, South Devon progeny were 264±5kg with 3.1±0.5mm fat while the lightest and fattest weaners were 235±5kg with 4.9±0.4mm fat sired by Wagyus.

INTRODUCTION

The objective of this paper is to introduce the Southern Crossbreeding Project to the industry by presenting some preliminary results and solicit input from interested parties.

The Southern Crossbreeding Project was established to determine which terminal sire breeds and sires within breeds, in southern Australian production systems, produce the most valuable progeny for a range of markets.

This project aims to compare breeds and sires within breeds for fertility, growth and carcass traits. Specifically gestation length, dystocia and birth weight; pre-weaning, post-weaning and feedlot growth; fat depth, eye muscle area, carcass weight, estimated lean meat yield, meat and fat colour; and fatty acid profiles of the meat and fat. This paper reports birth weight, weaning weight and P8 fat depth for sire breed from the first calf drop of the Southern Crossbreeding project.

MATERIALS AND METHODS

Angus, Belgian Blue, Hereford, Jersey, Limousin, South Devon and Wagyu sires were mated to purebred Hereford cows in a topcross design. These breeds were chosen to: produce progeny that represent a large range of biological types; coordinate with other projects presently being undertaken (Beef CRC Northern Crossbreeding and Purebreeding programs and the Davies Gene Mapping Program); and assess the merit of three breeds, presently largely unquantified, in Australia, (the Belgian Blue, South Devon and Wagyu).

In this project there are generally 12-15 progeny per sire, approximately twice the number of progeny per sire used in the Germ Plasm Evaluation in Cattle project (Cundiff et al. 1988). This allows estimation of sire breeding values while maintaining the accuracy of estimation of breed differences but only tests half the number of sires per breed. Nine Hereford and Angus sires and twelve sires from each other breed will be tested over three years, 78 sires in total. Progeny will be tested for growth and carcass traits and their

effect on dam reproduction. Progeny were weaned at 250 days and will be grass fed to 450 days and grain fed until slaughter at approximately 700 days of age. Progeny are being born in 1994, 1995 and 1996 and slaughter will be completed in summer 1997-98.

The herd is kept at Naracoorte, on 'Struan', and near Mt Gambier, at 'Wandilo', S.A. and run as a commercial operation. The cattle kept at Struan were managed as two contemporary groups. All male calves were castrated at birth. Calves were dehorned immediately after weaning.

The traits being recorded are: gestation length and birthing difficulties; weight at birth and every 50 days; length, height and girth at birth and every 150 days; fat depth at the P8 site at 150, 250 and every 50 days; ultrasound eye muscle area and marbling at 300 days and slaughter; muscle and fat lipid composition at 300 days and slaughter; and Ausmeat chiller assessment (marbling, meat colour, fat colour, texture/firmness, fat thickness at the $10^{th}/11^{th}$ rib, eye muscle area and estimated lean meat yield) at slaughter. In future across breed genetic parameters and sire breeding values will be estimated for all traits measured.

The SAS GLM procedure was used to calculate least squares means for birth weight, weaning weight and weaning P8 fat depth. The model fitted included a partial regression on date of birth with herd, sex, age of dam, breed of sire and sire nested within breed of sire fitted as fixed effects. The maximum model contained all main effects and all first order interactions. Type III sums of squares were used to test interactions for significance ($P<0.05$). No interactions were significant, so none were included in the final model.

RESULTS

Herd effects

There were no birth weight differences between herds. At weaning progeny weighed 247±6 kg in Struan herd 1, 257±6 kg in Struan herd 2 and 257±3 kg in the Wandilo herd and P8 fat depths were 3.0±0.5 mm, 4.3±0.5 mm and 4.7±0.3 mm respectively.

Sex effects

Females were 33.6±0.8 kg at birth and 243±4 kg and 4.3±0.3 mm at weaning, respectively. Male calves were 8.3% heavier at birth and 8.6% heavier and 16.2% leaner at weaning.

Age of Dam effects

Age of dam effects were not significant for birth weight. For weaning weight and P8 fat depth the effect of age of dam approximated a negative quadratic relationship with 7 year old dams producing both the heaviest and fattest calves. Progeny of 3, 7 and 11 year old cows were 241±3, 266±8 and 231±18 kg at weaning with a P8 fat thickness of 3.0±0.3, 5.1±0.7 and 3.2±1.5 mm respectively.

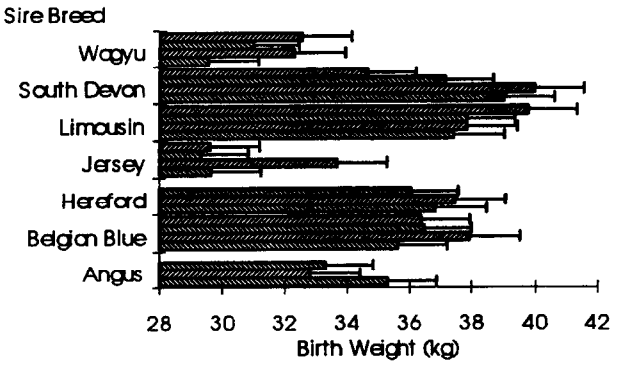
Sire breed and Sire within Sire breed effects

Sire breed differences were significant for the 3 traits studied here. However sire nested within breed was not significant.

The lightest calves were Jersey (30±1 kg) and Wagyu (31±1 kg) crosses while the heaviest calves were Limousin (38±1 kg) and South Devon (38±1 kg). Birth weights for Angus, Belgian Blue and Hereford sires averaged 34±1, 37±1 and 37±1 kg respectively.

Sire progeny means for birth weight are shown in Figure 1. T-tests (for differences between least squares means) of direct sire comparisons show one Jersey sire produced larger calves at birth than the other three and one South Devon sire produced smaller birth weight calves than two others. No other sire differences within sire breed were significant for birth weight. For all breeds dystocia rates were very low, overall (1.8%), which contributed to a total of 5.9% deaths at birth.

Figure 1: Birth weight of sire progeny groups by sire breed.



The weaning weights for Belgian Blue, South Devon, Hereford, Angus, Limousin, Jersey and Wagyu sired progeny were 268, 264, 259, 257, 256, 237 and 235, all ±5 kg. Sires within breeds were generally not significantly different but T-tests showed that one Jersey bull produced calves that were heavier than progeny of the other three bulls and two Limousin sires produced calves of significantly different weaning weight.

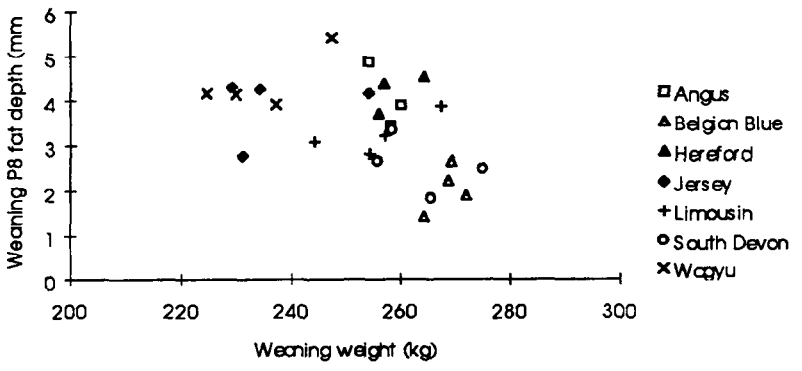
P8 fat depth at weaning showed similar trends. They were for Belgian Blue 2.4±0.4 mm, South Devon 3.1±0.5 mm, Limousin 3.7±0.4 mm, Jersey 4.4±0.4 mm, Angus 4.7±0.5 mm, Hereford 4.8±0.5 mm and Wagyu 4.9±0.4 mm. Only two Jersey sire groups differed significantly when T-tests compared sires within sire breeds. The standard errors for the T-test ranged from 0.6 to 0.9 mm.

Figure 2 shows the spread of sire groups within breeds for P8 fat depth and weight at weaning, as the calves approached the weaning market. The market for standard yearling carcasses requires carcasses of 160-220 kg (266-366 kg live weight) and 4-15 mm P8 fat depth (A. Economou, Beef Improvement News, pers. comm.).

DISCUSSION

All progeny except those from Hereford sires are crossbred. As such, assuming breed differences are principally due to additive genetic effects, we would expect the differences between purebred progeny of the sire breeds and the purebred Hereford progeny to be about twice the differences found in this trial.

Figure 2: Weaning fat depth by weaning weight for sire progeny groups.



American work on growth and carcass traits (marbling score, retail product (%), percent USDA Choice, lean to fat ratio, growth and maturity (Cundiff et al., 1988 and 1991)) suggests that the South Devon is intermediate between Hereford/Angus and Limousin cattle. Initial results from this project suggest that, for weight and P8 fat depth at weaning, the Australian Limousins are closer to Australian Herefords and Angus than are our South Devons. Figure 2 shows that two of the South Devon sires trialed appear similar to Limousins whereas the other two sires are similar to the Belgian Blue sires.

Wagyu and Belgian Blue sires are the extremes at opposite ends of the range produced in Figure 2 and may be useful as terminal sires to produce progeny for niche markets. Jerseys are not significantly different to Wagyus for any of the traits compared and may be a cheaper source of sires for such a market, due to their present availability.

On average, Limousin cross progeny in Figure 2 are marginally, not significantly, leaner than Hereford Angus progeny. The value of Limousins as terminal sires remains to be seen when traits such as dressing percentage, percent retail yield and growth to heavier weights are analysed.

Figures 1 and 2 indicate the amount of variation that exists in breeds used in southern Australia, both within and between sire breeds, when crossed to pure-bred Hereford dams. At this stage few sires have been tested per breed. Within breed variation will be better defined, as more sires are tested.

Future work for this project will include: 1) looking at other traits; 2) comparing growth of animals to market specifications; and 3) assessing the economic value of individual animals and sire progeny groups through the use of selection indices.

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