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The influence of cattle age and breed on the meat quality of typical UK retail specification beef (#119)

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Introduction

Meat quality is influenced by many contributing factors. The variation in United Kingdom (UK) prime beef quality is partially influenced by the variety of production systems and breed genetics in use. The breed type split of genetics in the 2008 UK cattle population was; 50.5% continental beef, 13.5% native beef and 36% dairy breeds. To date, there is little research into the meat quality of commercial UK slaughter beef, comparing popular breeds and age groups. The objective of this study was to determine if sire breed and age affect the meat quality of typical retail beef steak.

Methods

The *Longissimus Lumborum* of 76 animals, slaughtered in a commercial UK abattoir, were selected for the trial. Cross breeds from five of the most commonly utilised beef breeds (cross breed unknown) of 3 different age groups were used; *Limousin (n=15)*, *Simmental (n=15)*, *Charolais (n=16)*, *Hereford (n=15)* and *British Blue (n=15)*; Under *20 Months (n=25), 21-25 Months (n=15) and 26-30 Months (n=26).* Samples were collected after 14 days dry aging, when ultimate pH (pHu) was also recorded; further wet aged in a vacuum bag to 40 days and then retail skin-packed for a further 13 days. Colour measurement using a colorimeter and Warner-Bratzler shear force (WBSF) were carried out on the fresh meat at each aging point, the remaining samples were frozen until further analysis for drip loss (using a gravitational method), chemical composition using near infrared spectroscopy (NIR), cook loss and consumer sensory evaluation. One-way ANOVA and correlation were generated using IBM SPSS v25.

Results

A summary of the analysis of variance is shown in table 1. No significant differences were found between any groups at any aging point for WBSF and drip loss.

pHu was significant among age groups ($P<0.05$). Cattle aged 26-30m had a higher pHu (5.81) than cattle aged under 20m (5.65). A weak positive relationship between age and pHu was observed ($r=0.289$). Colour was the only factor to be significantly different at each aging point between age groups, shown in table 1. L* values were significantly different between age groups ($P<0.001$) (figure 1) at each aging point. The increase in L* values at day 40 is likely to be due to the opening and repackaging of the samples. This trend was observed for all L*a*b* values for both breed and age. A negative relationship between age and L* was established. The relationship strengthened as aging time increased (Day 14 $r=-0.405$; Day 53 $r=-0.450$).

Although L* is linked to pH, a stronger relationship was observed with age than pH. L* showed no relationship with aging time, however strong negative relationships were observed for a* ($r=-0.548$) and b* ($r=-0.674$). Significantly higher values ($P<0.05$) for both a* and b* were observed for 26-30m at day 40. Between breeds, colour was only significantly different at day 40 ($P<0.01$). Simmental had higher a* and b* values.

The fat analysis found a significant difference ($P<0.05$) between breeds. Limousin and Hereford had lower fat content in the lean muscle, 3.17% and 3.37% respectively, than Charolais (4.39%), Simmental (4.59%) and British Blue (4.15%). This partially agrees with Sevane *et al.* (2014) who observed that Limousin had significantly lower fat ($P<0.005$) than 15 European breeds, including Simmental and Charolais. A medium negative relationship between protein and age was observed ($r=-0.354$) and there were significant differences between age groups ($P<0.01$). Collagen was significant ($P<0.01$) between age groups; 26-30m had higher collagen content. A weak positive relationship between collagen and age was observed ($r=0.282$).

The sensory evaluation had only one significant result which was at day 14. British Blue was significantly less juicy ($P<0.01$) than the other breeds and scored significantly lower ($P<0.01$) for the total sensory score. Although there were no significant differences at Day 40 and Day 53, Simmental received the highest scores. No significant differences were observed between age groups; agreeing with the findings of Warren *et al.* (2008)who compared cattle aged 14, 19 and 24 months.

At Day 40 of aging, Limousin was found to have significantly higher cook loss ($P<0.01$) than Simmental, Charolais and British Blue. Limousin had the lowest median juiciness score at day 40, which could be linked to high cook loss. At day 53 of aging, 21-25 month old cattle had cook loss significantly less than 26-30m ($P<0.05$). A strong positive relationship was observed between cook loss and aging time ($r = 0.553$).

Conclusion

More differences were observed between age groups than breed groups, suggesting that age has more influence on quality than breed. Further research could examine consumer acceptability of colour through aging, with a focus on cattle age. From this research, there is no strong evidence to suggest that any breed has superior qualities.

Notes

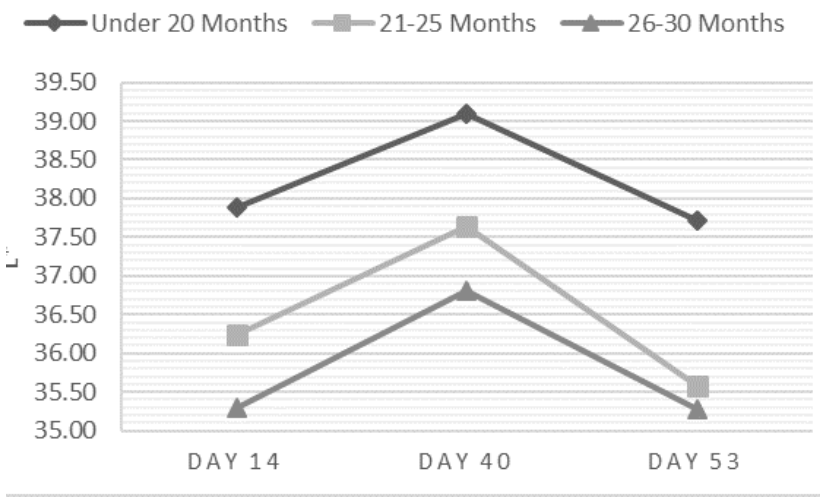

Figure 1: L* values for each age group at each point of aging

	BREED			AGE		
pHu		*ns*			*	
COLLAGEN		*ns*			**	
PROTEIN		*ns*			**	
FAT		*			*ns*	
AGING TIME	*Day 14*	*Day 40*	*Day 53*	*Day 14*	*Day 40*	*Day 53*
WBSF	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
COLOUR	*ns*	**	*ns*	**	*	**
COOK LOSS	*ns*	**	*ns*	*ns*	*ns*	*
DRIP LOSS	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
SENSORY TESTING	**	*ns*	*ns*	*ns*	*ns*	*Ns*

NS = NOT SIGNIFICANT
**** = P< 0.05***
***** = P<0.01***

Table 1: Summary of analysis of variance between breed and age groups

Notes