

**GENETIC ANALYSIS OF TEMPERAMENT
AND ITS RELATIONSHIPS WITH PRODUCTIVE
AND ADAPTIVE TRAITS IN TROPICAL BEEF
CATTLE**

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the basis of qualifications, research experience and publications (UNE
December 1996)

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

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Signature

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Confidentiality Clause

In respect of some results derived from Cattle and Beef Industry Cooperative Research Centre (Meat Quality) data sets, a confidentiality agreement exists, that precludes public release of the information before 31st December 1998.

In particular, Chapter 3 outlines differences in temperament scores between sires of different breeds. The Cattle and Beef Industry Cooperative Research Centre (Meat Quality) is required to lodge these results with their sponsoring breed societies for a period of 6 months before public release. It is expected that readers of this thesis will respect this confidentiality.

Abstract

“Temperament” is defined as an animal’s behavioural response to handling by humans. Experiments were conducted in zebu-derived herds grazed at pasture in the dry tropics of Central Queensland, to: 1)determine the best method of measuring temperament; 2)investigate whether temperament can be manipulated by genetic or non-genetic means; 3)identify genetic and environmental factors that affect temperament; 4)estimate relationships between temperament and productive and adaptive traits; 5)calculate effects of inbreeding on temperament and productive and adaptive traits; and 6)determine responses to selection for temperament, high EBV for weight at 600 days and low EBV for rectal temperature.

Subjective and objective measures of temperament were evaluated. Correlations between different measures of temperament were moderate to low and subjective tests were not sufficiently correlated with the objective measure to justify their use. The objective flight speed score was the most heritable of the tests examined, and was recommended as the test of choice for use in breeding programs using zebu derived animals. Even a single flight speed score was moderately heritable, but use of average of two or three flight speed scores substantially increased heritability. Age at measurement, breed and drenching to control gastrointestinal helminths had significant effects on temperament scores. Other factors such as sex, cow age, treatment with hormonal growth promotants and normal vs. early weaning did not affect temperament scores. It was concluded that temperament was unlikely to be modified significantly by practices such as intensive training of young animals, with the best option to improve temperament being through selection for an objective temperament score.

Direct responses to a single generation of divergent selection for flight speed score showed that selection for temperament was effective in modifying temperament of progeny. Correlated responses to selection for flight speed score indicated that, under extensive grazing systems, the economic value of temperament was derived mainly through increases in production costs. However, other experiments showed that animals with good temperaments grew faster in a feedlot and lost less weight during long distance transport than animals with poorer temperaments. Together with literature reports, this indicated that under intensive systems, the economic value of temperament was also derived through losses in production

associated with poor temperament.

Selection for high EBV for weight at 600 days increased weights at all ages from birth to two years, but did not always increase mature cow weights. Both direct and maternal genetic components of weights increased due to selection. Calf birth and mature cow weights were restricted due to effects of environmental stressors, ensuring negative consequences of selection for high growth rate on calf birth and mature cow weights were not completely expressed in the tropics. Resistance to heat stress and scrotal sizes were improved, but feed conversion efficiency and female fertility did not change through selection for high growth rate. Tick resistance improved in a relatively tick-susceptible line but did not change in a more resistant line. Worm resistance decreased in the more resistant line but did not change in the more susceptible line. There were no changes in buffalo fly counts, temperament or carcass or meat quality attributes due to selection for high growth rate. Inbreeding had adverse effects on all performance traits examined. However, effects over the 0 – 20% range of inbreeding that existed were generally minor, and except for some growth and fertility traits, were not of statistical, economic or biological significance. Selection for high growth readily overcame any deleterious effects of inbreeding on weights.

Selection for heat resistance was very effective in reducing rectal temperatures. Small correlated increases occurred in both tick and worm resistance in response to selection for low EBV for rectal temperature. Changes also occurred in the pattern of fat distribution. Carcasses from selected animals had higher levels of marbling and possibly lower levels of subcutaneous fat relative to carcasses from controls. Marbling has a very high economic value and further studies to investigate the mechanism of increased marbling in this line are warranted. Selection for low EBV for rectal temperature may reflect selection for factors other than resistance to heat stress per se (e.g., activity levels, metabolic rate or fat distribution).

Methods for determining relative economic values of temperament in beef production systems and strategies for inclusion of temperament in formalised breeding objectives for tropical areas are discussed. New areas of research are also suggested.