The effect of added organic selenium on nutritional value, chemical and technological quality characteristics of pork

Vplyv pridaného organického selénu na nutričnú hodnotu, chemické a technologické vlastnosti bravčového mäsa

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Abstract

The aim of the research was to evaluate the effect of organic selenium in the feed on the selenium content in pork and selected qualitative traits of pork. The experiment was performed on 29 pigs in the control group and 21 pigs in the experimental group. Animals in both group were fed by same mixture, feed mixture for experimental group was supplemented by 300 µg selenium per 1 kg mixture. Selenium was in form protein-mineral premix. Selenised feed mixture increased the selenium concentration in muscles, selenium content in muscle was significantly higher in experimental group ($P < 0.01$). There was not difference between groups in chemical composition of muscle – water, proteins and intramuscular fat content. Statistically significant difference was found only in saturated fatty acids ratio ($P < 0.05$), other fatty acids did not differ between groups. No statistical difference was found in pH, drip loss and shear force. The pork with higher content of selenium showed significantly lower oxidative activity ($P < 0.01$) and higher color stability ($P < 0.01$).

Keywords: chemical composition, pork, selenium, technological parameters

Abstrakt

Cieľom práce bolo vyhodnotiť vplyv skrmovania organickej formy selénu v krmive na obsah selénu vo svale a na kvalitatívne ukazovatele bravčoviny. Experiment bol vykonaný na 29 ošípaných v kontrolnej skupine a 21 ošípaných v pokusnej skupine. Zvieratá oboch skupín boli kŕmené rovnakou kŕmnou zmesou, zmes pre pokusnú skupinu bola obohatená o 300 µg selénu na 1 kg zmesi. Selén bol vo forme minerálno-bielkovinového premixu. Selénom obohatená kŕmna zmes štatisticky preukazne zvyšovala obsah selénu vo svalovine experimentálnej skupiny (P < 0.01). V chemickom zložení svaloviny – podiele vody, bielkovín a vnútrosvalového tuku sme rozdiel nezaznamenali. Štatisticky významný rozdiel sme zaznamenali len v podiele nasýtených mastných kyselín (P < 0.05), v obsahu ostatných mastných kyselín nebol rozdiel medzi skupinami. Rozdiel sme nezaznamenali ani v pH, strate vody odkvapom a strižnej sile. Bravčovina s vyšším obsahom selénu mala nižšiu oxidačnú aktivitu (P < 0.01) a vyššiu stabilitu farby mäsa (P < 0.01).

Kľúčové slová: bravčové mäso, chemické zloženie, selén, technologické parametre

Detailný abstrakt

Ošípané plemena Biela ušľachtilá boli rozdelené do kontrolnej skupiny 29 ks (13 bravcov a 16 prasničiek) a experimentálnej skupiny 21 ks (11 bravcov a 10 prasničiek). Experimentálna skupina bola kŕmená rovnakými kŕmnymi zmesami v rovnakých rastových fázach ako pokusná, pričom minerálno-bielkovinový premix použitý pre experimentálnu skupinu ošípaných bol obohatený seleniom o 300 µg × kg^{-1}. Genotyp všetkých ošípaných bol analyzovaný na marker RYR-1, pričom všetky experimentálne zvieratá zodpovedali genotypu NN. Ukazovatele chemického zloženia mäsa a zloženia intramuskulárneho tuku v *musculus longissimus thoracis* boli stanovené zo metódou FT IR prístrojom Nicolet 6700. Ukazovatele fyzikálnej kvality mäsa ako farba bola stanovená prístrojom spektrofotometer CM-2600d. Aktuálna acidita - log molc [H+] svalu, bola stanovená 45 minút a 24 hodín *post mortem* v *musculus longissimus thoracis* prístrojom Sentron - Titan. Strata vody odkvapom (%) bola stanovená v súlade s metodikou Honikel (1998). Strižná sila *musculus longissimus thoracis* bola stanovená texturometrom Warner-Bratzler značky Chatillon. Data z *in vivo* experimentu boli analyzované pomocou dvojfaktorovej analýzy rozptylu použitím štatistického softvérového balíka SAS® verzia 9.1 (SAS Institute Inc, Cary, NC, 2004). Naše výsledky potvrdzujú štatisticky významne vyšší obsah selénu na úrovni P ≤ 0,01 (Table 2). Podobné zistenia publikoval Mahan et al. (1999) ktorý zaznamenal dvojnásobné zvýšenie obsahu selénu v tkanivách a orgánoch u ošípaných, pri ktorých bola kŕmna dávka suplementovaná organickým selénom. Podľa Poovey et al. (2007) môže byť nedostatočný alebo štatisticky nepreukazný vplyv prídavku organického selénu na farbu mäsa ošípaných spojený s časom a podmienkami skladovania. V našom pokuse v experimentálnej skupine bola v ukazovateli farby mäsa a* po 7 dňoch nameraná hodnota 9,176, v kontrolnej skupine hodnota 3,618, rozdiel je štatisticky významný (P < 0,01). Rovnako v prípade ukazovateľa farba mäsa b* po 7 dňoch v svale *musculus longissimus thoracis* sa štatistická významnosť medzi experimentálnou a kontrolnou skupinou v našom pokuse prejavila na úrovni P ≤ 0,01. Tento výsledok je v súlade s výsledkami Stupku et al. (2010). Pridanie selénu zvyšuje aktivitu glutation-peroxidázy v sére. Práve táto zvýšená aktivita je spájaná so zvyšovaním stability lipidov počas skladovania (Marković et al., 2010). Štatisticky významné rozdiely sa v našom experimente v prípade oxidačnej stability prejavili na 7 deň na úrovni $P \leq 0,01$, na 3. deň na úrovni $P \leq 0,01$ a na 5. deň na úrovni $P \leq 0,05$. Naše výsledky sú v súlade s výsledkami Daun et al. (2001). Pri bravčovom mäse, ktoré je veľmi náchylné na lipidovú oxidáciu sa osvedčil prídavok selénu do diéty vykrmovaných ošípaných. V ukazovateli straty vody odkvapom podobne ako v experimente Mahan et al. (1999) sme nezaznamenali štatisticky preukazné rozdiely medzi pokusnou a kontrolnou skupinou. V prípade ukazovateľa strižná sila podľa Warner-Bratzlera bola v experimentálnej skupine zaznamenaná nižšia hodnota v porovnaní so skupinou experimentálnou, avšak zistené rozdiely neboli štatisticky preukazné. V súlade s našimi výsledkami je aj štúdia Clyburna et al. (2007) kde autori uvádzajú zníženie strižnej sily, avšak bez štatistickej preukaznosti. Zvýšený obsah selénu v experimentálnej skupine sa v pH_1 a pH_{24} v svale MLT podobne ako v našom experimente neprejavil ani vo výskumných prácach Bobčeka et al. (2010), Woltera et al. (1999) a Biana et al. (2010).

Introduction

Selenium is an essential trace element which is the very important for the human and the animal body, in spite of the toxicity. In the form of selenoproteins it acts as an antioxidant protecting against the effects of the free radicals and enhances the activity of the immune system, it is involved in the production of the enzyme glutathione peroxidase, which is necessary for the metabolism of the fats (Lyons et al., 2007; Thomson, 2004). Selenium has a positive effect on the activity of thyroid gland and liver, increases the fertility and influences positively the production of the testosterone. A sufficient amount of selenium in the body also has a positive effect on the magnesium absorption in the gastrointestinal tract (Rayman, 2012). Selenium significantly affects the deactivation of the heavy metals, for example cadmium and lead, and has a protective effect against a mutagens, for example the biphenyl and nitrosamines (Kalia and Flora, 2005; Valko et al., 2005). Another functions of selenium, but in the interaction with vitamin E, is the protection of the polyunsaturated fatty acids from the lipid peroxidation (Sunde, 2001). In addition to the mentioned functions, selenium protects organism against cardiovascular disease in both people and animals, by preventing the creation of blood clots. The studies confirmed the fact that low levels of selenium in the serum increases the risk of coronary heart disease in humans, but that also leads to a number of cardiovascular diseases in livestock, for example Mulberry heart disease in pigs (Combs, 2001; Fajt et. al, 2009; Rayman et al., 2011).

Selenium concentration in the food of animal origin is given by the selenium content in the feed used for animal nutrition (Lyons et al., 2007). Selenium intake in the people and livestock varies in the different parts of the world and it is compared using the so-called selenium status, showing the saturation of the organism by this trace element and its compounds. Selenium status depends on the various factors such as the absorption, the food consumption and excretion in relation to the bioavailability (Ermidou-Pollet et al., 2005). Organically bound selenium is used most often in the form of selenised yeast. The selenium enriched yeast contains selenium in the form of selenomethionine. This form is also included in many plants and cereals. An inorganic selenium compounds are less available for animals. An inorganic form is excreted by the urine, organic form mainly via feces. Selenium in its organic form has a higher utility (75.7%) than bounded selenium in inorganic form (49.9%). This is showed by a higher content of organically bounded selenium in all organs and tissues (Mahan and Moxon, 1978; Kim and Mahan, 2001). It should be noted that the activity of glutathione peroxidase (GSH-Px) in the serum remains the same in the organic and the inorganic form. The maximal activity of GSH-Px is achieved at a concentration of 0.1 mg*kg^{-1} feed in both forms. The levels of selenium in the meat of livestock and the animal products have seasonal fluctuations and vary depending on the feed composition (Fajt et al., 2009). The recommended addition of selenium is 0.3 mg*kg^{-1} in the feed mixture. The higher addition of selenium in the feed can have a negative effect on the animal health. This is showed by a respiratory disorder, ataxia, diarrhea and mortality in acute form. In the chronic form, which arises from the continual feeding of selenium, it can reduce feed intake, cause slow growth, liver cirrhosis or anemia (Fajt et al., 2009).

The concentration of selenium in plasma/serum of the people in European countries is 60 - 111 µg*l^{-1}, where the selenium status of the Slovak population is in the lower line of this range (Combs, 2001; Hać et al., 2001). In regard to the low selenium status of the Slovak population and the amount of pork consumption, the one of the suitable way of increasing selenium intake in the people is the addition of organic selenium to the compound feed for pigs, thus increase selenium content in the pork as the final product for the human nutrition.

The inorganic form of selenium (sodium selenite) as well as organic form (e.g., selenium-enriched yeast SELPLEX®) in the feed mixture of pigs increases the activity of GSH-Px in the serum. Increased activity of glutathione peroxidase is associated with the improvement of some indicators of the quality of pork such as increased ability of the meat to bind water, higher stability of the lipids during storage, and improves the color of pork (Marković et al., 2010). Feeding with the compound feed supplemented with the organic forms of selenium in 0.3 mg*kg^{-1} in the compound feed increased the content of selenium in the muscle *musculus longissimus thoracis* (MLT) (Bobček et al., 2004). Also the increased antioxidant capacity of the muscle has been published by Daun et al. (2001), Bobček et al. (2004) and Zhan et al. (2007). Zavodnik et al. (2011) found out that organic selenium added to the feed ration positively affects the ability of meat to retain water which is reflected in the improvement of the quality of pork. Zhan et al. (2007), Wolter et al. (1999) and Morel et al. (2008) noted the increase in the water binding capacity. The drip loss values were lower but not statistically significant (Bobček et al., 2004). Some authors reported (Kim and Mahan, 2001; Liu et al., 2011; Lyons et al., 2007) the selenium supplementation in feed can influence the daily weight gain.

The aim of the research was to evaluate the effect of feeding of compound feed with the addition of organic selenium to the nutritional characteristics, chemical composition and technological parameters of pork. It was hypothesized that selenium addition in diet of pigs will increase selenium content in muscles, reduces oxidation activity and stabilize color of pork.

Materials and methods

The experiment was carried out in the Experimental centre of livestock at the Department of Special animal husbandry of the Slovak University of Agriculture in Nitra. The experiment included 50 pigs of large white breed. DNA tests have detected genetic marker for all pigs RYR 1 (malignant hyperthermia syndrome) which correspond to all experimental animals NN genotype, dominant homozygote. The pigs were divided into control group of 29 pigs (13 barrows and 16 gilts) and experimental group of 21 pigs (11 barrows and 10 gilts). The control group was fed a standard feed ration consisted of the three feed mixtures, which were used at the different growth stages, 30 - 45 kg OŠ-03, 45 - 70 kg OŠ-04 and 70 - 100 kg OŠ-05 (Table 1). The experimental group was fed by the same feed mixtures in the same growth stages as the control group and the protein-mineral premix enriched by 300 $\mu g \cdot kg^{-1}$ of organic selenium was used in the experimental group of pigs. Addition of protein-mineral premix was allowed by ruling No. 1750/2006 issued by the Ministry of Agriculture of the Slovak Republic.

Table 1. Composition of the diet

Tabuľka 1. Zloženie kŕmnej dávky

Trait	Control group			Experimental group		
	OŠ-3	OŠ-4	OŠ-5	OŠ-3	OŠ-4	OŠ-5
Barley (%)	26.5	26.0	26.0	26.5	26.0	26.0
Wheat (%)	26.0	24.4	26.0	26.0	24.4	26.0
Corn (%)	17.7	26.3	27.0	17.7	26.3	27.0
Soybean meal (%)	26.5	20.0	15.2	26.5	20.0	15.2
Wheat bran (%)	0.0	0.0	3.0	0.0	0.0	3.0
Mineral and protein	3.0	3.0	2.8	3.0	3.0	2.8
Fodder acid (%)	0.3	0.3	0.0	0.3	0.3	0.0
Dry mater (%)	90.74	90.17	90.81	90.74	90.17	90.81
Crude protein (%)	15.28	11.65	11.46	15.28	11.65	11.46
Metabolisable energy (MJ)	13.55	13.38	13.06	13.55	13.38	13.06
Lysine (g)	9.48	7.41	6.30	9.48	7.41	6.30
Selenium – added ($\mu g * kg^{-1}$)	-	-	-	300	300	300

The pigs were housed in an environmentally controlled finishing barn with two pigs in each pen. They were allowed ad libitum access to feed and water. The fattening period in pigs lasted from 30 to 100 kg. The growth performance of pigs was controlled by weighing with an accuracy of 0.5 kg. The weighing was carried out in two week intervals (30 – 90 kg) and one-week intervals (90 – 100 kg).

Chemical composition of pork in *musculus longissimus thoracis* (MLT) muscle was determined from samples of muscle homogenate (50 g) using the FT IR method (Nicolet 6700). The total protein content ($g \times 100\ g^{-1}$), content of intramuscular fat ($g \times 100\ g^{-1}$), total water content ($g \times 100\ g^{-1}$) and content of individual groups of fatty acid methyl esters (FAME) ($g \times 100\ g^{-1}$ FAME) was analysed. The analysis of infrared spectra of muscle homogenate was done using the method of molecular spectroscopy. Individual groups of FAME were determined from the muscle homogenate of MLT muscle in the Laboratory of gas chromatography at Faculty of Natural Sciences (Comenius University, Bratislava, Slovakia).

The physical characteristics of meat quality were measured in the laboratory of the Experimental Centre near the Department of Animal Husbandry, SUA in Nitra. Meat color was determined from the cut of the MLT muscle above the last thoracic vertebra 24 h *postmortem* using the spectrophotometer CM-2600d. Commission Internationale de l'Eclaire (CIE) L*, a*, and b* values were determined using the CIELAB space with a D65 illuminate. The surface of the measured samples was wet so the color was determined from brightness (SCI). The actual acidity - log molc [H+] muscle was measured 45 minutes and 24 hours *postmortem* using combined micro-capillary electrodes (portable acidometer brand Sentron-Titan). For the determination of drip loss (%), the methodology described by Honikel (1998) was used. The Warner-Bratzler shear force was analysed after 7 day-storage at temperature 4 ± 1 °C. The samples were heated to temperature of 71 ± 1 °C for 30 minutes and then cut into chips of 1 x 1 cm across fibers. Shear force was determined using the device Chatillon.

Data from in vivo experiments were analysed using two-factor analysis of variance with fixed factors (the control group, the experimental group with selenium). The basic variance statistical characteristics were determined for experimental and control groups. To compare differences between groups, the statistical software package SAS ® version 9.1 (SAS Institute Inc., Cary, NC, 2004) was used. In terms of the individual groups of solid factor the number of genders (gilts and barrows) was balanced in the each group. The significance of differences was determined by F-test with a significance level of $P < 0.05$ and $P < 0.01$.

Results and discussion

The results showed statistically significant differences ($P \leq 0.01$) between the experimental group and the control group in the content of selenium in the muscle (Table 2). Mahan et al. (1999) and Fajt et al. (2009) have found the double increasing of selenium content in the tissues and organs of pigs fed by supplemented organic selenium. The same conclusion, significantly higher selenium level in the muscle (MLT) in pigs fed with compound feed with the addition of organic selenium, was presented by Bobček et al. (2004).

Table 2. Selenium level in *musculus longissimus thoracis* muscle of pigs

Tabuľka 2. Množstvo selénu v svale *musculus longissimus thoracis* ošípaných

Trait	Control (n = 29) Mean ± sd	Group organic selenium (n = 21) Mean ± sd
Selenium ($mg \times kg^{-1}$)	0.088 ± 0.01^{a}	0.153 ± 0.01^{b}

a : b = $P \leq 0.01$

According to Lagin et al. (2008, 2009), the application of organic selenium in the feed mixture of pigs causes the retention of the selenium in muscles and tissues and further has a positive impact on the quality of pork. The chemical composition and fatty acids content of intramuscular fat in *musculus longissimus thoracis* are shown in Table 3 and 4.

Table 3. Chemical composition of *musculus longissimus thoracis* muscle

Tabuľka 3. Chemické zloženie svalu *musculus longissimus thoracis*

Trait	Control (n = 29) Mean ± sd	Group organic selenium (n = 21) Mean ± sd
Total water (%)	72.189 ± 0.74	72.064 ± 0.62
Protein (%)	24.487 ± 0.57	24.668 ± 0.75
Intramuscular fat (%)	1.751 ± 0.74	1.665 ± 0.69

Table 4. Fatty acids in intramuscular fat of *musculus longissimus thoracis* muscle ($g \times 100\ g^{-1}$ FAME)

Tabuľka 4. Mastné kyseliny vo vnútrosvalovom tuku svalu *musculus longissimus thoracis* ($g \times 100\ g^{-1}$ FAME)

Trait	Control (n = 29) Mean ± sd	Group organic selenium (n = 21) Mean ± sd
Monounsaturated fatty acids	51.519 ± 2.00	50.870 ± 2.80
Polyunsaturated fatty acids	11.001 ± 1.67	11.165 ± 1.61
Saturated fatty acids	38.752 ± 1.66[a]	37.736 ± 1.45[b]
ω3 polyunsaturated fatty acids	0.477 ± 0.06	0.496 ± 0.07
ω6 polyunsaturated fatty acids	10.114 ± 1.55	9.975 ± 1.50

a : b = $P \leq 0.05$

Differences were not found between control and experimental group in intramuscular fat content in muscle. Only in saturated fatty acids content have been recorded significant difference between groups. Lowest content of intramuscular fat in groups fed by selenised feeds in chicken was presented by Ševčíková et al. (2006). In contrary Morel et al. (2008) reported highest level of intramuscular fat in pork fed by selenised feeds in combination with vitamin E. The meat color is an important indicator of the quality of pork. Organic selenium can affect the stability of the color of pork and poultry (Joksimović-Todorović et al., 2012). The same hypothesis, organic selenium improving the stability of the color of meat, was also confirmed by Zhan et al. (2007). The statistically significant difference at the level P ≤ 0.01 was also found in this experiment in the parameter the color of meat a* and b* after 7 days in muscle *musculus longissimus thoracis* (CIE 7a* MLT and CIE 7b* MLT). In the experimental group the indicator CIE 7a* MLT showed value 9.176 ± 2.601%, the control group showed 3.618 ± 1.13%. An indicator L* color of meat in the muscle *musculus longissimus thoracis* after 7 days (CIE 7L* MLT) showed statistically significant difference between the experimental and control group at P ≤ 0.05. Similar results were presented by Stupka et al. (2010) who tested the impact of the organic selenium in the form SEL-PLEX ® in the feed mixture for hybrid pigs and found the statistically significant difference in indicator L* and b* color of the meat. Color a* was not affected. In addition the statistical significance at P ≤ 0.05 level have been found in the indicator color of meat and a* after 24 hours in the muscle *musculus longissimus thoracis* (CIE 24a* MLT).

Speight et al. (2012) have not found significant differences between the color of the meat of boars in the experimental group fed by feed mixture enriched with organic selenium (CIE L* = 46.47, CIE a* = 10.32, CIE b* = 16.24) and the control group without the addition of selenium (CIE L* = 48.28, CIE a* = 10.67, CIE b* = 16.16. Mateo et al. (2007) showed a similar conclusion in his research. According to Poovey et al. (2007) meat color changes could be associated with the storage conditions.

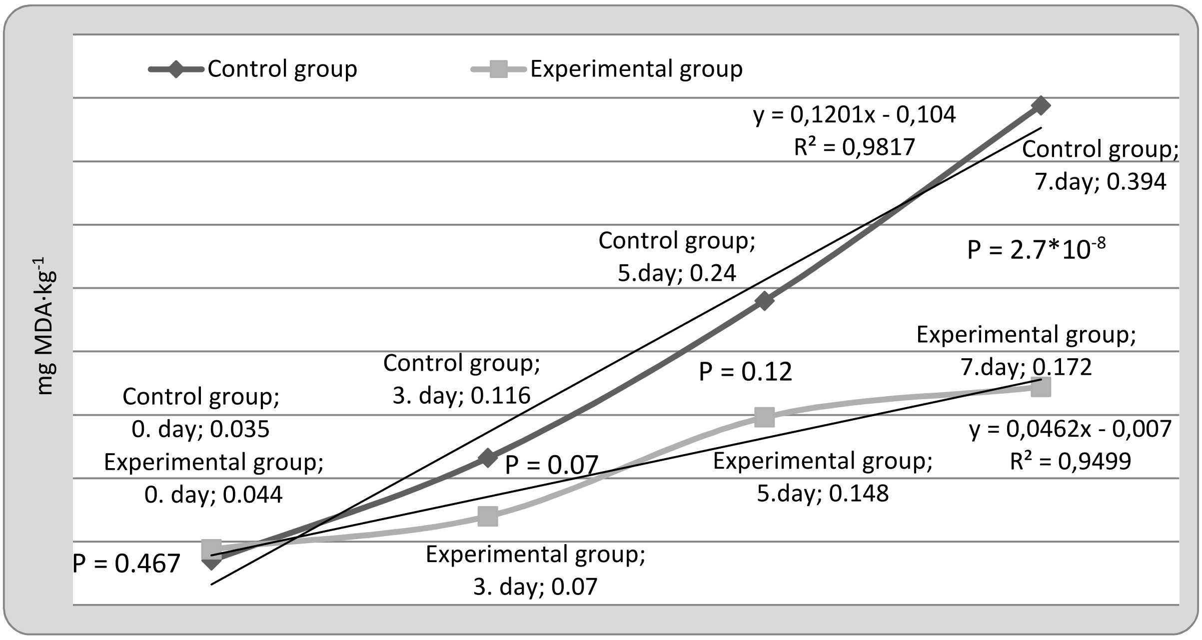

Figure 1. Effect of dietary organic selenium supplementation on the antioxidative stability of *musculus longissimus thoracis* muscle (n = 50)

Obrázok 1. Účinok prídavku organického selénu na antioxidačnú stabilitu svalu *musculus longissimus thoracis* (n = 50)

As stated above, the selenium is part of an endogenous enzyme glutathione peroxidase. Glutathione peroxidase has a significant antioxidant effect in elimination of the peroxides (Ďuračková, 1998; Kalia and Flora, 2005; Valko et al., 2005). Wolter et al. (1999) and Zhan et al. (2007) have shown that the addition of selenium in an organic form, in the supplemented feed mixture of the pigs increases the activity of the glutathione-peroxidase in serum.

This increased glutathione peroxidase activity is associated with the improvement of the selected parameters of pork quality for example the higher stability of lipids during the storage (Marković et al., 2010). This fact was confirmed by the results of this experiment. The positive effect of selenium in the experimental group was found on the oxidative stability of pork, measured 3, 5 and 7 days *post mortem* (Figure 1).

The statistically significant differences were found in oxidation stability in muscle *musculus longissimus thoracis* measured 7 days at $P \leq 0.01$, oxidation stability measured 3 days at a $P \leq 0.01$, oxidative stability at 5^{-th} day at $P \leq 0.05$. Results are in accordance with the conclusions of Bobček et al. (2004) that an increased intake of organic selenium increases the antioxidant capacity of muscles in pigs. According to Daun et al. (2001), pork is very susceptible to lipid oxidation so the addition of selenium to the diet of fattening pigs is very effective.

Water drip loss showed no statistical difference between the groups. Mahan et al. (1999) studied the effect of the dietary supplementation of selenium on the water drip loss. They found no statistically significant differences between the groups, which is equal with results of presented study. Also Janz et al. (2008) reported that the selenium supplementation had no effect on the water drip loss or the ability of meat to retain the water.

Table 5. Pork quality of *musculus longissimus thoracis* muscle

Tabuľka 5. Kvalita bravčoviny zo svalu *musculus longissimus thoracis*

Trait		Control (n=29) Mean ± sd	Group organic selenium (n=21) Mean ± sd
pH_1 - log molc. [H+]		6.217 ± 0.12	6.265 ± 0.11
pH_{24} - log molc. [H+]		5.707 ± 0.08	5.715 ± 0.07
Drip loss (24 hours) %		5.966 ± 2.57	6.417 ± 2.46
Color (24 hours)	CIE L*	57.933 ± 2.25	57.790 ± 2.96
	CIE a*	4.044 ± 4.68^a	6.674 ± 5.55^b
	CIE b*	4.879 ± 7.79	2.688 ± 7.87
Color (7. day)	CIE L*	58.326 ± 2.21^a	59.791 ± 2.51^b
	CIE a*	3.618 ± 1.13^c	9.176 ± 2.60^d
	CIE b*	6.340 ± 6.90^c	11.570 ± 6.23^d
Shear force (W-B) kg		4.526 ± 0.92	4.380 ± 0.72

a : b = $P \leq 0.05$, c : d = $P \leq 0.01$

The indicator pH or acidity of the meat is considered as the one of the most important indicators representing the quality of pork. Based on results of this study it is concluded the addition of the organic selenium in the feed mixture of pigs has no statistically significant effect on acidity (Table 5). The increased content of selenium in the experimental group in pH_1 and pH_{24} in muscle MLT has no effect in the papers of Bobček et al. (2010), Wolter et al. (1999) and Bian et al. (2010).

Shear force by Warner-Bratzler showed lower values in the experimental group but the difference was not statistically significant. Bobček et al. (2010) presented the lower measured values of the shear force in the experimental group but not statistically significant either. Clyburn et al. (2007) also found a lower values of shear force in pork from pigs fed with selenium additives, but without significant difference.

Conclusion

The results of the experiment confirmed the ability of selenium retention in muscles and tissues in pigs fed by selenised feed mixtures. Selenium content in pork was significantly higher in pigs fed by feed mixture supplemented with selenium. The content of water, protein and intramuscular fat was not significantly affected. Likewise, the content of particular fatty acids was the same in all treatments, except saturated fatty acids. Higher content of saturated fatty acids was recorded in pork from pigs without selenium in diet. The expected difference in oxidation activity was proven as well as color stability after 7 days post-mortem.

Acknowledgements

This work was supported by projects ECOVA - ITMS 26220120015, VEGA 1/0364/15, KEGA 035SPU-4/2015

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