CARCASE QUALITY OF TWO YEAR OLD STEER PROGENY OF ANGUS HEIFERS DIVERGENTLY SELECTED ON RIB FAT ESTIMATED BREEDING VALUES AND SUBJECTED TO TWO LEVELS OF NUTRITION PRE-WEANING

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SUMMARY

Beef producers have concerns that selection for carcase traits may affect maternal productivity and a project is being conducted to assess maternal effects up to calf weaning. This paper reports on the carcases of steer progeny. Steer calves from Angus heifers which had been selected for divergent EBVs for rib fat thickness and grazed at two nutritional regimes to weaning at approximately 8 months were then grazed post weaning on irrigated pasture as one herd until slaughter at 2 years of age. Carcase quality was assessed by Meat Standards Australia accredited assessors. Pre-weaning nutrition had a significant effect on hot standard carcase weight, fat colour and eye-muscle area. Selection on EBV s for fatness of the dam resulted in differences ($P<0.1$) in steer progeny carcase value due to price penalties applied to carcases below minimum fat specifications.

INTRODUCTION

Beef producers in southern Australia are concerned that selection for slaughter cattle with genetically leaner, higher yielding carcases may result in compromised maternal efficiency in herds supplying slaughter cattle. To address these concerns, the Beef CRC Maternal Productivity research program was established with research herds at Struan (SA) and Vasse (WA). Donoghue *et al.* (2010), reported a 10% reduction in calving of heifers which had been selected for low fat EBVs and subjected to low nutrition, when compared with those selected for high fat in this program. The main project concerned maternal effects to weaning which leaves the question: What effects are evident when steer progeny reach slaughter weights at 2 years of age?

MATERIALS AND METHODS

Angus heifers born in autumn 2006 were selected from the top 10% (N=75) and bottom 10% (N=75) mid parent EBVs for rib fat to establish divergent lines (High fat ave. EBV +2.5 and Low fat EBV -2.15). These heifers were mated (multiple sire mating) to Angus bulls of below average birth weight EBVs and average fat was approximately the breed average. During the 9 week mating period, bulls were rotated weekly around 3 mating groups with 3 bulls to 50 cows with equal representation of high and low fat lines. The progeny were grazed with their mothers at 2 stocking pressures (High nutrition and Low nutrition) until being weaned at approximately 8 months of age. Of the 61 steer calves at weaning, 59 were grazed as a single mob on irrigated perennial pasture until approximately two years of age when they were slaughtered in two consignments one month apart, in a commercial abattoir. The first slaughter group comprised the heaviest half of the fat lines and nutrition treatments followed a month later by the lighter steers. Steers were slaughtered under conditions required for Meat Standards Australia (MSA) assessment. The carcasses were assessed by qualified MSA assessors. Data was analysed using GENSTAT (Version 12) with a linear mixed model REML procedure with main effects of fat line, nutrition, and interaction, and accounting for variation in date of birth,, and where necessary carcase weight. Carcase value was set according to the abattoir company price grid for Angus MSA steers applying in May 2010. Carcases outside of either company or MSA specifications were discounted $0.45 / kilogram to the US steer price operating at the same time (Table 1).The carcase data was benchmarked against regional and national data for 2010.

RESULTS

Table 1. Carcase price grid (May 2010) in cents/kg.

HSCW(kg)	Angus MSA	US steer
320-340	350	305
300-320	345	305
280-300	340	300
260-280	340	295
240-260	335	290
220-240	335	285
200-220	330	275
180-200	320	255
Meat colour	1A-3	Any
Fat colour	0-3	Any
Fat depth (mm)	6-22	Any

There were effects ($P<0.05$) of pre-weaning nutrition on final live-weight, carcase weight (HSCW), eye muscle area (EMA), carcase value and fat colour (Table2) of carcases of the 2 year old steers. There was also an effect ($P<0.1$) of fat line on carcase value. The high fat line steers tended ($P<0.1$) to have more valuable carcases than those from low fat line steers. When carcase weight was included as a co-variate, then fat line became non-significant. Although all carcases met the MSA fat requirements (3-22mm P8 fat), 28% (7/25) of low fat line steers failed company requirements (6+mm P8 fat) compared to 12% (4/34) for the high fat line carcases ($P=0.12$). There was no nutrition by fat line interaction apart from fat ($P<0.1$) and meat ($P= 0.05$) colour, The low fat- low nutrition groups tended to have higher values in both traits than the other groups.

Table 2. Effect of pre-weaning nutrition and fat line of dam on steer carcases (Least mean square ±SE)

	High nutrition high fat	High nutrition low fat (±SE)	Low nutrition high fat(±SE)	Low nutrition low fat (±SE)
Steers	17	15	19	11
HSCW (kg)∗	313.5±4.6	305.8±5.8	301.5±5.5	293.6±5.9
P8 fat (mm)	8.0±0.5	7.4±0.6	8.4±0.6	7.6±0.6
Rib fat (mm)	7.2±0.4	6.7±0.5	7.3±0.5	6.8±0.5
EMA (cm^2) ∗	79.7±1.8	76.5±2.3	73.1±2.3	73.0±2.4
Hump height (mm)	62±2	61±2	65±2	62±2
Ausmeat marbling	1.5±0.2	1.5±0.2	2.1±0.2	1.7±0.3
MSA marbling	423±29	418±36	503±36	434±37
Ossification	150±3	152±4	148±4	159±4
pH	5.69±0.04	5.65±0.05	5.64±0.05	5.67±0.05
Meat Colour✝	3.3±0.2	3.0±0.2	2.8±0.3	3.5±0.3
Fat colour∗	2.2±0.1	1.9±0.2	2.3±0.2	2.6±0.2
Price ($/kg) ✝	3.36±0.04	3.27±0.05	3.34±0.05	3.27±0.05
Value ($)✝	1047±20	1001±25	1010±24	962±26
P8 fat (mm)[A]	7.8±0.5	7.3±0.6	8.6±0.6	7.9±0.7
EMA (cm^2)[A]	77.8±1.6	76.2±2.0	73.9±2.0	75.5±2.1
Liveweight (kg) #	593.1±7.4	594.3±10.9	580.1±7.7	561.9±12.6

[A] Carcass weight fitted as covariate (Fat and nutrition effects NS) ∗ $P<0.01$; ✝$P<0.1$; #$P<0.05$

DISCUSSION

The price offered per kg. (Table 1) increased from $3.20 per kg HSCW for 180kg carcases up to $3.50 for 340 kg within the company minimum criteria (fat range 6-22mm and HSCW 180-340kg), provided that the carcases met criteria for MSA grading. As the price per kg increased up to the 340 kg limit there is a clear incentive to market heavy steers. There were none which exceeded the preferred fat level. Eighty percent of carcases met the MSA criteria with 20% failing due to meat colour exceeding MSA score 3 with no treatment effect evident. All carcases met the MSA criteria for fat depth (3-22mm), ossification (Score 100-590), marbling (MSAMB score100-1190), carcase weight (180-390 kg). All carcases met the MSA criteria for fat depth (3-20mm), ossification (Score 100-590), marbling (MSAMB score100-1190), carcase weight (180-390 kg). However, 28% (7/25) of low fat line steers failed company minimum fat requirements compared with 12 % (4/34) for the high fat line group. This appears to account for the lower prices noted for low fat line carcases.

The results for meat colour downgrades were consistent with those for the SE region of South Australia (15-20%) but higher than the national figure (5%). The national loss due to meat colour downgrades has been estimated at $36m (MLA 2008).

CONCLUSIONS

Selection of Angus replacement heifers on EBVs for high rib fat can result in steer progeny which can finish on pasture to the preferred carcase weight (340kg HSCW) without penalty for being excessively fat (>22mm). However, the difficulty beef producers have when trying to finish steers at pasture may result in penalties for less fat than is preferred if selection for low fat EBVs is used. It should be noted that the steers herein were produced from heifers mated to Angus bulls of average fat EBVs and were finished on pasture and it would be expected that steers from mature cows would have higher fat levels. In the Maternal Productivity project there is evidence of advantages in both reproduction and carcase value as a result of selecting for higher fat Angus EBVs. A significant problem was noted with downgrades due to meat colour, which is consistent with the incidence of the problem in the region, the cause of which warrants further investigation.

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