THE EFFECT OF BRAHMAN PERCENTAGE ON CONSUMER EVALUATION OF BEEF

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SUMMARY

The effect of Brahman percentage on the eating quality of cooked beef, as assessed by an untrained panel, was examined. Steaks were taken from 125 yearling carcasses (electrically stimulated) which ranged in Brahman percentage from 0% to 100%, at 12.5% intervals. Three taste test dinners were conducted where participants evaluated steaks cooked to their preferred degree of doneness, for tenderness, juiciness, flavour and overall acceptability attributes. Results indicated that Brahman percentage did not have any significant effect on either subjective evaluations of eating quality, or laboratory measurements of toughness.

Introduction

The results regarding the influence of breed on the eating quality of beef have been somewhat equivocal. At the laboratory level, several U.S. workers (Wheeler *et al.*, 1990a; Whipple *et al.*, 1990; Shackelford *et al.*, 1991) have reported that meat from *Bos indicus* cattle is generally tougher than meat derived from *Bos taurus* genotypes.

At the consumer level, Kohun *et al.* (1990) substantiated these findings when they reported untrained consumers found Brahman steaks tougher than steaks from either 50% or 0% Brahman (i.e. Hereford). However, in two large Australian consumer studies, Kingston *et al.* (1987) and Hearnshaw (1992) found no significant breed effect when comparing meat derived from cattle which were at least 50% Brahman with *Bos taurus* cattle. The discrepancy between results of previous findings may be caused by the influence of extrinsic factors influencing meat quality.

The aim of this experiment was to investigate whether there was a threshold Brahman percentage at which consumers detected a decline in meat eating quality, particularly toughness, in yearling cattle raised and slaughtered contemporaneously.

Materials and Methods

Animals, pre-slaughter and slaughter procedure

Boneless striploins were collected from carcasses of 125 Brahman, Hereford and Brahman-Hereford cross steers produced in a crossbreeding program (NSW Department of Agriculture, Hearnshaw, 1992) designed to examine the effects of Brahman percentage on meat quality traits. The steers ranged in Brahman percentage from 0% to 100%, at 12.5% intervals and had a range of heterozygosity percentages (0% to 100%).

Pre-weaning, steers from each Brahman percentage group were run in three herds at separate locations. Steers were weaned at an average age of eight months. Post-weaning, they were managed on improved temperate pasture, as a single herd and slaughtered when they were assessed to be 220kg, dressed carcass weight (4-8mm fat at 12/13 rib) (average age of 18 months). Steers were transported to the abattoir, held overnight in pens with water available and slaughtered the following day using captive bolt stunning.

Carcass treatment

Carcasses were electrically stimulated using low voltage (<45V) stimulation which occurred within five minutes of stunning. Carcasses were then chilled and boned 48 to 78 hours post-slaughter. Striploins (*M. longissimus thoracis et lumborum*) were collected for both objective and subjective meat quality

evaluations. The two striploins from each carcass were packaged and blast frozen at -32°C for four days then stored at -20°C. Prior to the tastings, the frozen striploins were cut on a band saw into steaks of 22 mm thickness.

Laboratory measurements

Ultimate pH measurements were performed on raw meat samples (thawed at 4°C for 48 hours) and sarcomere length was determined using frozen samples of raw meat (Shorthose and Harris, 1990). Objective measurements of tenderness (Warner Bratzler (WB), Instron compression) were performed on the meat after cooking in a water bath at 80°C for one hour and then cooling (Harris and Shorthose, 1988).

Subjective evaluations

Three taste test dinners were conducted using participants who were untrained in meat quality evaluations. Prior to the tasting sessions, participants were asked to nominate their preferred degree of doneness, given the choice of rare, medium-rare, medium, medium-well done and well done. Steaks were thawed at 1°C for the four days prior to the taste test dinners, then cooked on a hot plate (estimated temperature was approximately 200°C) to the degree of doneness requested by participants. The same chef was employed for the three dinners.

At the taste test dinners, a brief introductory talk was given to inform participants of the tasting procedures for the evening. Groups of four steaks (of different Brahman percentages) were cooked together on the hot plate for the same period of time, to the degree of doneness requested by participants. Each group of four steaks was selected such that there was a minimum of at least 50% range in Brahman percentage. Each steak was cut into four cubes (approximately 2 cm^3), and one cube from each steak was then threaded onto a skewer in a predetermined order. Consequently, participants were allocated into groups (of four) within each tasting, and then presented with the skewer and asked to evaluate each cube individually for tenderness, juiciness, flavour and overall acceptability. One hundred and twenty participants tasted steaks from 120 steers over the three tasting dinners. The subjective evaluations were scored on a continuous five point scale from 1 (very tender, very juicy, very good acceptability and very strong meat flavour) to 5 (very tough, very dry, very poor acceptability and very weak meat flavour).

Statistical analysis

The effect of Brahman percentage on the objective measurements was examined using a least squares model which contained terms for percentage Brahman and heterozygosity, both as linear effects. Quadratic terms for percentage Brahman and heterozygosity and a Brahman x heterozygosity interaction were tested, but were found to be non significant ($P>0.05$) and were removed from the model.

The subjective evaluations were tested using a least squares model which contained terms for percentage Brahman and heterozygosity (linear), tasting (fixed effect), group within tasting (fixed effect) and taster (random effect). Quadratic terms for percentage Brahman and heterozygosity, and a Brahman x heterozygosity interaction were also tested and found to be non significant ($P>0.05$) and were removed from the model.

Results

The mean values (and standard deviations) for laboratory measurements and subjective evaluations are presented in Table 1. It can be observed that for subjective evaluations, participants used the whole scale (1 to 5) when evaluating meat quality attributes and that on the whole, participants scored the meat as being of average quality, that is, score 3.

Brahman percentage did not have a significant effect on any of the subjective evaluations of beef eating quality ($P>0.05$). Figure 1 illustrates the lack of a trend between subjective evaluations of tenderness and Brahman percentage. Likewise, for the objective measurements, no significant difference was shown, however, a slight positive trend was observed between WB initial yield ($P=0.078$, regression coefficient = 0.72 kg) and Brahman percentage (see Figure 2). A similar trend was observed between Instron compression values ($P=0.0053$, regression coefficient = 0.13) and Brahman percentage (see Figure 3). Subjective evaluations of tenderness did exhibit significant ($P<0.05$), but modest relationships with objective measurements of tenderness . Brahman percentage did not have any significant effect on either sarcomere length or on ultimate pH ($P>0.05$).

Discussion

In this comparison where cattle were raised and slaughtered contemporaneously, Brahman percentage did not have any significant effect on the objective or subjective evaluations of beef eating quality. The objective indices of tenderness were, however, slightly more sensitive to the increase in Brahman percentage compared with subjective evaluations.

The results of this study supported those of Kingston *et al.* (1987) and Hearnshaw (1992) who found breed (at least 50% *Bos indicus versus Bos taurus*) did not have a significant effect on consumer evaluations of meat eating quality.

However, the results were in disagreement with those of Kohun *et al.* (1990) and can possibly be explained by differences in experimental design. Firstly, animals used by Kohun *et al.* (1990) were considerably older (32-37 months compared to 18 months) and secondly, the carcasses were not electrically stimulated post-slaughter. It is well known that animal age and the application of electrical stimulation post-slaughter have a significant effect on ultimate meat tenderness.

Other U.S. studies have reported *Bos indicus* meat to have significantly higher WB shear values than *Bos taurus* meat when carcasses had not been electrically stimulated (Wheeler *et al.*, 1990a; Whipple *et al.*, 1990). This has been attributed to the observations made by Wheeler *et al.* (1990a), Whipple *et al.* (1990), and Shackelford *et al.* (1991) that *Bos indicus* has limited aging potential due to higher levels of calpastatin. *Bos indicus* meat also showed a slower rate of pH decline post-slaughter (Whipple *et al.*, 1990; Shackelford *et al.*, 1991), which Shackelford *et al.* (1991) suggested might have been due to differences in metabolic rates between the two breed types. Wheeler *et al.* (1990b) reported that the difference in shear values between breeds was reduced by electrical stimulation.

Conclusion

It was concluded that when yearling steers were raised under the same environmental conditions, and carcasses electrically stimulated, Brahman percentage did not have any effect on consumer evaluations of meat eating quality. A slight trend was observed for objective indices of tenderness to increase with increasing Brahman percentage, but this difference was not important as consumers could not detect any difference in beef eating quality.

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