

COMPARISON OF CARCASS TRAITS AND MEAT QUALITY CHARACTERISTICS OF SIMMENTAL AND
HEREFORD X BELGIAN BLUE STEERS

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Background

Meat animals with muscular hypertrophy, also known as double muscling, have long been of interest to breeders because of their higher yields of meat (Arthur, 1995). Unfortunately, this trait is sometimes associated with lower meat quality e.g. sheep containing the callipyge gene for hypertrophy produce tougher meat (Koochmaraie, 1995). The Belgian Blue, where double muscling results from a mutation in the myostatin gene (McPherron, 1997), is increasing in popularity as a terminal sire for dairy beef in New Zealand. Boccard (1982) and Bouton (1982) found that meat from double muscled Belgian Blues was more tender than meat from normal animals. However, Uytterhaegen (1994) reported limited ageing in carcasses from double muscled Belgian Blue.

Objectives

To compare carcass traits of Simmental (S) and Hereford x Belgian Blue (HxBB) steers.

To compare meat quality characteristics of the longissimus (LD) and semitendinosus (ST) muscles from these breeds.

Methods

Eight S and 8 HxBB steers were slaughtered at an age where they yielded carcasses weighing between 250 and 280 kg. They were electrically stunned, and immediately after slaughter the carcasses were immobilised, before being electrically stimulated using a rubbing rail.

The temperature and pH of the meat was determined using an Orion 8163 glass electrode and a temperature probe attached to a Hanna HI9025 portable pH meter. Initial measurements were at the legging stand for the LD and at the end stand for the ST. Further temperature and pH measurements were made over the 30 hours following slaughter. Samples were removed for tenderness determination at 12, 24 and 96 hours. The shear force of cooked samples was determined using a MIRINZ tenderometer (Chrystall, 1991). Cooking loss (%) was determined by weighing samples before and after cooking. A Minolta colorimeter was used to measure the colour of the meat.

Results and Discussion

Carcass Traits

Although the HxBB tended to be lighter at slaughter they produced significantly heavier carcasses than the S (Table 1). This effect was compounded by a higher dressing percentage. The results were similar to those reported in previous comparisons between crossbred Belgian Blue and other breeds (Cepin, 1997; Purchas, 1992). Two economically important muscles, the longissimus (strip loin) and the semitendinosus (eye round), were weighed and found to make up a greater percentage of carcass weight in HxBB compared to S (Table 1).

Table 1: Carcass and muscle traits of Simmental and Hereford x Belgian Blue steers (n=8 per breed).

Breed	Live weight	Carcass weight	Dressing percentage	Longissimus weight	Carcass %	Semitendinosus weight	Carcass %
Simmental	480	252 ^a	52.5 ^a	3.3 ^a	2.6 ^a	1.9 ^a	1.5 ^a
Hereford x Belgian Blue	461	267 ^b	57.9 ^b	3.8 ^b	2.8 ^b	2.4 ^b	1.8 ^b
SEM	6	5	0.6	0.1	0.1	0.1	0.1

^{a,b}Means with differing superscripts are significantly different ($p < 0.05$).

Meat Quality Characteristics

Both breeds showed a rapid decline in post-mortem pH, a result of the electrical stimulation, and reached an ultimate pH of below 5.6 (Table 2). The temperature declined slightly more slowly in the bulkier HxBB carcasses than in the S.

The HxBB showed no evidence of either a lower background toughness or a slower ageing rate, as there were no significant difference between breed differences in the shear force of meat at 12, 24 or 96 hours post-mortem (Table 3). The cooking losses were similar between breeds, while the meat from the S was both redder and more yellow than that from HxBB.

Comparing the two muscles, the semitendinosus (ST) had a slower post-mortem pH decline (Table 2). The ST was cooler than the longissimus (LD) for the first 90 minutes post-mortem but by 10 hours post-mortem it was significantly warmer and this continued through to at least 24 hours. The LD was more tender at 12 hours but aged less and the two muscles showed similar shear force values at 96 hours (Table 3). The limited ageing in both muscles may have been a result of overuse of electrical stimulation (Morton, 1998). The ST showed a greater cooking loss and, as expected, its colour was lighter and more yellow than the LD.

Conclusions

1. The HxBB showed higher carcass and dressing percentage, than the S providing a better yield of meat.
2. There were no major meat quality differences between the lines.
3. Belgian Blue bulls may be useful as terminal sires in dairy beef operations.

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Table 2: pH and temperature measurements in longissimus and semitendinosus of Simmental and Hereford x Belgian Blue carcasses (n=8 per breed).

Item	Hours p.m.	Breed		SEM	Muscle		SEM	Interaction
		Simmental	Hereford x Belgian Blue		Longissimus	Semitendinosus		
pH	0.25	5.80	5.85	0.04	5.70	5.95	0.03	NS
	1.5	5.60	5.68	0.04	5.58 ^a	5.70 ^b	0.04	NS
	10	5.57	5.57	0.01	5.59 ^a	5.55 ^b	0.01	NS
	24	5.55	5.56	0.01	5.54 ^a	5.57 ^b	0.01	NS
Temp (°C)	0.25	36.8 ^b	35.8 ^a	0.4	37.3 ^b	35.2 ^a	0.3	*
	1.5	29.5	30.5	0.8	32.5 ^b	27.5 ^a	0.5	NS
	10	12.5 ^a	14.0 ^b	0.3	12.7 ^a	13.8 ^b	0.4	*
	24	8.9	8.9	0.3	7.8 ^a	9.9 ^b	0.1	NS

^{a,b} Means within a main effect with differing superscripts are significantly different ($p < 0.05$). NS: not significant ($p > 0.05$). *significant ($p < 0.05$).

Table 3: Meat quality characteristics of longissimus and semitendinosus of Simmental and Hereford x Belgian Blue carcasses (n=8 per breed).

Item	Hours p.m.	Breed		SEM	Muscle		SEM	Interaction
		Simmental	Hereford x Belgian Blue		Longissimus	Semitendinosus		
Shear force (kgF)	12	11.1	11.4	0.4	10.7 ^b	11.9 ^a	0.3	NS
	24	9.4	9.6	0.6	10.3 ^a	8.7 ^b	0.5	NS
	96	8.5	8.8	0.5	8.3	9.0	0.5	NS
Cooking loss (%)	12	14.9	14.7	0.7	15.2	14.4	0.7	NS
	24	18.1 ^b	20.4 ^a	0.7	17.9 ^b	20.5 ^a	0.7	NS
	96	21.5	23.4	1.0	19.5 ^b	25.3 ^a	0.7	NS
Lightness (L*)	96	42.9	43.2	1.2	38.5 ^b	47.5 ^a	0.4	NS
Redness (a*)	96	27.2 ^a	26.2 ^b	0.3	26.4	27.0	0.3	NS
Yellowness (b*)	96	9.7 ^a	8.6 ^b	0.4	7.9 ^b	10.4 ^a	0.2	NS

^{a,b} Means within a main effect with differing superscripts are significantly different ($p < 0.05$). NS: not significant ($p > 0.05$).