THE QUALITY BEEF FROM CARPATHIAN PASTURES

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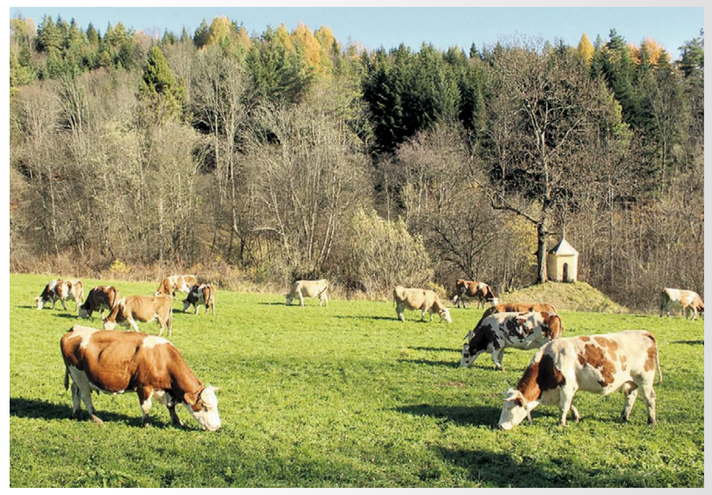

INTRODUCTION

Pasture nutrition, especially the richness of Carpathian pasture vegetation, should benefit the quality of meat from cattle grazing in the Carpathians. Carpathian pastured beef can be considered a brand of top quality beef. The return to more sustainable pasture-based ruminant feeding systems has led to a growing interest in the use of botanically diverse pastures (BDP) instead of monoculture pastures. Under the conditions of the Carpathians, the primary forage area for ruminants is permanent grassland - meadows and pastures, characterized by a rich and varied botanical composition of the sward. The most important permanent grasslands are grasses and papilionaceous (bean) plants. Grasses in particular provide food throughout the season. The Carpathian permanent grasslands are particularly rich and varied in botanical composition. The Carpathian flora includes about 500 plant species associated with mountainous locations. In the Polish Carpathians alone there are about 1,700 species of native and permanently established plants, which account for ¾ of the total national flora . Extensively used wooded pastures, considered the archetype of the traditional agricultural landscape in Europe with high natural and cultural values, are found in the Carpathians. These pastures are the so-called forest-pasture system, or sylvopastoral system. In the forest-pasture system, animals graze in wooded areas: traditional orchards, short-rotation groves, and tree-covered pastures. This is a good idea, as such grazing contributes to sustainable livestock production, reduces the impact on natural resources, and increases the productivity, profitability and viability of using the area. Pastured beef has a more desirable nutritional profile compared to beef from grain-fed cattle This enhanced profile is directly correlated with the forage (pasture or forage) consumed by the animal, being a good source of α-linolenic acid (C18:3n-3c) and vitamin E, but also other compounds with antioxidant properties, such as carotenoids and flavonoids

OBJECTIVES AND METHODOLOGY

The purpose of this study was to analyze the beef quality of native cattle breeds grazed and fed during the winter in the Polish and Slovak Carpathian Mountains. The material for the study consisted of samples of *m. semitendinosus*, taken from the carcasses of young bulls of the breeds Polish Red Cattle and Simmental (Poland) and Slovak Spotted Cattle (Slovakia). Polish Red Cattle and Simmental bulls used Carpathian (Bieszczady) pastures during the summer season and Slovak Spotted Cattle bulls used pastures in the Presov region. After the age of 6 months, winter feeding was based mainly on hay and hay and in summer on pasture greens. Bulls kept and fed indoors (in a barn) were fed concentrate, shredded barley, corn silage and hay ad libitum. Bulls were slaughtered at 18-20 months of age. Meat samples were vacuum packed in PA/PE vacuum bags and stored at 2-4°C until analysis. The following analyzes were performed in raw meat: (all analyzes were performed in duplicate): • Water content according to the standard PN-ISO 1442:2000 , • Fat content according to the standard PN-ISO 1444:2000 (Tecator's Soxtek HTZ-2 apparatus), • Protein content by Kjeldahl method PN-75/A-04018 (Büchi Labortechnik AG, a B426 mineralization furnace and a B339 distiller made in Switzerland), • Total ash content according to the standard PN-ISO 936:2000, • Total carbohydrates content was calculated assuming that the all total solids and water stand for 100%. The energy value was calculated using conversion factors, according to the Guide to Regulation (EC) No. 1169/2011. Meat colour was determined using a Konica Minolta CM-600d spectrophotometer (Minolta Co., Ltd., Tokyo, Japan) with a 50-mm diameter measuring head in the CIE L*a*b* system. Fatty acid profile was determined by two analytical methods: lipid extraction from meat according to Folch et al., (1957), and esterification according to AOAC (1995). The fatty acid methyl esters were separated by gas chromatography using a Trace GC Ultra (Thermo Electron Corporation, Milano, Italy) with a flame ionization detector (FID) using Supelcowax 10 column (30 m × 0.25 mm × 0.25 µm).

Table 1. Chemical composition (%)and caloric value of *m. semitendinosus* of the analyzed cattle breeds

Parameter	Pasture grazing			Bulls kept and fed indoors (in a barn)
	Cattle breed and country of origin			Simmental Poland
	Polish Red Cattle, Poland Bieszczady	Simmental Poland Bieszczady	Slovak Spotted Cattle	
Total solids	25.31±2.76	25.28±1.99	25.44±2.79	24.93±1.43
Protein	21.81±1.95	22.23±2.12	22.15±2.75	22.33±1.96
Fat	2.11±0.15	1.45±0.13	1.81±0.24	1.28±0.11
Ash	1.15±0.11	1.18±0.08	1.16±0.08	1.19±0.02
Carbohydrates (%)	0.24±0.04	0.42±0.09	0.32±0.08	0.13±0.009
Caloric value kcal/100 g kJ/100 g	 107.19 452.92	 103.65 438.70	 106.17 448.96	 101.36 429.18
Color parameters L* a* b*	 43.83±3.87 8.64±1.02 14.39±1.31	 47.10±2.94 8.81±0.95 14.25±1.09	 36.86±2.83 19.04±0.84 10.569±0.90	 36.22±2.74 18.89±1.01 8.91±0.89
Cooking loss - oven (%)	41.15±4.11	41.47±3.99	39.54±3.43	40.16±3.12

RESULTS AND DISCUSSIONS

Table 2. The fatty acids profile (% of total fatty acids) in *m. semitendinosus* of the analyzed cattle breeds

Fatty acids	Pasture grazing			Bulls kept and fed indoors (in a barn)
	Cattle breed and country of origin			Simmental Poland
	Polish Red Cattle, Poland Bieszczady	Simmental Poland Bieszczady	Slovak Spotted Cattle	
CLA	0.23±0.015	0.38±0.022	0.33±0.019	0.15±0.012
SFA[1]	47.029±0.461	46.96±0.326	47.705±0.289	64.480±0.242
UFA[2]	52.971±0.458	53.040±0.308	52.295±0.245	35.520±0.212
MUFA[3]	36.91±0.411	37.03±0.268	36.35±0.215	28.430±0.201
PUFA[4]	16.061±0.284	16.010±0.203	15.945±0.189	7.090±0.175
PUFA n-6	11.969±0.231	11.908±0.198	11.876±0.172	5.480±0.168
PUFA n-3	3.850±0.007	3.710±0.010	3.730±0.006	1.410±0.005
PUFA n6/n3	3.109±0.384	3.210±0.472	3.184±0.423	3.887±0.402
PUFA/SFA	0.342±0.090	0.341±0.012	0.335±0.009	0.110±0.005
PUFA/MUFA	0.436±0.052	0.433±0.011	0.439±0.008	0.250±0.004
UFA/SFA	1.127±0.062	1.130±0.024	1.097±0.012	0.551±0.010

Notes: [1]SFA - saturated fatty acids; [2]UFA - unsaturated fatty acids; [3]MUFA - monounsaturated fatty acids; [4]PUFA - polyunsaturated fatty acids

The beef analysed was characterised by high protein content and relatively low fat content . The meat of bulls kept and fed indoors (in a barn) had the lowest fat content. The colour parameters L*a*b* of the meat were typical for beef bulls. The most interesting changes for the consumer were observed in the fatty acid profile. Meat from bulls kept on pasture was characterised by a higher content of unsaturated fatty acids, especially PUFA n-6, PUFA n-3 and CLA, compared to meat from bulls kept and fed indoors (in a barn). The fatty acid profile of bulls kept and fed indoors (in a barn) did not meet the standards reported by Scollan et al., (2006). Of particular value to consumers is the appearance in ruminant fat of ALA and other n-3 family fatty acids and vaccenic acid t11 C18:1, which are involved in human and animal metabolism . Fresh pasture grass results in increased n-3 PUFA and CLA concentrations in muscle lipids, an increase in the PUFA:SFA (P:S) ratio and a decrease in the n-6: n-3 PUFA ratio . Pasture feeding provides natural antioxidants absorbed by muscle (Kearns et al., 2023), which help to balance the pro-oxidant effects of more PUFAs in muscle (Ponnampalam et al., 2014), thus improving the oxidative stability of meat.

CONCLUSIONS

Pasture grazing of slaughter cattle, especially on Carpathian pastures rich in diverse vegetation and especially in herbs, contributes to beef quality. Meat from slaughter cattle kept on pasture is characterised by a higher content of unsaturated fatty acids, especially PUFA n-6, PUFA n-3 and CLA compared to meat from cattle kept and fed indoors (in a barn). Pasture beef from young cattle kept on Carpathian pastures has a more desirable nutritional profile, which may contribute to increased consumer interest in this type of meat, and consequently to the development of cattle breeding in the Carpathian region.

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