FAT DEPOSITION IN THE HINDQUARTERS OF BRAHMAN, HEREFORD AND BRAHMAN X HEREFORD STEERS

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Summary

Twenty-six Brahman, 27 Hereford and 25 Brahman x Hereford F_1 steer sides (carcase weight 112 to 354 kg) were divided into quarters at the 10th - 11th ribs and totally dissected to study the influence of increasing fat on hindquarter composition. Subcutaneous fat grew faster than intermuscular fat in the hindquarters of all three breed types. With hindquarter intermuscular fat, Herefords had a significantly greater weight, proportion and growth rate than the Brahman x Hereford group, and a non-significantly greater weight and proportion than Brahmans. Hindquarter shape for which premiums of up to $40 are paid, is likely to be enhanced by both subcutaneous and intermuscular fat depots in Hereford steers relative to Brahman x Hereford steers.

Introduction

Conformation or shape is appraised in many carcase evaluation systems in the world (Bass *et al.*, 1981; Kempster *et al.*, 1982; Sorenson, 1988; Wood, 1988). This appraisal is often based on the shape of the hindquarter (Anon., 1987; Eldridge and Ball, 1992). Many cattle and carcases traded in Australia are derived from Hereford or Brahman x Hereford *(taurindicus)* types, and premiums of up to $40 per carcase are paid on the basis of shape of the hindquarter. Evidence has been produced, showing that the "desirable" hindquarter shape which attracts the premium payments may be attributed to fat, particularly subcutaneous fat (Taylor *et al.*, 1990; Eldridge and Ball, 1992; Johnson *et al.*, 1996). In the current study, 78 steer carcases were dissected at different weights, in order to show the influence of increased fattening on the hindquarter.

Materials and Methods

Brahman, Hereford and Brahman x Hereford F_1 steers were slaughtered at 100 kg intervals from about 200 kg to about 600 kg liveweight. This sequential slaughter of animals within breed produced 26 Brahman, 27 Hereford and 25 Brahman x Hereford carcases weighing from 112 kg to 354 kg. After chilling for 24 hours at 2°C, the right side of each carcase was dissected into its constituent tissues, muscle, bone, fat and connective tissue. The two dissectible fat depots, subcutaneous and intermuscular, were weighed separately. Each side was dissected as quarters, with the hindquarter and forequarter severed between the 10th and 11th ribs. The hindquarter constituted approximately 52% of side weight.

The growth of the subcutaneous and intermuscular fat depots, relative to hindquarter weight and side weight, within and among breeds, was studied by regression analysis.

Results

Curvi-linear analysis did not significantly improve the accuracy of simple linear analysis, so only the latter is reported in these results. Because regressions of intermuscular, subcutaneous and total dissectible (intermuscular plus subcutaneous) fat over side weight gave similar conclusions to those regressions over hindquarter weight, only the Figures for the latter are discussed.

Figures 1, 2 and 3 show the breed regressions for the weights of intermuscular fat, subcutaneous fat and total dissected fat over hindquarter weight, respectively. For intermuscular fat (Figure 1), the slopes of the Hereford and Brahman steer carcases were significantly greater than that of the Brahman x Hereford carcases. There were no significant differences between the regression slopes of the Hereford and Brahman carcases.

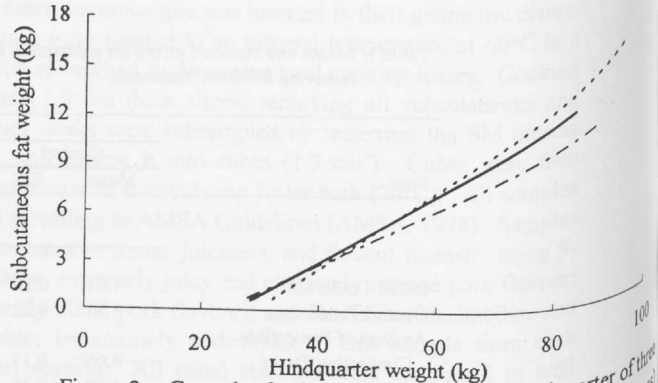

Figure 2. Growth of subcutaneous fat in the hindquarter of three breed types of cattle (——Hereford - - - - Brahman – - – Cross)

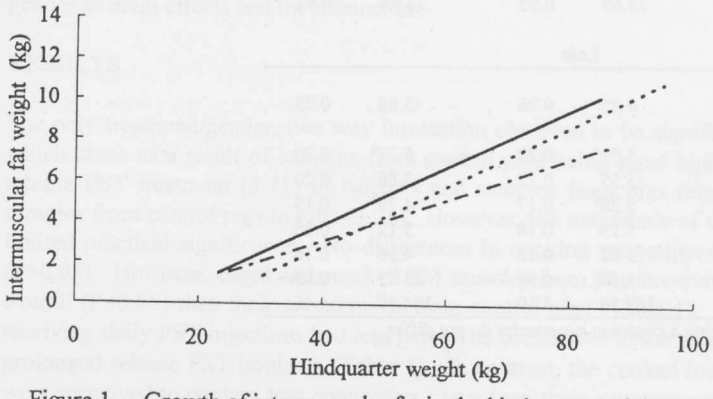

Figure 1. Growth of intermuscular fat in the hindquarter of three breed types of cattle (——Hereford - - - - - Brahman – - – -Cross)

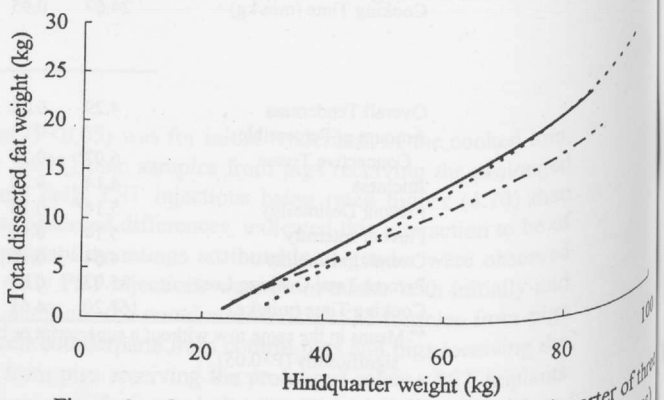

Figure 3. Growth of total dissected fat in the hindquarter of three breed types of cattle (——Hereford - - - -Brahman – - – Cross)

For subcutaneous fat (Figure 2), the Brahman carcases had a significantly greater slope than that of the Brahman x Hereford group, whereas the slope of the Hereford carcases was non-significantly greater than that of the cross-bred steers. Once again, the slopes of the Hereford and Brahman carcases were not significantly different. When total dissected fat weight was regressed on hindquarter weight (Figure 3), the slope of the Brahman carcases was significantly greater than that of the Brahman x Hereford group, the slope of the Herefords was non-significantly greater than that of the cross-bred carcases, and there were no significant differences between Herefords and Brahmans.

Within each of these three breeds, subcutaneous fat grew at a significantly greater rate than intermuscular fat, but over the carcase weight range studied (112 kg to about 354 kg), Herefords always had greater weights of intermuscular fat than the other two breed types. Table 1 shows the contribution of subcutaneous and intermuscular fat depots to hindquarter composition in these three breed types at domestic and export carcase weights.

Table 1. **Weights and proportions of subcutaneous, intermuscular and total fat in the hindquarters of light domestic and heavy export carcases***

Breed	Approximate carcase weight (kg+)	Hindquarter weight (kg)	Subcutaneous fat weight (g)	Subcutaneous fat % of hindquarter	Intermuscular fat weight (g)	Intermuscular fat % of hindquarter	Total fat weight (g)	Total fat % of hindquarter
Brahman	192	50	4753	9.5	4258	8.5	9011	18.0
	327	85	13211	15.6	9528	11.2	22739	26.8
Hereford	192	50	4966	9.9	5274	10.6	10240	20.5
	327	85	17507	14.3	10286	12.1	27793	26.4
Brahman x Hereford	192	50	4370	8.7	4088	8.2	12688	16.9
	327	85	14620	12.2	7714	9.1	22334	21.3

* + From breed regression equations. Values calculated at constant hindquarter weight 192 kg and 327 kg are typical weights of Australian domestic and export carcases respectively

Discussion

In the carcase weight range studied, subcutaneous fat grew at a significantly greater rate than intermuscular fat in each breed group. However, the Hereford carcases, with a relatively high intercept and a relatively large regression coefficient for intermuscular fat, always had a greater weight of intermuscular fat than the other two groups of carcases. This was true of regressions over hindquarter weight or side weight. Table 1 shows that the Hereford carcases (particularly) and the Brahman carcases had a greater weight of intermuscular fat than the cross-bred carcases. The regression coefficient for the Hereford carcases' subcutaneous fat was non-significantly greater than that of the Brahman x Hereford carcases, but increasing at the upper limit of the study (85 kg hindquarter or about 170 kg side weight). This was true also for regressions of total dissected fat weight.

Pure Brahmans are seldom marketed as carcases in Australia. Instead, most of the country's domestic and export carcase trade is derived from British breeds (particularly Herefords) or *taurindicus* types. When premiums are paid for shape, the *taurindicus* cattle and carcases often fail to attract the premiums. Taylor *et al.* (1990) and Johnson *et al.* (1996) attributed this mainly to the relatively slow growth of subcutaneous fat in the cross-bred cattle. However, in the current study, although the Hereford carcases had more subcutaneous fat than the Brahman x Hereford carcases at all marketing weights, they had much more intermuscular fat which grew at a greater rate than that of the Brahman x Hereford steers over the entire weight range. In these two types of carcases, therefore, the weight, proportion and growth rate of intermuscular fat in the hindquarter of the Hereford steers was likely to have a major influence on carcase shape.

Conclusions

The weight, proportion and growth rate of both subcutaneous and intermuscular fat depots have a large differential influence on the composition of the hindquarters of Hereford steers relative to those of Brahman x Hereford steers.

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