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Differences in meat quality and carcass composition of Friesian and Beef breed x Friesian cattle

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The Beef Breed Evaluation programme implemented by the Meat and Livestock Commission in 1972, compares different beef breeds and crosses for growth performance and carcass composition. Meat quality results are given for 108 steers, a sample from a 3-year trial within the programme evaluating dairy-bred cattle out of Friesian dams by a number of sire breeds. The sire breeds evaluated were Aberdeen-Angus, Charolais, Devon, Friesian, Hereford, Simmental, South Devon and Sussex. Comparisons were made on both an 18 month and a 24 month production system. Loin joints were evaluated at the Meat Research Institute. When compared at equal carcass fatness all breeds were judged satisfactory or better for colour, attractiveness and fat to lean ratio of the raw joint. For the roast joint, all breeds were judged satisfactory or better for colour, flavour, juiciness and attractiveness. Differences between breeds were generally small, but significant differences did exist in colour intensity of the raw and roast lean. Some carcass composition results are also reported for the 579 steers from the whole trial. Commercially important differences were found between breeds for killing-out percentage, carcass weight, and percentage of deboned, fat-trimmed joints in the carcass.

Unterschiede in der Fleischqualität und in der Schlachtkörperzusammensetzung der Friesischen sowie gegebenen Rindrasse x Friesische Rasse

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Das durch den Ausschuss für Fleisch und Vieh im Jahre 1972 ausgestaltete Rindvieh-rassenbewertungsprogramm vergleicht verschiedene Rindviehreassen und Kreuzungen in Hinsicht der Bewertung der Wachstumsrate und der Zusammensetzung des Schlachtkörpers. Als Grund der Fleischqualität diente innerhalb des Programmes als Musterkollektion des während 3 Jahre dauernden Versuches 108 Stück junges Rindvieh, die als eine Nachkommen von Friesischen Muttertieren und von Vatertieren mehrerer anderen Rassen gekreuzte Milchrasse bewertet wurde. Die als Vatertiere in Anschlag gekommen Rassen waren: Aberdeen-Angus, Charolais, Devon, Friesische Rasse, Hereford, Simmental, South Devon un Sussex.

Sowohl zwischen einem 18 monatigen, als auch einem 24 monatigen Züchtungssystem wurde verglichen. In dem Fleischforschungsinstitut wurde die Bewertung von Lendengelenken durchgeführt. Der Vergleich bei gleicher /identischer/ Schlachtkörperfettigkeit hat bei allen Rassen eine ausreichende, oder eine noch bessere Bewertung in Hinsicht der Farbe, der attraktiven Wirkung und des Fettes mit Rücksicht auf den mageren Bestand der rohen Lendengelenkenfläche /Lendenstück/ ergeben.

In Hinsicht des gebratenen Lendengelenkes erwiesen sich sämtliche Rassen als ausreichend, oder als noch besser die Farbe, den Geschmack, die Saftigkeit und die attraktive Wirkung betreffend. Die Unterschiede unter den einzelnen Rassen waren im allgemeinen klein, aber signifikante Unterschiede zeigten sich in Hinsicht der Farbenintensität zwischen dem rohen und dem gebratenen Fleischschnitzel.

3.1

Les différences entre la race bovine Friz et le croisement de Friz avec une autre race.
donnée en ce qui concerne la qualité de viande et la composition de la carcasse.

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Le programme qui a été élaboré par la Commission de la Viande et du Bétail en 1972 compare les races bovines différentes à la base du coefficient d'accroissement et la composition de la carcasse.

Le modèle d'essai de collection se composait de 108 jeunes boeufs et dans l'intervalle de trois ans on estimait la production laitière des femelles Friz et celle des femelles descendant des croisements avec les mâles des autres races différentes.

Les races qui pourraient être appréciables comme males étaient les suivantes: Aberdeen-Angus, Charolais, Devon, Friz, Hereford, Simmental, South Devon et Sussex. Les comparaisons se faisaient tant dans le système d'élevage de 18 mois que dans cel-ci de 24 mois. Dans l'Institut de Recherche en Viande on a procédé à l'évaluation des articulations de reins. Vu la substance maigre crue du domaine des articulations de reins /filet/ la comparaison a produit des résultats suffisants ou meilleurs en ce qui concerne la couleur, l'effet attirant et la graisse.

La substance cuite de toutes sortes était suffisante ou meilleure en ce qui concerne la couleur, le goût, le jus et l'effet attirant.

Les différences parmi les espèces étaient petites mais il y avait une différence significante entre les tranches crues et cuites, au point de vue de la force de couleur.

Parmi les 579 boeufs observés il y avait aussi quelques résultats en ce qui concerne la composition de la carcasse.

Различия между качеством мяса и составом полутиши у крупного рогатого скота породы Фриз и скрещенным Фриз

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В 1972 году Комиссия по животноводству и мясной промышленности начала сравнение различных пород крупного рогатого скота и различного скрещивания по их свойствам выращивания и составу полутиши. В течение трёх лет наблюдали 108 молодых бычков, происходящих от коров Фриз и различных пород быков. Среди пород быков были такие: Aberdeen-Angus, Charolais, Devon, Friz, Hereford, Simmental, South Devon, Sussex.

Сравнение проведено между 18 и 24 месячными системами животноводства. В исследовательском институте мясной промышленности исследовали корейку. Ваяя за основу говядину с одинаковой толщиной жира, определили, что в каждом случае хорошим был цвет, внешний вид и жир: мясо соотношение. Сравнивая жареное мясо у каждой породы был хороший цвет, вкус, сочность и внешний вид. Разница между отдельными породами была низкой, но интенсивность цвета значимо отличалась у сырого и жареного нежирного мяса. Авторы показывают и отдельные характеристики 579 молодых бычков, исследованных в течение всего опыта. С точки зрения торговли авторы обнаружили важные различия в отношении выхода после убоя, веса туши и %-ного содержания нежирного мяса.

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Introduction

Beef breed evaluation trials from various centres have shown reasonably clear-cut differences in growth performance and carcass composition. However, much debate still exists on the importance of breed as a factor influencing meat quality characteristics. This paper gives meat quality results for 108 steers, a sample from a three-year trial within the Meat and Livestock Commission's (MLC's) Beef Breed Evaluation Programme. Some carcass composition results are also given for the 570 steers involved in the complete trial.

Material and Methods

The production trials are currently carried out at two units covering the main systems and breeds currently popular, or which show commercial promise. One unit at Inglisteron, near Edinburgh, evaluates calves from suckler herds on two production systems. The second unit, at Sutton Bonington, near Nottingham, examines the performance of dairy-bred cattle out of Friesian dams on two production systems. One system approximates to the popular 18-month system, the other involves slaughter at about two years of age. Sire breeds evaluated to date at Sutton Bonington are Aberdeen-Angus, Charolais, Devon, Friesian, Hereford, Simmental, South Devon and Sussex.

The procedure and results for carcass characteristics in the three-year trial in Beef Breed Evaluation have been given by Kempster, Cook and Southgate, 1979. Briefly, selection for slaughter was based on the percentage of subcutaneous fat in the carcass estimated by a Scanogram ultrasonic machine. After standard slaughter and dressing procedure, carcasses were evaluated using a commercial cutting technique. The left side was divided into 14 standardised joints defined either by reference to skeletal points or by separation of adjacent muscles. Each joint was then deboned and subcutaneous fat trimmed to a maximum of 13 mm and intermuscular fat to a 'saleable level' defined by reference to the methods applied by several major wholesalers. The deboned fat-trimmed primals together with any lean trimming is referred to as saleable meat. In addition, one carcass in four was fully separated into lean, fat, bone and waste. These results are not considered in the present paper.

Untrimmed loin joints (10th thoracic to last lumbar vertebra) were evaluated for meat quality at the Meat Research Institute. Joints were boned, trimmed if necessary and rolled to a 15 cm diameter, and stored at -20°C until required. Raw joints were assessed by a taste panel for:

Fat to lean ratio (much too fatty and subsequently scored +3, to very much under fatty -3)

Overall attractiveness (extremely attractive +7, to extremely unattractive -7)

Joints were then oven-roasted to an internal temperature of 74°C and the *M. longissimus dorsi* (LD) assessed by a taste panel for:

Texture (extremely tender +7, to extremely tough -7)

Flavour (like extremely +7, to dislike extremely -7)

Juiciness (dry 0, to extremely juicy 4)

Colour preference of lean (like extremely +7, to dislike extremely -7)

Overall attractiveness (like extremely +7, to dislike extremely -7)

Lightness of the raw and cooked LD was determined using a Hunter colour difference meter and toughness of the cooked meat using a standard compressive test. Collagen was calculated from hydroxyproline assay. Further details of the MRI beef meat quality evaluation have been given by Rhodes (1976).

Carcass data were analysed using least square models which included the effects of year, sire breed, dam parity, region of Britain from which the calf was sampled and interactions between main effects as appropriate. Adjustments were made to equal age at start of test and to equal carcass subcutaneous fat percentage at slaughter (estimated by visual appraisal of external fat cover). Meat quality assessments were also analysed using least squares models which included the effects of the year, sire breed x system interaction. The data were adjusted to equal carcass subcutaneous fat percentage at slaughter.

Results and discussion

Numbers evaluated for meat quality characteristics and least squares means relating to assessments made on the raw joint are given in Table 1.

Sire breed influenced the amount of collagen as percent of wet weight, meat from Simmental and South Devon crosses had the lowest values about, 0.5, whilst meat from Sussex and Friesian the highest, about 0.6.

Lightness of the LD did not differ significantly between breeds. Only small differences existed in the ratio

of fat to lean of the standard joint: Devon and Angus crosses were judged to have the highest proportion of fat, whilst Charolais, Simmental and South Devon crosses the least. No differences were observed in overall attractiveness of the raw joint. Results for the cooked joint are given in Table 2.

Small, but significant breed differences existed in lightness of the roast lean, on average a range of 4 units was found between Sussex crosses, the lightest, and Friesian crosses, the darkest. Toughness did not differ between breeds and all meat was judged slightly to moderately tender. All breeds were judged acceptable for flavour, slightly juicy and on average there was little evidence of difference between breeds. Panel colour score and overall attractiveness did not show any marked breed differences but, in both cases, there was some evidence of a dislike of paler cooked meat.

Some carcass characteristics for cattle from the three-year trial are given in Table 3. Killing-out percentage (based on weights of dissected components) was highest for Charolais crosses on both systems of production. Differences in carcass weight reflected those found in commercial recording in Britain, with Charolais, Simmental and South Devon having the heaviest carcasses on both systems. Although comparison was made at the same level of subcutaneous fat, significant differences were recorded in saleable meat percentage. These were largely a reflection of differences in saleable meat to bone ratio. Sussex, Charolais and Angus cross cattle had higher saleable meat percentages than Friesian cattle in both production systems. Results for the percentage of saleable meat occurring in the higher-priced cuts confirm the general finding that there is little variation in tissue weight distribution. Differences between sire breeds were small, Simmental and Charolais crosses tended to have more lean in the higher-priced cuts. Commercially important differences were therefore restricted to killing-out percentage and saleable meat percentage.

In general, there were only small breed differences in meat quality. Darker meat tended to be preferred, but differences in the percentage of collagen in the LD did not influence toughness or texture. Flavour and juiciness of the loin joint showed no consistent breed differences and, along with texture, were judged satisfactory in all breed crosses.

References

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- Rhodes, D. N., 1976. Eating quality of meat - the interaction of composition, preference, regulation and marketing. Proc. 22nd European Meeting of Meat Research Workers, Sweden, 1976.

TABLE I Least square means for meat quality of the raw loin joint

| Sire breed | No. | Collagen [#] | Lightness* | Fat to [#] lean ratio | Overall [#] attractiveness |
|----------------|-----|-----------------------|------------|-----------------------------------|--|
| Aberdeen-Angus | 11 | 0.57 | 33.8 | +0.7 | +2.2 |
| Charolais | 23 | 0.55 | 32.9 | +0.2 | +2.3 |
| Devon | 17 | 0.55 | 33.4 | +0.8 | +1.7 |
| Friesian | 17 | 0.61 | 31.3 | +0.6 | +1.6 |
| Hereford | 10 | 0.57 | 33.7 | +0.4 | +2.7 |
| Simmental | 20 | 0.52 | 31.3 | +0.2 | +1.4 |
| South Devon | 5 | 0.49 | 31.0 | +0.2 | +2.4 |
| Sussex | 5 | 0.59 | 34.2 | +0.3 | +1.9 |

[#] as % of wet weight

[#] panel scores

* lower values indicate darker meat

TABLE 2

Least square means for meat quality of the cooked joint

| Sire Breed | Lightness | Toughness [#] | Texture [#] | Flavour [#] | Juiciness [#] | Colour [#] | Overall [#] attractiveness |
|----------------|-----------|------------------------|----------------------|----------------------|------------------------|---------------------|--|
| Aberdeen-Angus | 45.8 | 15.4 | +3.1 | +1.8 | +1.3 | +1.5 | +1.5 |
| Charolais | 46.1 | 15.7 | +2.2 | +1.7 | +1.4 | +1.5 | +1.9 |
| Devon | 46.7 | 12.9 | +3.4 | +1.3 | +1.6 | +1.0 | +1.4 |
| Friesian | 43.2 | 13.5 | +3.5 | +1.6 | +1.1 | +1.7 | +1.8 |
| Hereford | 45.2 | 17.4 | +1.6 | +1.2 | +1.4 | +1.5 | +1.9 |
| Simmental | 44.3 | 15.2 | +2.3 | +1.1 | +1.4 | +1.6 | +2.0 |
| South Devon | 45.3 | 13.9 | +2.1 | +1.1 | +0.9 | +1.4 | +1.4 |
| Sussex | 48.5 | 13.6 | +1.1 | +1.1 | +1.6 | +0.9 | +1.5 |

[#] total work in Joules x 100[#] panel scores

TABLE 3

Least squares means for carcass characteristics

| Sire breed | Number of carcasses | | Killing-out percentage | | Carcass weight (kg) | | Saleable meat in carcass (%) | | Percentage of total saleable meat in higher-priced cuts | |
|----------------|---------------------|------|------------------------|--------------------|---------------------|------------------|------------------------------|---------------------|---|-------------------|
| | 16mo | 24mo | 16mo | 24mo | 16mo | 24mo | 16mo | 24mo | 16mo | 24mo |
| Aberdeen-Angus | 24 | 22 | 48.5 _d | 48.7 _d | 180 _{fg} | 221 _e | 71.4 _{ab} | 71.3 _a | 44.5 _{ab} | 44.0 _a |
| Charolais | 32 | 30 | 51.5 _a | 51.6 _a | 262 _a | 317 _a | 71.6 _a | 70.8 _{ab} | 44.9 _{ab} | 44.0 _a |
| Devon | 57 | 61 | 48.5 _d | 49.0 _d | 186 _{fg} | 242 _d | 70.7 _{bc} | 70.2 _{bc} | 44.6 _{ab} | 43.8 _a |
| Friesian | 47 | 46 | 49.6 _{cd} | 49.7 _{cd} | 216 _d | 266 _c | 70.2 _c | 69.7 _c | 44.5 _{ab} | 43.8 _a |
| Hereford | 47 | 43 | 49.1 _{cd} | 50.1 _{bc} | 196 _f | 245 _d | 70.8 _{bc} | 70.1 _{bc} | 44.4 _{ab} | 43.9 _a |
| Simmental | 33 | 32 | 50.4 _b | 50.4 _b | 244 _b | 286 _b | 71.4 _{ab} | 70.3 _{bc} | 45.1 _a | 44.3 _a |
| South Devon | 24 | 23 | 50.1 _b | 50.7 _b | 228 _c | 279 _b | 71.4 _{ab} | 70.5 _{abc} | 44.2 _b | 43.3 _b |
| Sussex | 29 | 11 | 49.7 _{bc} | 49.2 | 202 _{ef} | 247 | 71.9 _a | 71.2 | 44.2 _b | 43.5 |

Means having different subscripts differ at P<0.05

[#] top piece (ex leg), rump, sirloin, fore-rib and psoas