Bulls technological meat quality influenced by breed and rearing intensity

E. Stenberg[1*], A.H. Karlsson[1],K. Arvidsson Segerkvist[1]

[1] Department of Applied Animal Science and Welfare, Swedish University of Agricultural Sciences, Skara.

*Corresponding author email: Elin.Stenberg@slu.se

I. INTRODUCTION

Production systems of bulls for meat production are often quite intensive and focuses on carcass composition and hence the production economy relates to rearing efficiency (feed efficiency, growth, slaughter age etc.) and carcass payment according to the EUROP classification system. Insemination of dairy cows using beef breed semen allows producers to add value of offsprings by increasing carcass yields and overall value. This adaption has great potential in Sweden, where approximately 85% of all dairy cows are still bred with dairy semen [1]. However, according to previous research, best paid carcasses according to the EUROP system does not automatically result in meat with the best eating quality [2]. Therefore, it is important to evaluate how such production systems would affect eating quality of the meat. Even if eating quality is a subjective measure and therefore differ depending on personal preferences, there are however some quality measures that can be highlighted as more important from a consumer point of view, such as colour, tenderness and juiciness. The aim of this study was therefore to investigate how purebred dairy bulls and dairy-beef crossbred bulls raised in either a low-intensity production system (slaughter age 18 months) or a high-intensity production system (slaughter age 15 months) would affect the technological parameters of meat quality; color (L*, a* and b*), thaw loss, cooking loss and Warner-Bratzler Shear Force (WBSF).

II. MATERIALS AND METHODS

This study compared meat quality attributes in meat from 69 bulls reared indoors. The study included 35 bulls of dairy breed (15 Swedish Red and 20 Swedish Holstein) and 34 crossbred bulls (15 Swedish Red × Angus and 19 Swedish Holstein × Angus). The bulls were fed either a high-intensity (64% concentrate) or a low-intensity (44% concentrate) diet *ad libitum* and were slaughtered at 15 or 18 months of age. The feed used was grass-clover silage. After slaughter, all *M. thoracis et lumborum* from the right side were aged at 4°C for seven days before being frozen at -18°C until analysis. All meat samples were weighed to get both thawing loss and cooking loss. All thawed meat samples were tested for colour (L*, a* and b*) and WBSF was measured on cooked meat samples. Data was analyzed using Proc Mixed in SAS with pen as random effect (SAS 9.4, SAS Inst. Inc., Cary, NC, USA). The study was ethically approved by the Ethics Committee on Animal Experiments in Gothenburg (case number 187-2014).

III. RESULTS AND DISCUSSION

Thawing loss, cooking loss, meat colour and WBSF are all presented in table 1. No significant interactions between breed and feed intensity were found. Differences were found for all colour parameters and thawing loss when comparing breeds. The beef-crosses had higher L*, a* and b* values compared to the pure dairy bulls. Previous research has suggested that trained panelists were able to detect a difference of 0.95 in a* and 0.9 in b* [3]. In this study greater differences for lightness, redness and yellowness could possible let consumers perceive a visual difference. The detectable difference may however not necessarily lead to consumer refusal in a purchase situation. Thawing loss differences indicate a higher loss in beef-crosses and in the high intensity group. Chamba*z, et al.* [4] also found differences in fluid losses comparing different beef breeds. Hence, an

explanation for increased thawing loss in the present study could be differences in muscle composition due to the breed or age at slaughter as a result of the different rearing intensities. As the numerical differences were small; 0.8% points for breed and 1.0% points for intensity, this might therefore not have any large impact on the eating quality. There were no effect on tenderness (WBSF), however, the numeric values of WBSF are still important to discuss, and Huffman *et al.* [5] stated an upper limit of 40.2N for consumer satisfaction and Miller *et al.* [6] scribed meat of 45.1N to be slightly tough. This suggests that meat in the current study has WBSF values close to values of beef considered tender.

Table 1 – Colour parameters, fluid losses and shear force values (WBSF).

Traits	Breed		Intensity		SEM[1]	P-value[2]	
	Beef-cross	Dairy	High	Low		Breed	Intensity
n	34	35	36	33			
L* (Lightness)	37.2[a]	32.5[b]	35.4	34.3	1.21	0.0265	0.5281
a* (Redness)	23.1[a]	20.9[b]	21.8	22.1	0.42	0.0068	0.6037
b* (Yellowness)	11.3[a]	9.2[b]	10.2	10.2	0.25	0.0004	0.9834
Thawing loss (%)	5.3[a]	4.5[b]	5.4[a]	4.4[b]	0.19	0.0157	0.0055
Cooking loss (%)	25.0	25.8	25.5	25.3	0.44	0.2814	0.7301
WBSF (N/cm[2)]	42.0	40.6	41.1	41.4	2.66	0.7323	0.9403

[1] Standard error of the mean. [2] Differences considered significant at P<0.05. a-b Mean values within rows with different superscripts differ significantly (p<0.05).

IV. CONCLUSION

The results from this study show that breed had a larger effect on technological meat quality attributes tested than rearing intensity. In this study, differences for lightness, redness and yellowness may not have a negative impact from a consumer perspective. WBSF values in this study may be close to values of beef considered acceptably tender.

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