EFFECT OF CLASSING THE BULL CARCASSES WITHIN QUALITATIVE CLASSES (EUROP) ON CHEMICAL AND PHYSICAL-TECHNOLOGICAL PROPERTIES OF MEAT

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Background

Classification of the slaughtered bodies of cattle according to the EUROP system gives the processor and farmer good survey on the quality in fattening cattle. It makes it easier for the meat processor to plan the production and meat distribution more effectively, and the farmer can take rational breeding measures that increase the portion of muscular substance in the carcass of cattle, and at the same time enable better economic valorization of the animal at purchase and realization. The task of a meat processor should be to supply the network of shops not only with valuable parts of the carcass but also with meat of high nutritional and sensorial quality. Is it possible to predict at least partially the quality of muscular substance by the assessment of the quality class of the carcass (meatiness and fattiness)? Which are then the relations between the carcass quality and quantitative parameters of meat? A number of authors have tried to answer this question (Temisan and Augustini, 1987; Shemeis *et al*., 1994; Fiems *et al*., 2000; Sañudo *et al*., 2000; Maher *et al*., 2001; Kim and Lee, 2003). Results of the mentioned authors are quite variable and they show that the classes of fattiness have better expression ability to predict the quality of meat (Bach *et al*., 1986).

Objectives

To evaluate the relationship between the quality class of the carcass of bulls assessed after the EUROP system and the meat quality (*m. longissimus thoracis*).

Materials and methods

We used total 340 adult slaughter bulls of different breeds (Slovak Spotted, Slovak Pinzgau, Holstein, Belgian Blue, Braunvieh, Limousine and Blond d'Aquitaine) in the experiment. Their average weight before slaughter was 515 kg. After slaughtering the carcass sides were examined and classified by a classifier after the official EU scheme (EC 1208/1981) and classed within the classes of meatiness (E, U, R, O P) and classes of fattiness (1, 2, 3, 4, 5). A muscle sample was taken from *m. longissimus thoracis* from the right side of carcass 24 hrs. post mortem. The sample was stored in a refrigerator at the temperature between +1°C and 3°C for further qualitative analyses. Content of total water, protein and intramuscular fat was determined in the apparatus Infratec 1265 48 hrs. post mortem. Furthermore the pH value (firm Radelkis), meat colour (Spekol) and water holding capacity (Hašek and Palanská, 1976) were measured. In the remaining sample the weight loss by cooking and shear force in the cooked meat (Warner-Bratzler) were determined on the 7th day after the slaughter. Values $\bar{x} \pm s$ of the studied qualitative parameters of meat were calculated and the differences between the quality classes of the carcasses (t-test) were tested by means of the STATGRAPHIC programme.

Results and discussion

In table 1 there are the average values of qualitative parameters of meat according to the qualitative classes of the carcasses considering the degree of meatiness (E, U, R, O, P). The results show that there are no significant differences among the classes of quality, except for small exceptions. The values are variable, there are no visible marked trends towards increasing or decreasing the values of qualitative parameters with the improvement or deterioration of carcass quality. The evaluation of shear force in cooked meat is worth mentioning; the most tender meat was in the least meaty carcass sides. The value of shear force in E class was 4.93 and in P class 3.44 kg ($P<0.05$). We noticed increasing content of intramuscular fat with deterioration of the meatiness in the slaughtered body (E = 1.99 and P = 2.49 g . 100 g^{-1}). Maher *et al*. (2001) found no constant influence of the effect of classification on the values of qualitative parameters in *m. longissimus dorsi* and *m. semimembranosus* in bullocks and heifers, using the most frequent classes according to the statistics in Ireland ($R4^+$, $R4^-$, O^{4+} and O^{4-}). If we compare the meat quality taking into consideration the classes of fattiness in the slaughtered body (1, 2, 3, 4, 5) we obtain results given in tab. 2. The content of intramuscular fat increased linearly with increasing fattiness of the carcass (class 1 = 1.19; class 5 = 2.52 g .100 g^{-1}). The differences between classes were statistically significant P<0.05). On the contrary, water holding capacity decreased (class 1 = 35.69; class 5 = 32.45 g . 100 g^{-1}). Results with other parameters of meat quality are quite variable. Bach *et al*. (1986) observed in bulls and Shemeis *et al*. (1994) in cows that with increasing fattiness of the carcass also the content of intramuscular fat increased, the values of shear force decreased, and the smell and flavour of meat were evaluated more favourably. Fiems *et al*. (2000) calculated the correlation coefficient between the degree of fattiness in carcass and content of intramuscular fat r = 0.704, values of shear force r = -0.244 and colour of meat r = -0.159 in bulls of Belgian Blue breed. The correlations, we calculated, were weak (0.104; -0.170 and –0.132). We also found out that the degree of marbling in meat correlated strongly with the content of intramuscular fat (r = -0.781).

Conclusions

Our results confirmed hitherto knowledge that the estimation of beef quality assessment is more precise if we use the classes of fattiness in the slaughtered body. We found most linear changes with the intramuscular fat using the meat classes as well as the classes of fattiness. Practical utilization of the results considering separately the classes of meatiness or classes of fattiness is questionable as the resulting quality class is in the EUROP system always the combination of the class of meatiness and the class of fattiness.

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Tab.1. Mean values ($\overline{x}$, s) of qualitative parameters in *m. longissimus thoracis* considering the classes of meatiness

Parameter	E	U	R	O	P	t – test
Water $g.100g^{-1}$	75,63±098	75,16±0,95	75,21±1,00	74,95±0,92	75,12±1,07	E:O*
Proteins $g.100g^{-1}$	21,43±0,63	21,63±0,83	21,83±0,75	21,88±0,74	21,89±0,71	E:O*
Fat $g.100g^{-1}$	1,99±0,78	2,19±0,95	1,98±0,83	2,32±0,84	2,46±0,82	R:O*
pH_{48}	5,75±0,18	5,71±0,21	5,74±0,24	5,71±0,20	5,71±0,17	
Colour %	8,86±1,64	9,70±2,34	9,43±2,53	9,30±2,23	9,62±2,50	
WHC $g.100g^{-1}$	34,15±3,22	34,50±3,59	33,56±3,62	33,88±3,42	33,92±1,30	
Cooking losses $g.100g^{-1}$	43,44±4,30	43,85±3,33	43,61±4,33	43,74±4,35	45,20±2,17	
Shear force kg	4,93±2,98	4,55±2,05	3,91±1,85	3,73±1,47	3,44±1,19	U:R,O*

* $P < 0.05$

Tab. 2. Mean values ($\overline{x}$, s) of qualitative parameters in *m. longissimus thoracis* considering the classes of fattines

Parameter	1	2	3	4	5	t – test
Water $g.100g^{-1}$	76,34±0,25	75,50±0,97	75,01±0,96	74,89±0,88	74,88±0,86	1:2*,3,4**
Proteins $g.100g^{-1}$	21,41±0,64	21,51±0,75	21,85±0,78	22,03±0,68	21,43±0,70	
Fat $g.100g^{-1}$	1,19±0,35	2,01±0,84	2,21±0,92	2,19±0,76	2,52±0,71	1:2,3,4*
pH_{48}	5,63±0,12	5,70±0,20	5,73±0,23	5,74±0,21	5,60±0,20	
Colour %	7,86±1,14	10,21±2,78	9,20±2,15	8,93±2,00	10,00±2,65	2:3,4*
WHC $g.100g^{-1}$	35,69±1,65	34,56±3,42	33,84±3,53	33,03±3,48	32,45±3,19	2:3*,4**
Cooking losses $g.100g^{-1}$	45,96±0,25	43,85±3,20	43,58±4,34	43,87±4,59	46,01±3,93	1:3**
Shear force kg	3,53±0,61	4,71±2,44	3,68±1,55	4,06±1,55	4,68±1,47	2:3**,4*

*$P < 0.05$, **$P < 0.01$