BEEF-ON-DAIRY HEIFERS GRAZING SEMI-NATURAL GRASSLANDS CAN PRODUCE TENDER BEEF

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I. INTRODUCTION

Swedish consumer´s demand for Swedish beef is increasing, and so is Swedish beef production. The aim was therefore to contribute to this trend by developing innovative ways to satisfy the market with beef of high and uniform eating quality. It is well known that eating quality of beef is highly related to the degree of marbling, i.e. intramuscular fat, which is a strong predictor of eating quality as it correlates positively to juiciness, tenderness, flavour, and overall acceptability [1].

A beef cattle body becomes fatter with increasing weight and age. As the growing animal deposits fat in a predetermined order, starting with filling up the abdominal and subcutaneous fat stores, i. e. trim fat, before depositing intramuscular fat, it is almost impossible to obtain a high amount of intramuscular fat (IMF) in the meat without the carcass getting too fat. These excessive fat deposits are a waste for the processors, a cost for the farmer, and an unnecessary environmental impact from a too long animal rearing period. The aim of this study was therefore to investigate the effects of dam breed, sire breed, and intensity of production system on meat quality characteristics from dairy × beef heifer production based on forage and a well-managed semi-natural grassland.

II. MATERIALS AND METHODS

The experiment was conducted at the SLU Götala Beef and Lamb Research Centre, Skara, Sweden. During indoor periods, the animals, consisting of 72 dairy × beef heifers acquired from commercial farms, were kept in groups of six in pens with deep straw bedding, while during grazing periods all animals grazed semi-natural grassland. The animals were followed from weaning to slaughter in an experiment with a 2 × 2 × 2 factorial design, comparing two sire breeds (Angus (ANG) and Charolais (CHA)), two dam breeds (Swedish Red (SRB) and Swedish Holstein (HOL)) at two production systems: moderately high (H) and Low (L) indoor feed intensity. In addition, the two production systems also differed in terms of slaughter age and number of summers on grass. The two systems were chosen to reflect possible rearing strategies combining grazing for nature conservation and production of market-oriented carcasses. The heifers were slaughtered at an age of 27 months (L), or at 20 months (H). For details regarding diet composition and production response, see [2]. After slaughter, carcass conformation and fat cover were graded according to the European Union Carcass Classification Scheme EUROP. Marbling was determined visually between the 10th and 11th ribs in the loin using the Swedish 5-point scale from no marbling to slightly abundant. pH_{24h} was measured between the 10^{th} and 11^{th} rib. Ultimate pH was measured at 48 h post-mortem. Colour was measured using a CM-600d Konica Minolta spectrophotometer. Tenderness was measured as WBSF; samples, aged for 5 days at 4℃, were weighed, vacuum packed, and heated in waterbath at 62°C and reweighed for cooking loss. The maximum force was recorded. For IMF samples were extracted and the IMF percentage was determined from the amount of fat extracted relative to the sample weight. For details, see [3].

III. RESULTS AND DISCUSSION

Generally, beef from production system L was darker, redder, tougher, and had lower IMF percentage compared to H. Beef from ANG crossbreeds was more red and tender and higher IMF% compared with beef from CHA crossbreeds.

Table 1 Technological meat quality of *M. longissimus lumborum* from heifers with the effects of feeding intensity (moderately high and low), sire breed (Angus and Charolais) and dam breed (HOL—Swedish Holstein; SRB—Swedish Red-and-White). Results are presented as least-squares means, standard error of the mean (SEM) with P-values.

Feeding intensity	High				Low				SEM	P-values[1]		
Sire breed	Angus		Charolais		Angus		Charolais					
Dam breed	HOL	SRB	HOL	SRB	HOL	SRB	HOL	SRB		FI	S	D
n	9	9	9	9	9	9	9	9				
pH_{24}[2]	5.49ab	5.47ab	5.53ab	5.53ab	5.46a	5.59b	5.59ab	5.61b	0.03	0.014	0.007	0.104
pH_{48}[2]	5.39ab	5.40abc	5.37a	5.39ab	5.48e	5.42bcd	5.45de	5.44cde	0.01	<0.001	0.362	0.153
L*[3]	31.0abcd	32.1cd	31.5bcd	32.7d	28.4abc	28.0ab	28.0ab	27.4a	0.8	<0.001	0.958	0.411
a*[3]	15.1abc	14.8abs	14.2ab	13.8a	16.5cd	17.2d	16.0bcd	16.0bcd	0.4	<0.001	0.003	0.882
b*[3]	15.6	16.2	15.9	15.4	15.9	16.8	15.1	15.6	0.5	0.810	0.068	0.249
Cooking loss (%)	15.1	15.3	15.8	16.2	14.9	15.4	16.2	17.0	0.8	0.697	0.051	0.297
WBSF (N)[4]	38.0a	34.9a	40.1a	41.9ab	43.3ab	45.3ab	56.4b	43.3ab	3.2	<0.001	0,01	0,247
IMF (%)[5]	6.37bc	7.28c	3.96ab	4.04ab	5.27abc	5.14abc	2.80a	3.77ab	0.67	0.012	<0.001	0.326

[1]a-c: values within a row with different superscripts differ significantly at $p < 0.05$. [2]pH measured at 24 and 48 h post-mortem. [3]L* (lightness), a* (redness), b* (yellowness). [4]WBSF peak force. [5]Intramuscular fat concentration.

IV. CONCLUSION

Beef-on-dairy heifers reared on forage and semi-natural grasslands with one or two grazing seasons can deliver high quality beef. Beef from heifers reared under moderately high feeding intensity was less tough and had higher IMF% but was lighter and less red compared with heifers reared under low feed intensity. Beef from Angus crossbreeds was redder (b*) with lower shear force (WBSF), i.e. more tender and had a higher intramuscular fat content (IMF%) than Charolais. These characteristics are generally associated with superior meat quality. Notably, beef from Charolais crossbreeds in low feed intensity production system (L) was of considerably lower quality, compared to the better-performing Angus crossbreeds and Charolais crossbreeds in the moderately high production system (H). While sire breeds differed on some important meat quality traits, meat quality of Swedish Holstein (HOL) and Swedish Red (SRB) crossbreeds was comparable.

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