Chemical evaluation of the quality of meat of broilers fed with the supplement of nature propolis

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short communication

Summary

The effect of added supplement from nature propolis of the quality of broilers meat was researched in this paper. Besides resin plant components, propolis contain bee secretions of the salivary glands, such as lipophilic substances, mucus, adhesives, oils, and even wax. Propolis had many therapeutic activities such as antimicrobial (antibacterial, antiviral, antifungal), anti-inflammatory, regenerative (heals wounds and restores damaged tissue), immunostimulatory, anesthetic, spazmic and anticarcinogenic (antitumor), cardiovascular (reinforces the structure capillaries) and finally antioxidant. Usage of antibiotic growth promotors is abandoned in poultry production as well, it is neccesary to find alternative strategies for control and prevention of infections. Broilers buttlock and white meat from ten broilers from each experimental group were taken in order to examine the effect of addition of the supplement of nature propolis to the controlled food intended for broilers on chemical quality of broilers meat using standard chemical methodes. The data provided by this study illustrate beneficial effects of nature propolis supplement on the quality of broilers meat.

Key words: *broilers, propolis, meat quality*

Introduction

Apitherapy in modern biomedicine became frequent choice in the prevention and treatment of humans and animals, with more attention paid to the healing properties of propolis. It is believed that the word „propolis" comes from the Greek words *Pro* (front, for) and *polis* (city), what means the protection of the city, or hives, or word „propoliso", a Greek or Latin word which means smoothed. Bees during the spring and summer collection resin yellow - green to brown or reddish - brown buds tissue secretions and / or bark usually poplar, alder, birch, ash and chestnut and coated the inside of the hive in order to protect them from winter cold, drafts, bad weather and earthquakes. Also, they using propolis to polished honeycomb cells that serves as a warehouse for honey, pollen or brood. Except as building material for hive, propolis had essential oils with antimicrobial effect on pathogenic microflora of hives. Propensity of different types of bees to collect propolis is not equal . Thus, the Caucasian bee (*Apis mellifera caucasica*) uses large amounts of propolis (300 g), while the Italian and Ukrainian less. Bees widespread in India *Apis dostra, Apis indica* and *Apis florea*, and African subspecies of common honey bee (*Apis mellifera scutellata*) does not collect propolis or collect in a very small quantity. Besides resin plant components, propolis contain bee secretions of the salivary glands, such as lipophilic substances, mucus, adhesives, oils, and even wax (Špoljarić, 2013). Based on the available literature data, the use of propolis orally and / or parenterally in large quantities is not toxic to animals and humans, but on the contrary, there are many therapeutic activities such as antimicrobial (antibacterial, antiviral, antifungal), anti-inflammatory, regenerative (heals wounds and restores damaged tissue), immunostimulatory, anesthetic, spazmic and anticarcinogenic (antitumor), cardiovascular (reinforces the structure capillaries) and finally antioxidant (Sforcin, 2007). Accordingly, preparations of natural propolis could be an important component of alternative strategies for nonclinical use of antibiotics, especially in the production of animal feed intended for human consumption. Therefore, the aim of this study was to show the chemical quality assessment of meat of broilers fed with substitute of natural propolis.

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Figure 1 **Commercial production of propolis, OPG Špoljarić, Zagreb.**

Figure 2 **Visualized bee Apis Mellifera Carnica OPG-a Špoljarić, using electornic microscope SEM Tescan Mira3 FEG (Centre for forensic investigation, research and expertise Ivan Vučetić, Zagreb, Croatia)**

Material and methods

The research was conducted within the VIP project No.:2012-11-17. The study was carried out in 38 days on the farm „Živković", Kvarte, Perušić on 90 broilers (breed ROSS 308, 45 male, 45 female). Broilers were divided into 2 groups, containing 45 animals each. Groups were kept apart, but in the same facility. C group of broilers during the experiment was fed with basal food intended for broilers (starter 0-14 days of age; finisher I. 14-28 days of age; finisher II. 28-38 days of age). Broilers group A during the whole experiment were fed with basal food intended for broilers with addition of powder supplement of nature propolis in concetration of 0,1%. During the whole experiment food and water were available to broilers *ad libitum*. As a supplement to the basal food for broilers, powder supplement of propolis from commercial production of Špoljarić, Zagreb (Figure 1.) was used.

Propolis was taken from the community bee *Apis meliifera* (Figure 2.) in the area of Ivanic Grad. After the seizure, propolis was cooled for one hour at -20 ° C and then milled to powder. After the samples for analytical microbiological analysis had been taken, samples of milled propolis were analyzed by the method of associated gas chromatography - mass spectrometry (GC-MS, Perkin Elmer, SAD) (Centre for forensic investigations, research and expertise Ivan Vučetić, Zagreb, Croatia) and by the electronic microscope SEM Philips XL 30 with EDX detector using the software package Genesis version 6.02 (Edax), and by EDX active surface detector 10 mm^2 (Edax, model 135-10 PV9760/68) (Centre for forensic investigations, research and expertise Ivan Vučetić, Zagreb, Croatia). Then, nature propolis in powder were mixed with basal food intended for broilers in concentration of 0.1% (Figure 3, Figure 4).

At the end of the experiment, 38th day, in abattoir, broiler buttlock and white meat from ten broilers from each experimental group were taken in order to examine the effect of addition of the supplement of propolis to the basal food intended for broilers on chemical quality of broiler meat. On Department of Hygiene and Technology of Foodstuffs of Faculty of Veterinary Medicine, University of Zagreb, shares of: water (Method according to ISO 1442 standard), fat (Method according to ISO 1443 standard), proteins (Method according to ISO 937 standard) and ash (Method according to ISO 936 standard) were determined. Statistical analyses of experimental data in content of fats and protein in meat of control (untreated) group of animals and treated group (A group) of broilers, were provided using the t-test for dependent samples.

Discussion and results

In modern intensive farming of animals for human consumption considerable efforts are being made in the understanding of intestinal

Figure 3 **Sample of dry biomass powder of nature propolis**

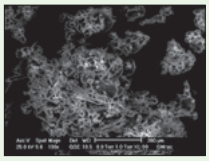

Figure 4 **Visualized ultrastructure of dry biomass powder of nature propolis, using electornic microscope SEM Tescan Mira3 FEG (Centre for forensic investigation, research and expertise Ivan Vučetić, Zagreb, Croatia)**

Table 1 **GC-MS qualitative analysis of experimental preparations**

GC-MS qualitative analysis of the nature propolis supplement
benzyl alcohol
benzoic acid
4-vinilfenol
2-methoxy-4-vinilfenol
vanilla
benzyl benzoate
4-hidroksicinamic acid
ferulic acid
tektokrizin

infectious diseases, their diagnosis, including the biology of pathogens, host resistance and treatment, where little is known about the prevention of these diseases using immunomodulatory and nutritional strategies. In fact, all these problems so far have been solved by adding a suboptimal dose of antibiotic growth promoters in animal feed. Fears from a possible risk to human health from the use and / or misuse of antibiotic growth promoters in food for animals for human consumption, has led to a ban on their use in the EU (Regulation EC No. 1831/2003). In order to adjust to the withdrawal of antibiotic growth promoters in food for animals (in the EU since 2006.), it is obligated for Croatia, as an EU member state since 01.07.2013., to comply with the legislation of the EU and to join the European scientific trends in veterinary medicine in order to determine the relevant health criteria, as well as science-based recommendations for the use of alternative strategies for antibiotic growth promotors in food for animals. So today, when usage of antibiotic growth in poultry production is abandoned, one of the possible alternative strategies for the control and prevention of infection in the intensive farming could be a blending of natural propolis in animal feed, where it is necessary to verify and define its potential probiotic and immunomodulatory effects on the health and productivity of

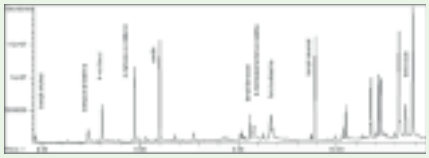

Figure 5 **Histogram display of GC-MS qualitative analysis of the nature propolis preparations used in the experiment (Centre for forensic investigation, research and expertise Ivan Vučetić, Zagreb, Croatia)**

Table 2 **Chemical composition of meat of broiler fed with the addition of 0,1% of supplement of the nature propolis during the 38 days experiment (n=10 for each group)**

Experimental group	Cut broiler meat	Water, %	Ash, %
B	Drumstick	72.19	1.02
	White meat	70,58	1,14
A	Drumstick	73.00	1.06
	White meat	72,85	1,13

Table 3 **Differences in content of fat and proteins (%) in meat of broiler buttocks (n=10 per each group).**

Treatments	C		A	
	Fats	Proteins	Fats	Proteins
Mean	7.46	17.90	6.94	17.38
Stand. Error	0.19	0.075	0.08	0.092
Comparisons	**C vs A**	**C vs A**	-	-
Diff.	0.52*	0.52**	-	-
Stand. Dev. Diff.	0.623	0.478	-	-
t	2.656	3.414	-	-
p	0.0261	0.0076	-	-

**: p<0.01; *: p<0.05; ns:not significant
C=Control, A=treatment with 0,1% natural propolis

Table 4 **Differences in content of fats and proteins in white meat of broilers (n=10 per each group) A-fed with natural propolis during the 38 days of feeding, C-control**

Treatments	C		A	
	Fats	Proteins	Fats	Proteins
Mean	5.656	20.076	6.035	19.801
Stand. Error	0.128	0.101	0.127	0.102
Comparisons	-	C vs A	A vs C	-
Diff.	-	0.275 ns	0.379*	-
Stand. Dev. Diff.	-	0.466	0.434	-
t	-	1.864	2.757	-
p	-	0.095	0.022	-

**: p<0.01; *: p<0.05; ns:not significant
C=Control, A=treatment with 0,1% natural propolis

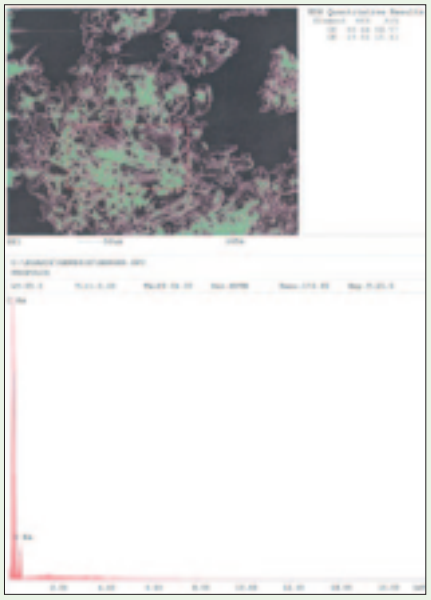

Figure 6 **Elemental chemical analysis of the sample of the nature propolis preparation for the presence of heavy metals, performed on electron microscope SEM Philips XL 30 with EDX detector (EDAX), with 10mm² of active surface (Centre for forensic investigations, research and expertise Ivan Vučetić, Zagreb, Croatia)**

fattening broilers. Based on literature data it is known that the composition of propolis depends on the plant species from which the bees collect it with its basic components: flavonoids, cinaminic acid derivatives, terpenes, alcohols, ketones, phenols, calcon, heteroaromatic compounds, carbohydrates, and 22 minerals and seven vitamins (Dobrowolski et al., 1991; Bankova et al., 2000). In this study by using gas associated method of mass chromatography-spectrometry (GC-MS) in dry preparation of propolis, mixed in a standard poultry food, the presence of toxic chemicals harmful to the health of poultry has not been established (Table 1, Figure 5.). Also, elemental chemical analysis of the sample preparation for the presence of heavy metals and pathogens, done on the electron microscope SEM Philips XL 30 with EDX detector (EDAX), with 10mm² of active surface, in this study has not shown their presence, while sodium, sulfur and calcium were found only in traces (Figure 6.).

Oršolić et al. (2008.) pointed out that the flavonoid components of propolis are attributed to probiotic and immunostimulatory effects, and that the intensity of these effects depends on the concentration of flavonoids in the preparation of propolis, which varies according to the different geographical areas and plants that are found there. For the preparation of natural propolis used in this study added to the food for the broilers, we found its beneficial effects on health, immune and production parameters in broilers. Accordingly, meat of broilers fed with the addition of mixture of natural propolis had not altered chemical composition with respect to the shares of water and ash in white and dark meat (broiler buttocks) in relation to meat of 38 days old broilers fed with commercial food (Table 2.).

It is obvious in Table 3 that total fat and protein content in broilers buttock fed with mixture of natural propolis is significantly higher compared with control group of animals (at the level of error $p<0,05$ for fat content and $p<0.0001$ for protein content).

Furthermore, fat content in broilers white meat in treated (A group) is significantly higher compared to the control group ($p < 0.05$), whereas no significant differences in protein content between control and treated groups of broilers.

Conclusion

Altered chemical composition of broilers meat fed with the addition of natural propolis, regardless of its established beneficial effects on health, immunity and production indicators, shows the benefit of conducting further research of adding propolis in feed for animal consumption, depending on the concentration of entrainment, and the

Qualität des Hühnerfleisches stammend von Masthühnern gefüttert mit Zugabe von natürlichem Propolis

Zusammenfassung

In dieser Arbeit wurde der Einfluss vom nativen Propolis auf Qualität des Fleisches von Masthühnern untersucht. Außer harzreichen pflanzlichen Bestandteilen befinden sich im Propolis Sekrete von Bienenspeicheldrüsen wie lipophile Substanzen, Schleime, Klebstoffe, Öle und sogar Wachs. Propolis hat zahlreiche therapeutische Wirkungen wie z.B. antimikrobische Wirkung (antibakterielle, antivirulente, antifungale), gegen Entzündungen, regenerationsfähige Wirkung (hilft bei Wundenheilung und regeneriert das beschädigte Gewebe), immunostimulative, anästhetische, spasmatische und antikanzerogene (antitumor), cardiovasculare (befestigt die Kapilarstruktur) Wirkung und Antioxidationswirkung. Man hat vom Gebrauch der antibiotischen Wachstumerreger in Hühnerherstellung Abstand genommen. Infolge dessen zeigt sich als nötig, alternative Strategien der Kontrolle und Prävention der Infektion zu finden. In der Untersuchung wurden Keulen und Filet von zehn Masthühnern aus jeder Experimentalgruppe benutzt, um den Einfluss des nativen Propolis als Zugabe der standarden Viehfuttermischung für Masthühner auf chemische Fleischqualität mittels chemischer Standardmethoden zu bestimmen. Die Resultate dieser Untersuchung zeigen eine positive Wirkung von nativem Propolis auf Fleischqualität der Masthühner.

Schlüsselwörter: *Masthühner, Propolis, Fleischqualität*

La qualità della carne dei polli da ingrasso alimentati con l'aggiunta della propoli naturale

Sommario

Il presente lavora esamina l'effetto dell'aggiunta del propoli nativo sulla qualità della carne dei polli da ingrasso. Oltre alle sostanze resinose di origine vegetale, la propoli contiene le secrezioni delle ghiandole salivari, come le sostanze lipofile, il muco, la colla, l'olio e perfino la cera. La propoli ha numerosi effetti terapeutici come l'effetto antimicrobico (antibatterico, antivirale, antifungale), l'effetto antinfiammatorio e regenerativo (fa rimarginare le ferite e ripara il tessuto danneggiato), l'effetto immunostimolatorio, anestetico, spastico ed anticancerogeno (antitumorale), gli effetti cardiovascolari (rafforza la struttura dei vasi capillari) e infine l'effetto antiossidante. L'uso degli stimolatori di crescita a base di antibiotici è abbandonato nella produzione della carne di volatili e occorre trovare delle strategie alternative del controllo e della prevenzione delle infezioni. Nella ricerca sono utilizzate le cosce e la carne bianca di 10 polli da ingrasso di ogni guppo di prova per esaminare l'effetto dell'aggiunta della propoli naturale nell'impasto del mangime standard per i polli da ingrasso sulla qualità chimica della carne per mezzo di metodi chimici standard. I risultati di questa ricerca hanno presentato un effetto positivo della propoli naturale sulla qualità della carne dei polli da ingrasso.

Parole chiave: *polli da ingrasso, propoli, qualità della carne*

length of the period adding during the breeding period.

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