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A STUDY OF THE RELATIONSHIPS BETWEEN GROWTH,
CARCASS AND MEAT CHARACTERISTICS OF
ANGUS STEERS

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ABSTRACT

Growth, defined as change in weight, may be considered the most important single characteristic of slaughter cattle. Fast-growing cattle may have better food conversion and reach slaughter early. The end-products in a beef production business, namely, carcass and meat, have properties which determine consumer acceptability. This study focussed attention on growth, carcass and meat characteristics in cattle. Literature was reviewed on factors that influence variability in these traits and relationships reported in the literature between some of the traits were summarised.

Records on 117 Angus steers born in 1975 and 1976 (years 1 and 2) were analysed by the least squares method of fitting constants. Data included birth weight, calf milk consumption pre-weaning average daily gain (ADG), weaning weight, post-weaning ADG, yearling weight, 2-year weight, finish (30-month) weight, carcass weight, kidney and channel fat weight, eye muscle width, depth, and area, fat depth, fat trim percentage, intra-muscular fat percentage, sarcomere length, meat tenderness, muscle pH, and colour, lean percentage and bone percentage.

Fixed-effects constants fitted to growth data were: herd, age of dam and peri-natal treatment (calving on pasture or sawdust pad). Covariance analysis was adopted with 3 covariates: dam autumn liveweight, calf birth weight, and milk consumption. Factors fitted to post-slaughter data were: maturity, slaughter lot and pre-slaughter fasting, with 3 covariates, carcass weight, pre-weaning ADG, and post-weaning ADG.

Results were inconsistent between years. Therefore, few factors were conclusively judged to be important sources of variation in the traits studied. Herd influenced milk consumption ($P < 0.05$) and pre-weaning ADG in year 1, and weaning and yearling weight ($P < 0.01$) in year 2. Age of dam did not affect growth traits ($P > 0.10$). Treatment was unimportant to pre-weaning growth in both years, but year 1 analyses suggested that it affected post-weaning ADG ($P < 0.01$) and finish weight ($P < 0.05$). This result may be attributed to chance.

Regression on dam weight was non-significant for all growth traits. Calf birth weight was found to be an important factor as far as various growth traits in year 2 were concerned, namely, weaning weight ($P < 0.01$), and milk consumption, pre-weaning ADG and yearling weight ($P < 0.05$). Regression of weaning weight on birth weight approached significance ($P < 0.10$), but birth weight was otherwise unimportant in year 1. Milk consumption influenced weaning weight ($P < 0.05$) in year 1; approached significance for its effect on pre-weaning ADG and yearling weight in year 1, and weaning and 2-year weight in year 2 ($P < 0.10$).

Maturity did not affect post-slaughter characteristics other than eye muscle depth ($P < 0.05$) in year 2. Slaughter lot was responsible for variation in eye muscle width ($P < 0.001$) and dressing-out percentage ($P < 0.01$) in year 1; dressing-out percentage and bone percentage ($P < 0.001$) in year 2.

Four-day pre-slaughter fasting affected few carcass or meat traits adjusted for carcass weight by covariance analysis. The results were inconsistent between years. In year 1, fasting affected dressing-out

percentage ($P < 0.001$) only, while in year 2 such effect was not apparent ($P > 0.10$), but it was appreciable on other traits: eye muscle width and meat tenderness ($P < 0.05$) and sarcomere length ($P < 0.001$).

Regression of various traits on carcass weight was significant: dressing out percentage, kidney and channel fat, fat depth, intra-muscular fat percentage, fat trim percentage, eye muscle depth, eye muscle area, sarcomere length, and bone percentage in year 2; it was significant for dressing-out percentage and kidney and channel fat in year 1. Pre- and post-weaning ADG were less important covariates: the former was significant to eye muscle depth, dressing-out percentage, intra-muscular fat percentage and bone percentage in year 2, but non-significant in year 1. The latter approached significance in eye muscle area, dressing-out percentage, fat trim percentage and bone percentage in year 2 ($P < 0.10$).

Residual sums of squares were used to estimate phenotypic correlations between traits studied. Correlation coefficients between growth traits were positive and medium to high except those between early growth (pre-weaning ADG, and birth, and weaning weights) and post-weaning ADG, which were negligible. Pre-weaning ADG and weaning weight had a perfect correlation coefficient ($r = 1.0$) in both years. Estimates between growth and carcass traits varied widely; notable were those for post-weaning ADG, 2-year weight, and finish weight with carcass weight, which were high in both years ($r = 0.86, 0.80$; $r = 0.80, 0.85$; and $r = 0.92, 0.92$, respectively).

Carcass traits were mostly positively correlated, with low to medium coefficients between them. Lean percentage had a strong negative correlation with fat trim percentage ($r = -0.71$), but bore little relationship with other traits. Correlation coefficients between carcass and meat traits were mostly positive, but low and inconsistent between years. Carcass weight was related to most fatness attributes of the carcass and meat. Most meat traits were positively correlated with each other with low and medium correlation coefficients.

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Any inadequacies, or inaccuracies in this thesis are the sole responsibility of the author and should not be viewed as shared responsibility with any of the organizations or persons who offered help or views as stated or implied in the foregoing paragraphs.

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