Influence of Gender on Fatty Acids Content in Wild Boar (*Sus scrofa) Venison*

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Abstract

The aim of the study was to evaluate the influence of sex on content of some chosen fatty acids in wild boar venison. Soxhlet method of extraction and gravimetric method were used. Relative content of fatty acids in clear intramuscular fat was determined by gas chromatography with flame ionization detector on Agilent 689A GC apparatus. Analyses of each fatty acid show differences in all samples of meat being analysed. The differences are as follows: the average values reached 0,81 % in males and 0,82 % in females in alpha – linolenic acid, the average values reached 15,86 % in males and 14,01 % in females in linoleic acid, the average values reached 2,71 % in males and 2,98 % in females in palmitoleic acid. No statistical significance were determined in this differences ($P>0.05$). The next analyses show follow differences: the average values reached 43,15 % in males and 44,62 % in females in oleic acid, acid the average values reached 0,42 % in males and 0,48 % in females in arachidonic, significant importance ($P<0.05$) were determined. According to our result we can state that gender present relevant factor influencing the fatty acids content in intramuscular fat in some fatty acids.

Key words: wild boar, venison, fatty acids

1. Introduction

One of the primary objectives of the red meat industry has been an attempt to consistently deliver high quality meat to consumers. Eating quality has long been recognised as a determinant for repeat purchasing [1]. Red meat consumers primarily use the visible fat (intra- and intermuscular) [2] and nutritional claims on packaging as an indication of the healthiness of meat products [3]. Quality assurance of meat products can be enhanced by matching live animal and carcase characteristics with consumer acceptance [4,5]. When considering the nutritional value of meat containing fat, three factors are important: the total fat content; the PUFA:SFA ratio; and the omega-6 to omega-3 fatty acid ratio (ω6:ω3) [6]. However, the healthiness and sensory properties of meat are also determined by the overall fatty acid profile [7]. The meat industry has been successful in reducing the fat content and modifying the fatty acid profile of red meats in accordance with the demands by health conscious consumers [8,9], [10]. Decreases in the fat content of game meat is, however, not necessary since the fat content is known to be very low (2–3%) [8,11]. Balanced and varied intake of food plays an important role in human health. Over last 100 or 200 years, the human diet has changed significantly. The most significant in developed countries over the last 50 years. These changes have occurred in particular in higher intake of animal products, resulting in an increased content of admitted fat and also energy [12-14]. In addition to the amount of fat, the fatty acid composition is also a key aspect of meat quality because it affects

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sensory and technological aspects such as succulence, taste and softness of the meat [15]. The morphological and histological characteristics of the venison are closely related to the particular lifestyle of the wild game and there are also influenced by the physical and chemical composition of the venison [16]. Also the cholesterol content (45mg/100g of fat) is lower compared to pigs (101mg/100g of fat). Consequently, wild game meat is considered to be a healthier alternative to pork meat [17].

2. Materials and methods

Monitoring area

Samples used for intramuscular fat analysis were derived from wild boars, which were hunted on driven hunt. The locality from which the analyzed pieces come from is situated in the district of Zlaté Moravce in Western Slovakia (Nitra´s region), the cadastral territory of the village Hostie. This location is located on the eastern side of the Tribeč Mountain.

Sampling

Samples were collected during driven hunt, in the field at the place of capture. Sampling was performed during the initial treatment of the game. One sample presented 100g of muscle mass, everyone sample was individually marked. The primary protocol recorded data: location, date, sex and age. The age was determined based on the development and wear of dental teeth. The analyzed samples were uniformly collected from the inside of the thigh muscle, this site is ideal for collecting muscle samples without the need to further disturb the compactness of the skin. The sample was taken from *Musculus semimembranosus*. Sampling was carried out during hunting season from November to December 2013.

Own analyses

Compact muscle mass was mechanically homogenized before the analysis itself. The content of the fatty acids was determined in vitro in the net intramuscular fat content.

The fat content was determined by extraction and gravimetric method according to Soxhlet and percent fatty acid content in pure fat using gas chromatography with a flame ionization detector on an Agilent 6890A GC instruments.

The subject of the study in our work was to evaluate differences in the content of selected unsaturated fatty acids depending on the gender. Across the chemical analysis process, samples were individually identified.

Analysed acids

The content of these unsaturated fatty acids has been investigated in our work from the competent analysis of the fatty acid content of intramuscular fat of the *Musculus semimembranosus*:

- Monounsaturated fatty acids: palmitoleic acid, oleic acid
- Polyunsaturated fatty acids: alpha-linolenic, linoleic acid, arachidonic acid

Statistical analysis

The content of the individual unsaturated fatty acids studied was determined by gender. The statistical significance of differences in mean values of the individual unsaturated fatty acids was tested by the Kolmogor-Smirnov test in the experiment. Statistical analyzes were processed by the Statgraphic Centurion program.

3. Results and discussion

The results of comparing the content of selected unsaturated fatty acids between the sexes in the wild boar venison are presented in table 1. The male sample consisted of thirteen pieces, sample of male consisted of twelve pieces.

The average value of the palmitoleic acid in the intramuscular fat is 2.89% in the female sample, which is 0.18% more than male sample. In this case we did not found a statistically significant difference (P=0.443255). [18] studied the difference of unsaturated fatty acids between sexes of wild boar venison too. The monitored muscle was *Musculus longissimus dorsi*. The average content of palmitoleic acid in male was 3.31% respectively in female it was 3.01%. They found higher content monitored acid more than 0.5%. When we compare the results for the females, we see much smaller difference. [19] monitored palmitoleic acid content in the roe deer venison. They found average value 1.95%.

In a standard sample of 13 males and 12 females, we found statistical significant difference between the sexes (P=0.0404109). Venison of

males contained 43.15%. This is significantly lower than average content of females, difference is almost 1.5%. [18] found the average content of oleic acid in males of wild boar in value 39.29%, in females 40.13%. It is almost the same content. We found much higher contents in both groups; differences are almost 4% in male group and 4.49% in female group. Content 29.88% of oleic acid in wild boar venison found [19]. It is lower content than our result. They study red deer (17.51%), roe deer (26.15%) too. There are markedly differences in every one species comparing with our results.

Table 1. Average values of monitored unsaturated fatty acids, standard deviations and significance tests results in tested groups

	Palmitoleic acid		*Oleic acid*		*Linolenic acid*		*Alpha - linolenic*		*Arachidonic acid*	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
n	13	12	13	12	13	12	13	12	13	12
$\vec{x}$ [%]	2.71[a]	2.89[a]	43.15[a]	44.62[b]	15.86[a]	14.01[a]	0.81[a]	0.82[a]	0.42[a]	0.48[b]
SD	0.35	0.39	2.76	1.62	2.19	1.65	0.22	0.14	0.19	0.11
P-value	**P** = 0.443255		**P** = 0.0404109		**P**= 0.0535289		**P** = 0.316307		**P** = 0.028057	

Means values with different letters in the same group showed a statistical significance of P≤0.05.

In the result of linolenic acid is big difference between our groups (1.85%), but without statistically significant difference (P=0.053528). The higher content is in the group of males, it is 15.86%. In second group is average value of linolenic acid 14.01%. [18] found difference between the sexes 1.67%. Average value in group of male was 11.37% and in female group 13.04%. We found higher contents with comparison with both groups. Lower content of linolenic acid in wild boars found [19] too. They found average content 11.62% in wild boar, similar content they found in roe deer (11.62%). In red deer they found average content 12.34%, which is closest to our results.

We found almost the same average contents in alpha-linolenic acid. In group of males we found average content 0.81% and in the female group we found average content 0.82%. We did not found statistically significant differences (P=0.316307). [18] found average content in wild boar venison in male group 0.46% and in female group 0.64%. There are lower average contents in both groups. Wild boar venison in [19] study had average content of alpha-linolenic acid in the level 1.46%. It is much higher content than our results. They found higher contents in the other species of wild games, in red deer venison it was 3.31%, roe deer 3.31% and in moose venison they found average content of alpha-linolenic acid 4.77%.

The last monitored unsaturated fatty acid was arachidonic acid. We found higher content in group of females, it was 0.48%. Difference between our groups was just 0.06%, but we found statistically significant difference (P=0.028057). [18] found much higher content arahcidonic acid in wild boar venison. In group of males they found average content 2.86%, in group of females they found similar result, it was 2.83%. Higher content of arachidonic acid in wild boar venison found [19] too, it was 2.02%. In the other species they found higher contents, in red deer venison it was 4.25%, in moose venison 4.59% and in the roe deer it was average content of arachidonic acid 5%.

4. Conclusions

In the nature, there are many factors than can affect the content of unsaturated fatty acids in intramuscular fat. The most important factor affecting the content of these acids is the species. Other factors than can affect the level of unsaturated fatty acids in the meat are the locality, which is related to climatic conditions, stress during the hunting season and changing the structure or amount of food. The content of unsaturated fatty acids in intramuscular fat may also be different in individual parts of the body, which is found in comparison with the results of other authors. Our research was focused on the

content of unsaturated fatty acids from the *musculus semimembranosus* and other work focused on *musculus longissimus dorsi,* resp., *lumborum.* We found that the female gender had higher values in almost all cases. Just in linolenic acid we found higher content in group of male. In oleic acid an in arachidonic acid we have found the statistical significance of the differences. We found that sex affects the content of some unsaturated fatty acids in wild boar venison.

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