THE MEASUREMENT OF TEMPERAMENT IN CATTLE AND THE EFFECT OF EXPERIENCE AND GENOTYPE

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SUMMARY

The temperaments of one- and two-year-old bulls and heifers of six genotypes were individually assessed in five different situations by recording aspects of their behaviour. All of the scores were significantly positively correlated with each other. In general, Brahman cross cattle had higher scores (i.e. reacted more violently) than Africander cross cattle which in turn had higher scores than British breeds. Nematode infestation generally depressed the temperament scores. However the differences between genotypes and the effect of nematode infestation depended on the test situation chosen. Heritabilities were calculated for the score from three of the tests.

INTRODUCTION

Cattle producers regard the behaviour or temperament of cattle as an important trait (Elder et al. 1980a, 1980b; Hassall 1974) but there has been little scientific study of this problem. For scientific research on this trait it is necessary to be able to score or measure the temperament of each animal and, to be useful, a score must be correlated with behaviour during normal handling procedures. Hearnshaw et al. (1979) described a temperament scoring system and reported that Bos indicus cross cattle had worse temperaments than B. taurus breeds. However the differences between breeds may depend on the scoring system used. This paper compares five tests of temperament and examines the effects of genotype and of the past experience of the cattle on these scores.

MATERIALS AND METHODS

Animals and experimental treatments

The animals used in this experiment were from the 1978, 1979 and 1980 calvings at the CSIRO Tropical Cattle Research Station 'Belmont'. There were six breed groups: Africander cross (AX), Brahman cross (BX), Hereford-Shorthorn cross (HS), grade Brahman (GB), grade Africander (GA) and reciprocal crosses between the AX and BX lines (RX) (Anon. 1976). The total number of animals in these genotypes were 209, 146, 145, 31, 108 and 318 respectively. The crossbred animals were all F2 or later generations except for a small number of F1 RX animals.

All 1978 calves and 1979 heifers were divided between three different preweaning treatments - the normal station management group were only handled twice prior to weaning: the parasite-free group were dipped and treated for helminths every three weeks: the parasite-free control group were handled every three weeks. The AX, BX, GA and RX genotypes all only received the normal station management so there was some confounding of preweaning treatment with breed. The 1980 calves and 1979 bulls received normal station management.

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Postweaning half the 1978 and 1979 heifers were injected with anthelmintic (WF) every 4 weeks immediately prior to the temperament test; the remaining half were untreated controls (WFC).

The 1979 and 1980 bulls were either infected with a mixed culture of nematode larvae three weeks prior to testing and bled (WORM); or were bled but not infected (BLED); or were controls neither bled nor infected (CONTROL).

The 1978 calves were tested at 21 and 22 months of age and the 1979 and 1980 calves when 9 and 10 months old.

Data collection

The behaviour of the cattle in five different situations was observed:

(i) CRUSH test. The cattle were held in a crush for tick counting. (1978 heifers, 1979 bulls and heifers, 1980 bulls)

(ii) RACE test. The cattle were held in a panel of a race. (1978 bulls, 1979 bulls, 1980 heifers)

(iii) BAIL test. The cattle were held in a crush and restrained in a headbail. (1978 and 1980 bulls)

In these three situations the vigour of movements (MOV) was rated on a seven point scale from stands quietly (1) to struggles violently (7), and the degree of audible respiration (BLO) was rated from no audible respiration (1) to blowing frequently or snorting (4). In the BAIL test nearly all animals scored 1 for BLO so only the MOV score from this test has been analysed. The occurrences of bellowing, kicking and lying down were also recorded but as these responses occurred infrequently these data were not analysed further.

(iv) POUND test. The cattle were allowed individually into a circular yard six metres in diameter in the centre of which stood the observer. The yard was divided into quadrants by two lines. The number of times an animal crossed a line during one minute (LIN) was recorded and its speed of movement (SPE) was rated from stands still (1) to gallops (5). (1980 bulls)

(v) YARD test. Animals were allowed individually into a yard 20 metres by 30 metres. The observer walked towards the animal and closest distance that the animal would tolerate between them - its flight distance (FD) - was measured in paces. (1980 bulls)

Statistical analysis

Each of the scores was subjected to least-squares analysis of variance based on a model which included the effects of age-sex group, breed, treatment, and dam age. Preweaning treatment and dam age were consistently non-significant and so were eliminated from the final model. In order to test the significance of test x breed interactions the differences between scores from the CRUSH and BAIL tests (1980 bulls), and between the RACE and CRUSH tests (1978 bulls) were analysed using the same model.

In order to estimate between-sire variance components each age-sex group was analysed separately using a model including breed, sire within breed, and treatment, but only significant treatments were included. Heritabilities were calculated from these variance components for the first three tests and the average heritability for each test was calculated from the age-sex groups on which that test had been performed.

RESULTS

Correlations between scores

The CRUSH test was performed twice on the 1979 bulls six weeks apart and the

correlations between scores were 0.45 for MOV and 0.37 for BLO. The RACE test was also performed twice six weeks apart on the 1978 bulls and the correlations were 0.66 for MOV and 0.54 for BLO. The correlations between the scores on the 1980 bulls are given in Table 1. All these correlations were significant ($p<0.01$).

TABLE 1 Correlations between temperament scores of 1980 bulls

	CRUSH BLO	BAIL MOV	POUND SPE	POUND LIN	YARD FD
CRUSH MOV	0.75†	0.37	0.51	0.34	0.47
CRUSH BLO		0.35	0.49	0.37	0.45
BAIL MOV			0.35	0.37	0.39
POUND SPE				0.60	0.71
POUND LIN					0.45

† $p<0.001$ for all coefficients.

Effects of genotype and experience

The least-squares means for each of the scores is given in Table 2. In the BAIL test BX, GB and RX genotypes had the highest scores, the HS the lowest, and the AX and GA were intermediate. The breed differences are similar in the other tests but less distinct and in fact were non-significant in the POUND and YARD tests, The Brahman-derived genotypes and Africander-derived genotypes had similar scores in the CRUSH and RACE tests but the Brahmans had higher scores on the BAIL test and this caused significant breed x test interactions. The accuracy of the estimates of the breed effects may have been influenced slightly by the partial confounding of breed and preweaning treatment.

Infestation with internal parasites decreased the temperament scores especially in the BAIL test and regular anthelmintic treatment increased the scores. Including live weight in the least-squares model as a covariate did not alter the effect of worm infestation. Although not significant, there were trends for calves from older dams and calves with extra preweaning handling to have lower scores.

Heritabilities

The average heritabilities (±s.e.) in the CRUSH test were MOV 0.25 ± 0.20, BLO 0.20 ± 0.16, in the RACE test were MOV 0.17 ± 0.21, BLO 0.57 ± 0.22 and in the BAIL test 0.67-t-0.26.

DISCUSSION

The MOV score in the BAIL test is similar to the temperament score of Hearnshaw *et al*. (1979) and the ranking of the breeds is also similar. However other tests do not show the same breed differences. The high correlation between SPE and FD in Table 1 and other unpublished data suggest that these scores have the highest repeatability of all those described. Therefore, poor repeatability can not explain the non-significance of breed differences in the SPE and FD scores. The smaller number of animals tested may have contributed to this lack of breed differences. It appears that an animal's temperament depends on the situation in which it is observed. Hence an individual or breed may score high in one test but low in another.

The depressed score of worm infected cattle could reflect generally depressed activity due to the acute worm infestation. It appears that this effect of worms is not due to an effect on live weight. The higher scores of the

TABLE 2 Least-squares means for factors affecting temperament

	CRUSH		RACE		BAIL	POUND		YARD
	MOV	BLO	MOV	BLO	MOV	SPE	LIN	FD
Breed								
HS	1.39[a]	1.15[a]	1.51[a]	0.95[a]	2.28[c]	1.44	8.01	4.34
GA	1.77[b]	1.37[ac]	2.17[b]	1.35[cd]	2.35[c]	1.76	6.60	4.27
AX	1.92[b]	1.24[ac]	1.93[ab]	1.11[ac]	2.64[ac]	1.95	10.14	5.61
GB	2.18[b]	1.87[b]	2.07[ab]	1.88[b]	3.49[ad]	1.71	12.27	5.20
BX	1.76[b]	1.76[bc]	2.47[b]	1.61[bd]	4.02[d]	1.80	13.23	5.78
RX	1.92[b]	1.49[bc]	2.38[b]	1.65[bd]	3.40[ab]	2.09	12.68	5.87
Treatments								
CONTROL	1.92	1.64[a]	2.29[a]	1.77[a]	2.15[a]			
BLED	1.90	1.43[ac]	2.02[a]	1.11[b]	3.79[b]	1.82	11.66	5.56
WORM	1.65	1.26[bc]	1.77[b]	1.39[b]	2.65[a]	1.86	9.5	5.01
WFC	1.65[a]	1.26[a]						
WF	2.00[b]	1.62[b]						
Age-Sex								
1978M			1.83	1.51[ac]	3.03			
1978F	2.02	1.45						
1979M	1.70	1.51	2.44	1.71[a]				
1979F	1.73	1.26						
1980M	1.84	1.55			3.03	1.84	10.59	5.29
1980F			1.82	1.06[bc]				

Levels within a factor which do not share a common superscript are significantly different ($p<0.05$). There were no significant differences within factors with no superscripts.

anthelmintic treated cattle could be due to their low worm burden or could be due to the unpleasant experience of being injected shortly before the temperament test was carried out.

Although the precision of the heritability estimates is limited by the number of animals tested, they suggest that selection of bulls and heifers with low scores would result in improved temperament. However before any of these tests can be used in selection programmes or for experimental purposes we need to know which of these tests is correlated with the behaviour of cattle that interferes with routine handling in paddocks and yards.

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