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SELECTION FOR BEEF CATTLE CARCASS AND MEAT QUALITY TRAITS

A thesis presented in partial fulfilment

of the requirements for the degree of

Master of Agricultural Science in

Animal Science at

Massey University

PAUL LEONARD CHARTERIS

1995

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This thesis is dedicated to my Mum,

Mirja Anita Charteris

who never thought her son could make a career of being a bull expert

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ABSTRACT

Carcasses in the Japanese beef market are rewarded for increased yield and superior meat quality traits such as marbling, fat colour, meat colour and firmness and texture of meat. Due to the relatively high cost of feedlotting New Zealand compared with North America and Australia, genetic improvement may provide a low-cost alternative for improving beef quality destined for the Japanese market. The objectives of this study were to characterise meat quality traits for a sample of New Zealand pasture-finished beef cattle and determine the potential rate of genetic gain for these traits through selection.

Records on 24 146 Angus and 5 632 Hereford carcasses processed at Manawatu Beef Packers between March 1993 and August 1994 which had been evaluated for beef marbling standard (BMS), beef fat standard (BFS) and beef colour standard (BCS) were used to derive overall meat quality score. Overall meat quality score in the Japanese grading system is determined by the lowest grade from: semi-objective assessment for BMS, BFS and BCS; and subjective assessment for meat brightness, firmness and texture, fat lustre and quality. Subjective measures of meat and fat quality are not routinely recorded at this plant and therefore overall meat quality score could only account for the three recorded items. The majority of Angus and Hereford carcasses (84.0 and 82.9%) had an overall meat quality score of 1 (inferior) and no carcasses had score 5 (excellent).

Improvement of one grade in BMS (or BFS) for Angus carcasses decreased the proportion of score 1 carcasses to 12.8% (or 74.7%) and improved overall meat quality score from an average of 1.17 to 1.96 (or 1.29). A change of one grade in BMS (or BFS) for Hereford carcasses decreased the proportion of score 1 carcasses to 16.1% (or 66.8%) and changed overall meat quality score from an average of 1.18 to 1.90 (or 1.35).

Selection based on a well-designed progeny test would take 5 (or 9) years to improve BMS (or BFS) by one grade. Biological factors introduce a lag of at least six years from

the start of test matings until there can be widespread harvest of beef cattle with improved meat quality. Selection for BMS can improve overall meat quality score more effectively and more rapidly than selection for other meat quality traits.

Some Angus sires used in New Zealand are sourced from North America where sire expected progeny differences (EPD) for carcass traits are based on performance of feedlot finished progeny. Sires may rank differently based on progeny records from feedlot-finished cattle (North America) and pasture-finished progeny performance in New Zealand. The objective of this study was to determine importance of genotype by environment interaction effects when sires from a New Zealand Angus progeny test programme were evaluated based on pasture-finished and feedlot-finished progeny records.

Fourteen Angus sires were evaluated for live weight, carcass and meat quality traits based on records from pasture and feedlot finished steer progeny. Estimated breeding values (EBV's) of sires were obtained using a Best Linear Unbiased Prediction (BLUP) procedure. Correlations between sire EBV's estimated from pasture and feedlot-finished progeny records ranged from -0.16 (for meat colour) to 0.50 (for subcutaneous fat depth). There were no significant ($P<0.05$) sire by environment interaction effects, which may have due to differences in site and method of measurement of traits and different slaughter facilities. Rank correlations between sire EBV's ranged from -0.13 (for fat colour) to 0.49 (for subcutaneous fat depth). Small negative rank correlations between sire EBV's were obtained for five of the eight traits analysed indicating sires tended to rank differently based on pasture or feedlot finished progeny records.

Keywords: Angus, Hereford, selection, marbling, fat colour, meat colour, progeny test, feedlot, pasture, genotype by environment interaction

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