P-01-24

An investigation into the performance and eating quality of holstein beef (#474)

Michael A. Campbell[1, 2], Veronika Vicic[1, 2]

[1] Charles Sturt University, School of Animal & Veterinary Science, Wagga Wagga, Australia; [2] Graham Centre for Agricultural Innovation, Charles Sturt University and NSW Department of Primary Industries, Wagga Wagga, Australia

Notes

Introduction

The aim of this study is to investigate the carcass performance and eating quality of Holstein steers in comparison to other traditional beef bred *Bos Taurus* steers using a consumer sensory panel.

Methods

A selection of 12 steers (6 Holsteins and 6 Angus X British Breed) sourced from a commercial farm in the Riverina, NSW, were processed at Tey's Australia, Wagga Wagga. Prior to slaughter the cattle were fed a mixed ration of grain, hay and supplements and had free access to pasture. Carcasses were assessed by an accredited Meat Standards Australia (MSA) grader.

On day one post-slaughter the striploins (*m. longissimus thoracis*) from the left hand side of all 12 carcasses were collected and aged for two weeks in a chiller at 4°C. When the ageing process was complete, each striploin was cut into steaks of 25mm thickness. The steaks from the striploin were divided into three sections (A1 (anterior end, position one), A2 (anterior end, position two) and P3 (Proximal end, position three)). All the meat was placed in a freezer at -18°C.

The consumer sensory trial was approved by The CSU Faculty of Science Ethics in Human Research Committee (Protocol No. 400/2017/21). The consumer sensory panel consisted of 60 random untrained consumers. The steaks were cooked using a Silex clam shell grill unit set at 220°C. All steaks were cooked for 2 mins 45 secs and reseted for 2 minutes to achieve a constant degree of "doneness".

Each consumer received seven portions of meat. Consumers were asked to score samples for tenderness, juiciness, flavour and overall liking. The values of each consumer score for tenderness (tn), juiciness (ju), flavour (fl) and overall liking (ov), were used to create a composite meat quality score (MQ4) for each piece of steak.

A linear model (using R, Team 2017) was used to analyse the MSA index score which included breed as a variable. A Bayesian Network (BN) model, using Netica Software, was developed to provide an alternative but mathematically coherent framework for the analysis of eating quality. Based on Bayes Rule, this BN model linked all variables relating to the eating quality score (breed, carcassID, location, day, order, tenderness, juiciness, flavour, overall liking and MQ4) as a network. In conjunction with the BN model, a mixed effect linear regression model was used to analyse the composite MQ4 score.

Results

The Holstein carcasses (55.71 ± 2.13) and the mixed bred carcasses (56.27 ± 1.94) did not perform significantly ($P > 0.05$) different to each other or in relation to MSA index scores.

The difference between Holstein Friesian steers (67.29 ± 12.96) and mixed bred steers (63.20 ± 13.32) was not statistically ($P > 0.05$) different in relation to eating quality as assessed by the MQ4 scores.

Using the BN model, the MQ4 scores were assessed by breed and position of the striploin. The MQ4 scores for mixed bred steers decreased along the striploin (A1 = 64.7 ± 19, A2 = 62.4 ± 30, P3 = 58 ± 21) from the anterior to the posterior end. Holstein steers differed from that of the mixed bred steers as the MQ4 scores along the striploin stayed relatively consistent (A1 = 68.3 ± 20, A2 = 64.3 ± 20, P3 = 65.4 ± 19). Holstein steers outperformed the mixed bred steers in all three positions of the striploin in regards to eating quality.

There was a larger distribution of scores for P3 of mixed bred steers in comparison to P3 of Holstein steers (Figure 2.4).

Figure 2.4, Comparative distribution of MQ4 scores by breed and position of the striploin.

The four sensory parameters were assessed in relation to breed and position of the striploin. For mixed bred cattle, the scores for all four sensory parameters decreased along the striploin. However, for Holstein steers the scores for all four sensory parameters stayed consistent across the striploin. Holstein steers outperformed mixed bred steers for each sensory parameter in regards to breed and position of the striploin (Figure 2.6).

Figure 2.6, Comparative distribution of consumer scores for each sensory parameter (Tn, Ju, Fl, Ov) by breed and position.

Conclusion

This study has shown that carcasses derived from Holstein steers can potentially have equal to or better MSA Index scores and eating quality when compared to traditional British bred cattle.

The individual carcass parameters including the MSA Index scores from both Holstein and mixed bred steers were not significantly different.

Holstein steers showed consistency in eating quality along the striploin compared with a decrease in eating quality along the striploin for mixed bred steers.

No statistical differences were detected between eating quality of breeds however, the BN model was able to show that prediction accuracies for Holstein steers to perform in higher eating quality categories, was greater than that of the mixed bred steers.

	Day 0	Day 7	Day 14	Day 21	SEM	*P*-value
pH	5.60[a]	5.48[b]	5.48[b]	5.45[b]	0.02	<0.001
Color parameters						
L*	40.8[c]	44.5[b]	44.4[b]	45.1[a]	0.3	<0.001
a*	15.0[c]	17.8[ab]	18.8[a]	17.1[b]	0.2	<0.001
b*	4.09[c]	6.19[b]	7.12[a]	6.92[a]	0.16	<0.001
C*	15.6[c]	18.9[b]	20.1[a]	18.4[b]	0.3	<0.001
h*	14.9[d]	19.1[c]	20.8[b]	22.1[a]	0.4	<0.001
Consumer acceptability						
IMA	5.49[b]	6.20[a]	5.90[ab]	5.86[ab]	0.11	0.029
VA	5.74[b]	6.44[a]	6.22[ab]	3.97[c]	0.11	<0.001

Table 1 Ageing effect on pH, instrumental color, and in-mouth and visual acceptability of foal meat. Different superscripts in the same raw indicate statistically significant differences ($p \le 0.05$).

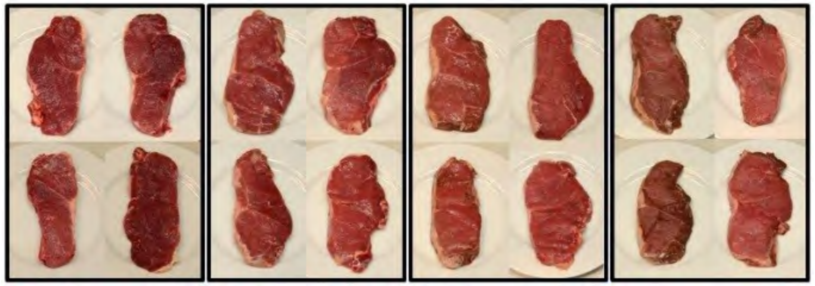

Figure 1 Photo compositions (0, 7, 14 and 21d) for visual acceptability.

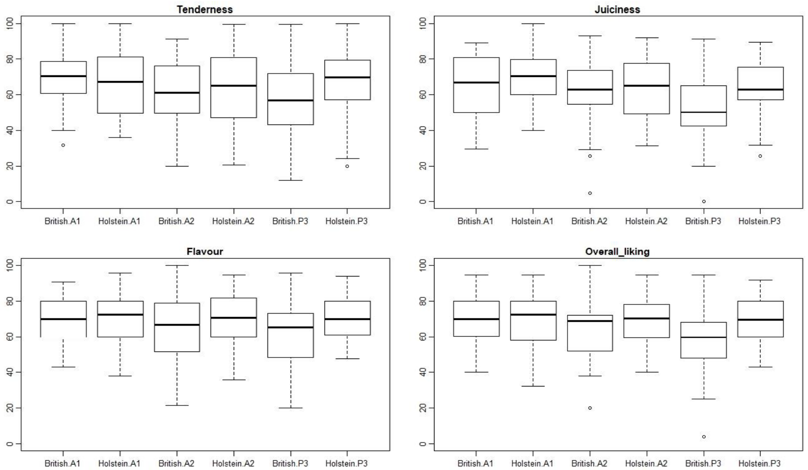

Figure 2.6:
Comparative distribution of consumer scores for each sensory parameter (Tn, Ju, Fl, Ov)

Notes