THE QUALITY OF STEAKS PRODUCED FROM DAIRY VS BEEF CATTLE BREEDS

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I. INTRODUCTION

Beef has been an important element of the diet and is characterized by undeniable nutritional value and unique organoleptic properties, being a source of high-biological-value protein, polyunsaturated fatty acids, fat-soluble vitamins and many bioactive nutrients and antioxidants [1,2]. Beef production in Poland is based on dairy or dual-purpose cattle herds. As much as 93% of the total amount of cattle in the country is dairy cattle, making the Polish Holstein-Friesian (PHF) the main source of beef. Among beef breeds, Limousine (LM), Hereford (HH), and Charolais (CH) are the most popular in Poland [2]. Since beef from dairy breeds is of unmatched quality, technological solutions are being sought to improve its culinary quality. One method is sous-vide cooking, which is recommended to improve the quality of beef [3]. Therefore, it was hypothesized that beef steaks, both from beef breeds (LM) and dairy breeds (PHF), subjected to sous-vide processing would have similar tenderness and juiciness.

II. MATERIALS AND METHODS

The steaks were prepared from 31 *longissimus lumborum* (LL) muscles from young (approximately 21 months old) Limousine bulls (LM, beef breed, n=14) and Polish Holstein-Friesian bulls (PHF, dairy breed, n=17). The experimental material included bulls, equally reared and fed at the Agricultural Experiment Station in Bałcyny (Poland). Details of breeding, slaughter and sampling procedures are described in the previous article [4]. Wet ageing was carried out at 4°C for 14 days. The samples were then frozen (-18°C) until the experiment was carried out. To characterize the raw material, its chemical composition, pH and color were examined [4]. In order to verify the hypothesis, 2.5 cm steaks were subjected to 2 types of thermal treatment: in individual plastic bags, submerged in a water bath (WB) at a temperature of 80°C, and kept for 40 min and vacuum-packaged products cooked in the sous-vide (SV) device at 60 °C for 4 h [4]. Warner-Bratzler Shear Force (WBSF) was determined using Instron 5942 (Instron, Norwood, USA), whereas tenderness, juiciness and intensity of meat flavor were assessed sensory on a 10-point scale sensory [4]. Statistica 13.3 was used for the data analysis. The data were subjected to analysis of variance using ANOVA, by considering a level of significance $p < 0.05$. To compare sensory analysis results, non-parametric Mann-Whitney U test was applied.

RESULTS AND DISCUSSION

Meat raw material from the LM breed was characterized by a significantly higher water content of 74% (LM) vs 72% (PHF) and protein content of 23.7% vs 22.8% respectively, a lower fat content of 2% (LM) vs 4.4% (PHF), and a similar level of ash content – 1%, which is comparable to the results of other researchers [2]. The LL muscle from both breeds was characterized by the same lightness L*, while the raw material from the PHF breed was more red (a*) and yellow (b*) compared to the LM breed. Muscle pH was 5.58 LM and 5.45 PHF. The analysis of the results after the applied thermal treatments allowed for the conclusion, that the breed influenced all (except tenderness after heating in WB) tested parameters of the steaks shown in Table 1. Regardless of the type of thermal treatment,

LM steaks recorded higher scores for the examined characteristics in the sensory assessment, as well as lower WBSF by 44% (WB) and 19% (SV), which indicates better tenderness of LM steaks. The type of thermal treatment also significantly influenced the tested parameters (except meat taste intensity-PHF), giving better results for steaks cooked using the sous-vide method - Table1. Despite the use of sous-vide cooking, the panelists gave significantly higher scores to steaks prepared from the LM meat breed compared to those from the dairy breed - tenderness 7.7 (LM) vs 5.96 (PHF) and juiciness 7.28 vs 5.28, respectively.

Table 1 – Effect of cattle breed and thermal treatment on Warner-Bratzler shear force (WBSF) and sensory-assessed juiciness, tenderness, and meat taste intensity (mean values and standard error of the mean SEM).

Attribute	Thermal treatment method (T)	Cattle breed (B)				P value
		PHF (dairy)		LM (beef)		
		$\bar{x}$	SEM	$\bar{x}$	SEM	B
WBSF, N	WB	55.5	1.4	36.6	0.8	*
	SV	31.5	1.6	25.6	0.8	*
	P value T	*		*		
Sensory quality						
Juiciness, points	WB	2.67	0.13	4.67	0.16	*
	SV	5.28	0.15	7.28	0.15	*
	P value T	*		*		
Tenderness, points	WB	5.01	0.16	4.77	0.18	NS
	SV	5.96	0.19	7.70	0.19	*
	P value T	*		*		
Meat taste intensity, points	WB	6.37	0.15	8.02	0.12	*
	SV	6.50	0.11	8.69	0.11	*
	P value T	NS		*		

* Difference significant at $p < 0.05$. NS = no significant difference. HO- Holstein-Friesian bulls; LM – Limousine bulls; WB - water bath; SV – sous-vide; Sensory assessment on 1–10 scale, juiciness (1, extremely dry; 10, extremely juicy), tenderness (1, extremely tough; 10, extremely tender), meat taste intensity (1, imperceptible; 10, extremely intense)

III. CONCLUSION

The results of the present study do not confirm the formulated hypothesis. Despite the use of the sous-vide method, steaks prepared from Limousine beef were characterized by much better tenderness, juiciness and intensity of meat flavor in sensory evaluation as well as lower shear force in instrumental evaluation compared to steaks from Polish Holstein-Friesian dairy breed. Therefore, there is a need for further research and to propose other technological treatments that could equalize the quality of dairy and meat breed steaks.

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