PE9.42 Influence of dietary mycotoxins adsorbents supplementation on quality of pork meat(M. Semimembranosus) 401.00

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***Abstract*– Technological and nutritional quality of *M. Semimembranosus* in pigs, fed with diets supplemented with three different mycotoxins adsorbents, inorganic and organic origin (Min-a-Zel, Mycosorb and Mycofix), were examined.**

The results showed a positive influence of use of mycotoxins adsorbents Min-a-zel on improved nutritive value of produced pork. According to the defined criteria for meat quality determination, the average quality of muscles from halves of control and experimental groups is RFN (normal). The analysis of all results obtained during the investigations point to a positive opinion on the use of mycotoxins adsorbents (Mycosorb and Min-a-zel).

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***Index Terms*—Pork (*M. semimembranosus*), Mycotoxins adsorbents, Meat quality**

I. INTRODUCTION

Quality of pigs halves and meat is influenced by a number of exogenic and endogenic factors. Feeding as the exogenic factor, take a part with more than 30 % on quality of halves and meat.

Feeding as the exogenic factor is responsible for more than 30% of halves and meat quality. That is why in regions with developed pork production, big attention is paid to feeding i.e. optimisation of animals meals [1]. In the recent period, except to fulfil the energetic and nutritional demands of feed, attempts have been made to enrich feed with substances which can prevent diseases, but having in mind that the use of drugs increases the price of the final product (pigs, halves, pork) [2].

Mycotoxins, the secondary metabolite products of fungi (*Fusarium, Aspergillus, Penicillium*), are responsible for mycotoxicosis, diseases very common in pigs [3]. Symptoms of mycotoxicosis are laxity, polidipsy, poliuria, changes on bones, liver and kidney damages [4]. Mycotoxins are harmful for human also, as they cause chronic illnesses, while some of them are marked as carcinogenic or potentially carcinogenic by the international cancer agency. Unfortunately, mycotoxins are very present in feed and food [5].

Therefore, it is very important to eliminate mycotoxins from feed and food chain. One possibility is to add adsorbents to feed to bind the mycotoxins in the animals digestive system [6]. Also, the addition of adsorbents in feed results in decrease or elimination i.e. reduction of mycotoxins in meat, milk and eggs. However, literature data relating the effects of feed supplementation with mycotoxins adsorbents on pork meat quality are lacking.

Therefore, the objective of this study was to evaluate the nutritional and technological quality of pork *M. Semimembranosus*, fed diets supplemented with three different mycotoxins adsorbents, Min-a-Zel (inorganic adsorbent), Mycosorb and Mycofix (organic adsorbents).

II. MATERIALS AND METHODS

A. *Experimental design*

All pigs included in these investigations were from the same genotype and with initial weight approximately 25 kg. The control group (K) obtained standard mixture for pigs and the experimental groups were fed the same mixture with the addition of 2 g/kg of mycotoxin adsorbents, O_1 group - Mycosorb– organic adsorbent, O_2 group - Min-a-Zel – inorganic adsorbent for and O_3 group – Mycofix - organic adsorbent. Feeding of all groups of animals ended when the average mass of pigs was 97 – 110 kg. Pigs were slaughtered and processed by standard technological procedure. Nutritional and technological quality of meat was investigated on *M. Semimembranosus* (SM).

B. *Nutritional quality measurements*

Nutritional quality measurements were carried out by usual analytical methods: content of water, by drying to constant mass [7], content of total ash, by burning at 550±25 ºC to constant mass [8], content of free fat, by Soxhlet method [9], content of protein, using Kjeldahl´s method for determination of nitrogen content and then multiplying by factor 6.25 [10]. Content of protein of connective tissue was determinate by multiplying hydroxyproline content by the factor 8, and relative content of protein of connective tissue (RCPCT) was calculated by dividing the content of protein of connective tissue with the content of protein [11].

C. *Technological meat quality measurements*

pH was measured in the centre of SM muscles 45 min ($pH_{45'}$) and 24 h pm (pH_{24h}) using the portable pH meter equipped with an insertion glass combination electrode [12].

Water holding capacity (WHC_{24h}) was determined by compression method and expressed as % of bound water [13].

Colour measurements of lightness (L^*_{24h}) were performed with photo colorimeter MINOLTA CHROMA METER CR-400 (Minolta Co., Ltd., Osaka, Japan).

D. Criteria for meat quality determination

PSE (Pale, Soft, Exudative): $pH_{45'}$<5.8, pH_{24h}<6.2, L^*_{24h} >50, WHC_{24h} (%)<50;

RSE (Reddish, Soft, Exudative)**:** $pH_{45'}$ <5.8, pH_{24h} <6.2, L^*_{24h}= 43 – 50, WHC_{24h} (%)<50;

RFN (Reddish, Firm, Non-exudative)**:** $pH_{45'}$>5.8, pH_{24h}<6.2, L^*_{24h}= 43 – 50, WHC_{24h} (%)=50-60;

PFN (Pale, Firm, Non-exudative): $pH_{45'}$>5.8, pH_{24h}<6.2, L^*_{24h}>50, WHC_{24h} (%)>60;

DFD (Dark, Firm, Dry): $pH_{45'}$>5.8, pH_{24h}>6.2, L^*_{24h}<43, WHC_{24h} (%)>65 [14].

E. Statistical analysis. All data are presented as means ± standard deviation. The results were evaluated statistically using the analysis of variance and Duncan's multiple range test in the Statistical Analysis System [15].

III. RESULTS AND DISCUSSION

A. Nutritional quality

Meat is very rich in nutrients and plays important role in human diet [16], thus it is very important to investigate if the addition of mycotoxins adsorbents has any influence on nutritional quality of pork meat.

Addition of mycotoxins adsorbents to feed mixture had no significant influence on average water content (Table 1) in the examined *M. semimembranosus* samples. Compared with results of Dzinic [17], it is clear that water content in samples investigated in this experiment is somewhat lower than in samples of multi-race hybrids from study mentioned before.

Content of total ash in meat is about 1 %, while in lean meat it can be higher, up to 1.5 % [16], as also confirmed in this investigation.

Fat content in muscles of control group was higher than in muscles in all-experimental groups (O_1, O_2, O_3). Lowest fat content was found in experimental group O_2, however the differences were not statistically significant (P>0.05).

It is important to mention that the average free fat content in *M. semimembranosus,* both in control and experimental groups was higher than 2% - the upper limit for MS muscles of good quality, intended for processing highest quality meat product, especially cooked ham (18).

The highest average protein content was found in experimental O_2 group, significantly higher than group O_3, which means that meat obtained from pigs fed with diets supplemented with inorganic adsorbent (Min-a-zel) had better quality, from nutritional point of view. In control (K), and experimental groups O_1 and O_3 protein content was lower than 21%. Vidovic (19) reported, that 21% of protein content is the bottom limit for quality muscles (*M. semimembranosus*) of pigs, what is the basic task in modern pig raising.

The average relative content of connective tissue protein (RCPCT) in meat protein (MP) ranged from 2.03 to 3.03% for control (K) and experimental group O_2, respectively. The RCPCT value of the control group muscles was significantly lower compared with experimental groups O_1 and O_2 (P > 0.05), and they fulfil the defined criterion for values in quality muscles (RCPCT<2%).

B. Meat quality

Different parameters and criteria for defining and classifying of pork quality are given in contemporary literature. Parameters chosen for quality defining are:

$pH_{45'}$, pH_{24h}, L^*_{24h} and WHC_{24h} (%) and they define five quality groups of meat: PSE, RSE, RFN, PFN and DFD.

Measurements of technological quality of MS are presented in Table 2. Determined $pH_{45'}$ values were higher than 5.9. Highest $pH_{45'}$ values were for control group (K), with statistically significant differences with O_1, O_2 ($P<0.05$), and O_3 ($P<0.001$). Regarding the $pH_{45'}$ value criteria for quality, MS of all examined groups were potentially of RFN, PFN and DFD quality.

The pH_{24h} value measured in MS samples ranged from 5.72 (group O_1) to 5.90 (group O_3) ($P>0.05$).

The results obtained from other parameters of technological quality (colour - L^*_{24h} and water holding capacity-WHC_{24h}), helped on defining the average muscle quality of control and experimental groups.

Lightness (L^*_{24h}) of examined MS was between 42.79 and 46.98, what indicated normal colour (RSE and RFN quality).

Incidence of different quality of MS of control (K) and experimental (O_1, O_2, O_3) groups of pigs are shown in Fig. 1.

Highest incidence of normal quality (RFN) MS was found in control group. Further, somewhat better muscles quality of O_1 experimental group (addition of Mycosorb) was found compared to experimental group O_2 (Min-a-zel) and O_3 group (Mycofix added).

On the basis of the discussed results, the conclusion is that the addition of mycotoxins adsorbents has no significant influence on meat quality, as the majority of samples are of RFN quality.

IV.CONCLUSION

The obtained values for technological meat quality parameters $pH_{45'}$, pH_{24h}, L^*_{24h} and WHC_{24h} (%) shown that the average technological quality of muscles from pig halves of control and experimental groups was RFN (normal).

The frequency of muscles of normal quality was lower in the experimental groups than in the control group. Also, somewhat better quality of *M. Semimembranosus* was for experimental group O_1 compared to experimental group O_2 was found, as well as of experimental O_3 group compared to experimental O_2 group.

The analysis of the results obtained in the investigations gives a positive opinion on the use of mycotoxins adsorbents (Mycosorb and Min-a-zel) in pigs feed.

ACKNOWLEDGEMENT

This study was supported by the Ministry of Science and Technological Development of the Republic of Serbia, Project No. TR20037.

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Table 1. Average values of *M. semimembranosus* nutritional quality for control and experimental groups

Parameters (%)	K	O_1	O_2	O_3
Water content	$74.47^{ns} \pm 0.75$	$74.54^{ns} \pm 0.70$	$74.55^{ns} \pm 0.64$	$74.64^{ns} \pm 0.60$
Total ash content	$1.13^{ns} \pm 0.02$	$1.07^{ns} \pm 0.12$	$1.17^{ns} \pm 0.08$	$1.24^{ns} \pm 0.07$
Free fat	$3.72^{ns} \pm 0.54$	$3.62^{ns} \pm 0.90$	$3.06^{ns} \pm 1.04$	$3.44^{ns} \pm 0.79$
Protein	$20.69^{a,b} \pm 0.46$	$20.77^{a,b} \pm 0.45$	$21.22^{a} \pm 0.86$	$20.55^{b} \pm 0.46$
Relative content of protein of connective tissue (RCPCT)	$2.03^{a} \pm 0.37$	$2.74^{b} \pm 0.90$	$3.03^{bc} \pm 0.64$	$2.30^{ab} \pm 0.22$

^{abc} indicates significant difference at $P < 0.05$

Table 2. Average values of pH, WHC, and lightness L_{24h}* for control and experimental groups

Parameters	K	O_1	O_2	O_3
$pH_{45'}$	$6.25^{a,A} \pm 0.22$	$6.01^{b} \pm 0.16$	$6.04^{b} \pm 0.24$	$5.90^{B} \pm 0.28$
pH_{24h}	$5.78^{ns} \pm 0.27$	$5.72^{ns} \pm 0.21$	$5.75^{ns} \pm 0.27$	$5.90^{ns} \pm 0.27$
L_{24h} *	$46.27^{a} \pm 2.62$	$46.98^{a} \pm 3.56$	$46.49^{a} \pm 4.76$	$42.79^{b} \pm 1.32$
WHC_{24h} (%)	$81.32^{a,A} \pm 4.27$	77.38 ± 4.96	$75.10^{B} \pm 5.22$	$76.80^{b} \pm 3.27$

^{AB} indicates significant difference at $P < 0.001$; ^{ab} indicates significant difference at $P < 0.05$.

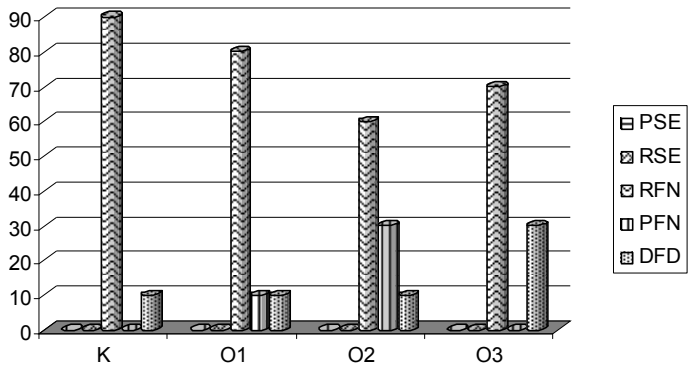

Figure 1. Incidence of different MS quality of halves of control and experimental groups