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THE EFFECT OF THE PROPOLIS EXTRACT ON BROILER HUBBARD JV INTERAL FAT

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ABSTRACT
The aim of the experiment was to evaluate the influence of feed mixtures with propolis extract on weight and fat creation in carcass body of chickens from Hubbard JV hybrid combination. Propolis extract was applied into the feed mixtures in amount of 150 mg kg^{-1} (1st experimental group), 450 mg kg^{-1} (2nd experimental group), 600 mg kg^{-1} (3rd experimental group) and 800 mg kg^{-1} (4th experimental group). Fattening was lasted for 42 days on deep litter (sawdust). Into the experiment, 500 pieces of 1-day chickens were included and then 5 groups of 100 pieces were created: control group – C (without propolis extract application) and 4 experimental groups – E1, E2, E3 and E4 (with a dose of propolis extract). Higher weight of carcass body ($P \geq 0.05$) was found in E1 and E2 groups (1022.37 g - E1 and 1019.75 g - E2) compared with C group (1005.12 g) and lower weight of carcass body ($P \geq 0.05$) was found in E3 and E4 group (927.37 and 916.75) compared with control group. Significant differences ($P \leq 0.05$) were found between the groups E1 and E4, E2 and E4, E1 and E3 and between the groups E2 and E3. The lowest content of abdominal fat was recorded in control group and in E4 group (0.73%). In experimental groups, values of abdominal fat content were decreased by gradual increasing of propolis extract dose in Hubbard JV chicken nutrition (1.03% - E1, 0.99% - E2, 0.80% - E3 and 0.73% - E4). Gizzard fat from carcass body was value-balanced and ranged from 0.29% (E1) to 0.44% (E3). Heart fat was from 0.047% (P4) to 0.068% (P1).Internal fats were considered together from carcass body and the value ranged from 1.17% (P4) to 1.43% (P2). In control group, internal fat was 1.21%. Content of internal fat from carcass body as well as abdominal, gizzard and heart fat contents showed no significant differences ($P \geq 0.05$) between the groups. We found that propolis extract positively influenced the carcass body weight only in E1 and E2 groups. In these groups, no distinctive impact on fat creation was detected. Propolis in the doses of 150 mg kg^{-1} and 450 mg kg^{-1} can be recommended to application in nutrition of Hubbard JV chickens. Higher concentration of propolis extract (600 mg kg^{-1} and 800 mg kg^{-1}) may result in decrease of carcass body weight.

Keywords: chickens Hubbard JV, propolis extract, fat

INTRODUCTION

Consumption of poultry meat has had a growing trend in Slovakia, it was approximately of 19.9 kg per head in 2007 **(Nagy, 2009)**. Poultry is characteristic for the best conversion of nutrients into the meat and therefore production costs as well as prices of poultry products on the world market are relatively low compared with the other animal products. Effort is to breed more efficient hybrids, to improve the conversion of nutrients and to shorten the fattening period **(Marcinčák et al., 2008)**. Primary importance of fat in human nutrition is presence of polyunsaturated fatty acids, which have an essential role in organism as precursors for variety of biologically active substances. Broiler chickens have fat content of 5-7%, of which approximately 30% are saturated fatty acids and 70 % are unsaturated fatty acids **(Halaj and Golian, 2000)**. Poultry fat contains a higher amount of polyunsaturated fatty acids compared with the other carcass animals. It is caused by relatively high content of phospholipids in membrane structures of muscle cells **(Bystrický and Dičáková, 1998)**.

The complete feed mixtures are used for nutrition of broiler chickens. Over the last few years, feed mixtures have been enriched by probiotic preparations or by other available additions,

which are added into the feed mixtures as a possible substitution for excluded animal meals, antibiotic preparations and coccidiostats, what is in accordance with new legislation determined by laws and regulations of European Union and for the purpose of health state improvement, mortality reducing and the better utilization of feed nutrients as are described in papers by **Fuller (1992)**, **Nahashon et al. (1992)**, **Kumprecht and Zobač (1998)**, **Haščík et al. (2004, 2006, 2007)** and **Bobko et al.(2009)**. Integration of new component in animal nutrition has to retain technological, nutritional and sensorial properties of meat without their deterioration **(Aleson-Carbonell et al., 2004; P´erez-Alvarez, 2006)**. As alternative substitutions in nutrition, bee products (pollen, propolis or their extracts) may be employed, because they can have positive influence on health state, economic use of feed and quality of product **(Prytzyk et al., 2003; Wang et al., 2004; Haščík et al., 2005a, b, 2007; Angelovičová et al., 2006, 2008; Shalmany a Shivazad, 2006; Seven et al., 2008 and others.)**. Several plant supplements contain substances, which increase the gluttony and digestion **(Barreto et al., 2008)**. Some researchers showed these substances may stimulate a natural immunity of poultry and may decrease the pathogen microorganisms' activity **(Cross, 2002; Dalloul et al., 2003; Kačániová et al., 2011)**. The contemporary basic requirements in poultry nutrition are to respect the poultry physiological demands on consumption of energy and nutrients, to keep a good animal health and a high yield **(Suchý and Straková, 2004**). **Haščík et al. (2005a)** stated that intensive selection and efficacy of feed mixtures used in chicken nutrition for the last decades shorten the fattening period to less than half, but intensive growth of chickens caused an increased fat deposition, mainly in abdominal cavity in form of abdominal fat. According to **Simoneová (1999)**, large part of subcutaneous fat, fat placed in abdominal cavity and in intestinal region belong to the total body fat. Excessive accumulation of broiler abdominal fat is a result of imbalance between the energy intake and output, while amount of abdominal fat decreases with reduced energy consumption **(Skřivan, 2000)**. **Hood (1984)** and **Fischer et al. (1990)** found that energy intake reduction in food mixture by 20-25% had an influence on substantial decrease and reduction of body fat.

Lipid content in poultry meat depends on various factors as e. g. animal species, breed, gender, origin, and muscle anatomy **(Benková et al., 2005)**. Fat is important in term of meat sensorial properties for consumer, because fat is a source of aromatic substances influencing mainly the taste **(Pipek, 2000)**. Fatty compounds are considered as a taste medium, and only 1-2% fat from total animal weight is sufficient for this purpose (**Winkelmayer et al., 2005**). Meat of mammals and birds are different and birds' meat, with certain exceptions, is culinary prepared and consumed with skin, subcutaneous connective tissue, together with blood vessels and nerves, which are in meat **(Uhrín et al., 1993)**. All these facts influence substantially the taste properties of poultry meat. But certain negatives occur; it is primarily the increase of energy value, which is caused by subcutaneous fat connective tissue and by lipids of the skin.

Fat in certain amount is an important part of meat. An excessive fat tissue formation is considered as an undesired consequence of modern broiler type selection for increased growth. Fat accumulated in broiler carcass bodies is a waste product for consumer; nutritional value of food increases unacceptably following with possible risk to human health and carcass yield is artificially increased **(Mahmouda and Mihaly, 1998)**. According to **Ochrimenko et al. (1997)**, chemical composition of broiler chickens fat causes an unpleasant smell and fatty acids placed in the fat negatively influenced the taste of broiler chickens. Also based on these factors, intestinal, heart, gizzard and abdominal fat represent certain economic losses, because of carcass yield decrease. Increased fat deposition in broiler bodies is not desirable for producer and for consumers, too **(Cherian and Wolfe, 1996; Lichtenstein, 1999)**.

Following the literature sources and new trends in poultry nutrition, the aim of the experiment was to verify the influence of propolis extract applied in various concentrations on carcass body weight and on proportion of internal fats in carcass body of Hubbard JV chickens.

MATERIAL AND METHODOLOGY

Experiment was performed in poultry test station Zámostie Company. Tested animals were broiler chickens of Hubbard JV hybrid combination. Five hundreds of one-day old chickens were

included in the experiment and five groups of one hundred pieces per each were created as follows: control group – C (without propolis extract application) and four experimental groups – E1, E2, E3 and E4 (with certain dose of propolis extract). Chicken fattening lasted forty two days. Chickens were bred on deep litter (sawdust). Feed mixture was served using tubular feeders. Feed mixtures were mixed and prepared according to Gazette of Ministry of Agriculture and Rural Development (original name: Vestník MP SR) (2004) in Biofeed Company located in Kolárovo. Feed mixtures were analysed in term of basic nutrients and energy value at the Department of Animal Nutrition (Faculty of Agrobiology and Food Resources, Slovak University of Agriculture in Nitra). Feed mixture was manually served in periodic intervals each day and chickens were fed by the system *ad libitum*. All evaluated groups were fed by starter feed mixture HYD-01 (powder form) to 21st day of age and then, from 22nd day to 42nd day of age, all animals were fed by feed mixture HYD-02 (powder form). Feed mixtures HYD-01 and HYD-02 were produced without antibiotic preparations and coccidiostats. Nutritional value of the feed mixtures was uniform in each group during the experiment, but in experimental groups, propolis extract was added to both feed mixtures at a dose of 150 mg kg^{-1} (E1), 450 mg kg^{-1} (E2), 600 mg kg^{-1} (E3) and 800 mg kg^{-1} (E4). Propolis originated in Slovak Republic. Propolis extract was prepared from milled propolis and was mixed with 80% ethanol **(Krell, 1996)**. Propolis solution was extracted in water bath at 80 °C for 1 hour under the reflux. Solution was centrifuged after extracting and cooling. Obtained supernatant was evaporated at 40-50 ° C using rotary vacuum evaporator and water bath. Then the residue was weighted. The evaporation of residues at dose of 15 g (E1), 45 g (E2), 60 g (E3) and 80 g (E4) were separately dissolved in 1000 cm3 of 80% ethanol and applied into the 100 kg of each feed mixture intended for evaluated group of Hubbard JV chickens. Water was available *ad libitum* by self-powered system using nipple drinkers with drip tray. At the end of fattening (42nd day), 60 pieces (30 male pieces and 30 female pieces) from each group were selected for carcass analysis, which was performed at Department of Animal Products Evaluation and Processing (Faculty of Biotechnology and Food Sciences, Slovak University of Agriculture in Nitra). We evaluated the carcass body weight and proportion of fat tissue from carcass body weight of Hubbard JV chickens (proportion of abdominal, gizzard, heart and total internal fat). Weights were measured on analytical scales of KERN 440-33N type with the accuracy of 0.01 g and calculated. Results of the experiment (arithmetic average, standard deviation) were statistically assessed using programme Statgraphics Plus version 5.1 (AV Trading, Umex, Dresden, Germany). Analysis of variance followed by Duncan test was used to determine significance of differences between the groups.

RESULTS AND DISCUSSION

Obtained values of carcass body weight, abdominal, gizzard, heart and total internal fat expressed as percentages from carcass body of Hubbard JV hybrid combination chickens are recorded in the tab 1.

Higher carcass body weight ($P \geq 0.05$) was found in the 1st and 2nd experimental group (E1 – 1022.37 g, E2 – 1019.75 g) compared with the control group (1005.12 g). Lower carcass body weight ($P \geq 0.05$) was detected in the 3rd and 4th experimental group (E3 - 927.37 g, E4 – 916.75 g) compared with control group. Significant difference ($P \leq 0.05$) in carcass body weight was detected between the 1st and 4th experimental group, between the 2nd and 4th experimental group, between the 1st and 3rd experimental group and between the 2nd and 3rd experimental group. Carcass body weights detected in this experiment are higher than results of **Seven et al. (2008)** and are lower compared with results of **Haščík et al. (2010, 2012)**, who used a probiotic preparation and pollen extracts in nutrition of Ross 308 chickens.

The lowest content of abdominal fat in carcass body was detected in control and 4th experimental group (0.73%). The values of abdominal fat in carcass body decreased in experimental groups by gradually increasing doses of propolis (E1 – 1.03%, E2 – 0.99%, E3 – 0.80%, E4 – 0.73%) without significant differences ($P \geq 0.05$) between the groups. **Angelovičová (1997)** tested a reduced level of metabolisable energy in feed mixtures and found comparable results of abdominal fat in carcass body, in numbers below 1.00%. Results did not confirm a tendency of abdominal fat

increased deposition in groups with propolis extract application in nutrition of Hubbard JV chickens. **Haščík et al. (2005a)** stated similar conclusion in experiment with application of probiotic preparation through the water. Obtained results of abdominal fat content are lower compared with results of **Uhrín et al. (1993)** and **Krížková et al. (1995)**, who recorded these values in 1.5-3.0%.

Tab 1 Meat performance and presence of internal fat in Hubbard JV carcass body

Indicator	Group				
	C	E1	E2	E3	E4
Carcass body weight (g)	1005.12^{ab}± 115.77	1022.37^{a}± 103.74	1019.75^{a}± 74.66	927.37^{b}± 66.25	916.75^{b}± 51.63
Content of abdominal fat in carcass body (%)	0.73±0.39	1.03±0.29	0.99±0.36	0.80±0.43	0.73±0.33
Content of gizzard fat in carcass body (%)	0.42±0.32	0.29±0.15	0.39±0.13	0.44±0.39	0.38±0.28
Content of heart fat in carcass body (%)	0.051±0.030	0.068±0.030	0.051±0.010	0.054±0.010	0.047±0.020
Content of total internal fat in carcass body (%)	1.21±0.39	1.41±0.31	1.43±0.30	1.31±0.56	1.17±0.34

C – control group, E1 – 1st experimental group, E2 – 2nd experimental group, E3 – 3rd experimental group, E4 – 4th experimental group,

Note.: Average values in the line followed by different letter have significant differences at $P \leq 0.05$.

Content of gizzard fat in carcass body was without significant differences ($P \geq 0.05$) between the groups and the values ranged from 0.29% (E1) to 0.44% (E3). Obtained results are lower than results of **Haščík et al. (2007)**, who found its content from 0.59% to 0.69%. **Horváthová and Lagin (1985)** and **Lagin (1989)** recorded content of gizzard fat in higher values from 0.99% to 1.02%.

Content of heart fat in carcass body was found from 0.047% (E4) to 0.068% (E1). No significant differences ($P \geq 0.05$) were detected between the groups of experiment. Obtained results of heart fat content is in accordance with results found by **Haščík et al. (2007)**, who detected its content in numbers to 0.06%.

Total internal fat in carcass body was evaluated, too. The lowest content of total internal fat was detected in the 4th experimental group (1.17%) and the highest content of total internal fat was detected in the 2nd experimental group (1.43%). In control group, content of total internal fat was 1.21%. Significant differences were not detected between the groups of experiment.

CONCLUSION

In the experiment, propolis extract was applied into the feed mixtures for chickens of Hubbard JV hybrid combination in amount of 150 mg kg^{-1}, 450 mg kg^{-1}, 600 mg kg^{-1} and 800 mg kg^{-1}. Influence of propolis extract on carcass body weight and fat deposition in carcass body was tested. Lower concentration of propolis extract (150 mg kg^{-1} and 450 mg kg^{-1}) influenced positively the carcass body weight, but in experimental groups with higher concentrations (600 mg kg^{-1} and 800 mg kg^{-1}) of propolis, carcass body weight decreased ($P \geq 0.05$) compared with control group. Between the

control and experimental groups, no significant differences ($P \geq 0.05$) were detected in content of abdominal, gizzard, heart and total internal fat in carcass body. Propolis extract in tested concentrations (150 mg kg^{-1} and 450 mg kg^{-1}) may be applied in nutrition of Hubbard JV chickens, because no negative effect on fat content and increased carcass body weight were detected. However, propolis extracts concentration of 600 mg kg^{-1} and 800 mg kg^{-1} are not recommended, because decreased carcass body weights were found.

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