Potravinarstvo, vol. 8, 2014, no. 1, p. 184-189
doi:10.5219/373
Received: 24 March 2014. Accepted: 28 March 2014.
Available online: 25 June 2014 at www.potravinarstvo.com

ISSN 1337-0960 (online)

SENSORY EVALUATION OF COBB 500 CHICKEN MEAT AFTER APPLICATION OF DIFFERENT ADDITIVES IN THEIR NUTRITION

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ABSTRACT

The objective of the experiment was to verify the effect of different feed additives in nutrition of Cobb 500 broiler chickens on the sensory quality of breast and thigh muscle modified by baking at temperature 200 ºC for 60 minutes. The experiment included 250 one-day-old Cobb 500 hybrid chickens, which were divided into 5 groups (n=50): control (I) and experimental groups (E1 with Agolin Poultry at doses of 100 $mg.kg^{-1}$, E2 with Agolin Tannin Plus at doses of 500 $mg.kg^{-1}$, E3 with Biostrong 510+FortiBac at doses of 1000 $mg.kg^{-1}$ and E4 with Agolin Acid at doses of 1000 $mg.kg^{-1}$). The chickens were fed during 42 days of age by *ad libitum* system with feed mixtures: BR1 starter feed mixture (until the of 10th day of age), BR2 growth feed mixture (from 11th to 20th day of age), BR3 growth feed mixture (from 21st to 35th days of age) and BR4 final feed mixture (from 36th to 42nd days of age). Feed mixtures were produced with coccidiostats in powder form. Panellists evaluate aroma, juiciness, taste and tenderness on 5 point hedonic scale where 1 (the worst) and 5 (the best) were the extremes of each characteristic. Significant differences were found between control and experimental group E3 in juiciness and tenderness of breast muscles and between control and experimental group E2 in smell of thigh muscles. Sensory evaluation of breast and thigh muscles in Cobb 500 chickens after application of different feed additives indicated that these additives have not worsened the quality of meat. The highest sensory score was obtained in experimental group E4 (with addition of Agolin Acid at the dose of 1000 $mg.kg^{-1}$).

Keywords: sensory analysis; chicken meat; broiler chicken; feed additives

INTRODUCTION

Processed chicken products' consumption has also dramatically increased over the last decades **(Bianchi et al., 2009)**. Poultry meat is a very popular food commodity around the world due to its low cost of production as compared to meat products as beef, lamb or pork, low fat content, high nutritional value and distinct flavour **(Barbut, 2002; Chouliara et al., 2007; Patsias et al., 2008)**.

Food safety is an important aspect of food quality and efforts should be led to safety of new functional products from poultry meat **(Burdock et al., 2006)**. Meat quality may be affected already by manipulation of animal feeding **(Kennedy et al., 2005; Assi and King, 2007)** or *post mortem* manipulation of carcass body. Poultry meat and meat products are important source of proteins, but other components as fats have an important role in their composition, too. Nutrient content in meat products is between 40% and 50% **(Ordõnez et al., 1999)**, and fat performs the primary role in sensory aspects as taste and juiciness of all meat products **(Lucca and Tepper, 1994; Hughes et al., 1997; Cofrades et al., 2000)**.

New legislation, EU regulation and bans regarding the use of animal meal, classical antibiotic stimulators for growth and antimicrobial substances in feeds of animal including poultry lead to application of new supplements and biotechnological products in science as well as in practice **(Haščík et al., 2006, 2007; Bobko et al., 2009)**.

Maintaining of appropriate technological, nutritional and sensorial properties in meat is one of the conditions for new component integration in animal nutrition, because different supplements can cause the deterioration of meat quality, mainly in term of sensory properties **(Aleson-Carbonell et al., 2004; Pérez-Alvarez, 2006)**.

In recent years, products containing essential oils derived from several spices and herbs could be used in animal nutrition as feed additives to promote the growth. These phytogenic additives may have more than one mode of action, including improving feed intake and flavour, stimulating the secretion of digestive enzymes, increasing gastric and intestinal motility, endocrine stimulation, antimicrobial, anti-viral, anthelminthic and coccidiostat activities, immune stimulation, and anti-inflammatory and anti-oxidative activity and pigments **(Kırkpınar et al., 2011)**.

Many studies have also been conducted on the effects of dietary essential oils or combinations thereof on the performance of poultry but with varying and conflicting results. While some reports **(Hertrampf, 2001; Alçiçek et al., 2003)** demonstrated that essential oils improved animal performance, some researchers **(Schiavone et al., 2001; Lee et al., 2003a,b; Papageorgiou et al., 2003; Botsoglou et al., 2003, 2004)** reported that these additives were not effective in this regard.

The evaluations of properties as taste, smell, juiciness and tenderness, which are subject of sensory analysis, are important factors that consumers will consider before making a decision to buy poultry **(Liu et al., 2004)**.

Quality assessment parameters of chicken meat, including sensory flavour and texture profiles, have been widely used in scientific studies to validate pre-processing treatments and postharvest processing technologies for chicken meat **(Swatland, 1999; Lyon et al., 2001)**. According to **Augustin and Fischer (1999), Brestenský (2002), Mojto and Zaujec (2003), Haščík et al. (2004)**, evaluated sensory properties are dependent on type of used feed mixture, content of intramuscular fat in meat, way of meat preparation, genetics and many others intra-vital and extra-vital factors.

The objective of present study was to evaluate the effect of different additives as a dietary supplement added to feed mixtures on sensory quality of broiler chicken meat.

MATERIAL AND METHODOLOGY

Animals and diets

The experiment was undertaken in poultry test station Zamostie Company. The experiment included 250 pcs of one-day-old hybrid chickens Cobb 500, which were divided into 5 groups (n=50): control (I) and experimental groups (E1, E2, E3 and E4).

Experimental broiler chickens were fed during 42 days of age by *ad libitum* system with feed mixtures: BR1 starter feed mixture (until the of 10th day of age), BR2 growth feed mixture (from 11th to 20th day of age), BR3 growth feed mixture (from 21st to 35th days of age) and BR4 final feed mixture (from 36th to 42nd days of age). Feed mixtures were produced with coccidiostats in powder form.

Nutritional value (Table 1) of feed mixtures were the same in each group during the whole experiment. However, the diet of broiler chickens in experimental groups were supplemented by feed additives on base of acids and plant essential oils: Agolin Poultry at doses of 100 mg.kg^{-1} (E1); Agolin Tannin Plus at doses of 500 mg.kg^{-1} (E2); Biostrong 510+FortiBac at doses of 1000 mg. kg^{-1} (E3) and Agolin Acid at doses of 1000 mg. kg^{-1} (E4).

Sample analysis

At the end of the fattening (42nd day) and after slaughtering, 15 pieces of chickens halves were chosen from each group and were heat-treated at 200 °C for 60 minutes. From each halves, part from a thigh and breast muscle were separately evaluated in sensory analysis. Sensory evaluation of anonymous samples was performed by six-member committee and five-point scale was used

Table 1 Composition of the basal feed mixtures

Ingredients (%)	Starter (1 to 10 days of age)	Grower I. (11 to 20 days of age)	Grower II. (21 to 35 days of age)	Finisher (36 to 42 days of age)
Maize	46.33	48.50	50.05	50.91
Wheat	14.00	15.00	15.00	15.00
Soybean meal (45% CP)	30.00	26.60	28.00	26.70
Fiesh meal (72% CP)	2.50	2.00		
Dried blood	2.00	2.00		
Soybean oil	1.00	1.80	2.80	3.00
Monocalcium phosphate	1.60	1.25	1.30	1.48
Calcium carbonate	1.37	1.55	1.50	1.56
Fodder salt	0.20	0.30	0.35	0.35
Lysine	0.27	0.15	0.15	0.16
Methionine	0.27	0.18	0.17	0.20
Threonine	0.09	0.10	0.08	0.07
Vitamin premix	0.05	0.04	0.04	0.03
Micromineral premix	0.04	0.04	0.04	0.04
Enzyme phytase	0.015	0.015	0.015	0.015
Wheat meal	0.215	0.12	0.10	0.135
Maxiban (Narasin+Nicarbasin)	0.05			
Sacox (salinomycin sodium)		0.055	0.055	
Analyzed composition (g.kg^{-1})				
Crude protein	220.00	207.00	197.00	188.00
Fibre	20.00	24.00	28.00	29.00
Lysine	14.00	12.50	12.50	11.50
Methionine	6.00	5.20	5.20	5.00
Ca	9.00	8.50	8.50	8.50
P (non-phytate)	4.20	4.00	4.00	4.00
Na	1.60	1.60	1.60	1.60
[1]ME_N (MJ.kg^{-1})	12.30	12.75	13.15	13.15

[1]ME_N - Metabolizable energy, CP - Crude protein

for the self-assessment. Panelists evaluate aroma, juiciness, taste and tenderness on 5 point hedonic scale where 1 (the worst) and 5 (the best) were the extremes of each characteristic.

Statistical analysis

The results of experiment were processed in statistical programme Statgraphics Plus version 5.1 (AV Trading, Umex, Dresden, Germany). The variables statistical values (arithmetic mean, standard deviation) were calculated and to determine the significant differences among groups was used variance analyses with subsequent Scheffé's test.

RESULTS AND DISCUSSION

Results from sensory evaluation of valuable parts of carcass (breast and thigh muscles of Cobb 500 broiler chickens carcasses) after application of aditives in the feed mixtures at the doses of Agolin Poultry 100 $mg.kg^{-1}$ (E1); Agolin Tannin Plus 500 $mg.kg^{-1}$ (E2); Biostrong 510+FortiBac 1000 mg. kg^{-1} (E3) and Agolin Acid 1000 mg. kg^{-1} (E4) are recorded in Table 2 and 3.

Firstly, the properties of sensory quality in breast muscle were evaluated. We found the highest score in the control group (4.20 points) and lowest in the group E3 (4.00 points) in sensory evaluation of smell in breast muscle. Taste of breast muscle was the best in the E4 group (4.13 points) and the worst in the group E2 (3.83 points). Juiciness, which depends on the water content and fat content in muscle, was highest in the group E3 (4.26 points) and the lowest in the group E2 (3.53 points). Tenderness was highest in the group E3 (4.36 points).

In the terms of overall sensory assessment in breast muscles of Cobb 500 chickens after baking, we found the highest value in the group E3 (16.90 points) and the lowest in the group E2 (15.06 points). From a statistical point of view, balanced values in individual variables were achieved between groups, but the significant differences ($p \le 0.05$) were found in juiciness and tenderness of breast muscle between control group and experimental group E3.

Smell of thigh muscle was 4.40 points in control group and it ranged from 3.96 points (E2) to 4.43 (E1) points in experimental groups. The results for taste were comparable between the control and experimental groups (3.93 - 4.20 points), what was confirmed also in the juiciness of thigh muscles (from 3.93 points in control group to 4.33 points in E1). The highest score of tenderness was recorded in tested group E1 (4.26 points) and the lowest score in tested group E4 (4.06 points). In term of the overall sensory assessment of thigh muscles we found the highest score in the experimental group E1 (17.20 points) and the lowest in the tested group E2 (16.23 points). The significant differences ($p \le 0.05$) we found in taste of thigh muscles between control group and group E1 and between control group and group E2.

Obtained results from sensory evaluation of most valuable carcase parts of Cobb 500 chickens with application different feed additives on base acids, plant extracts and oils are in accordance with tendencies which were found by **Połtowicz (2000), Osek et al. (2001), Barteczko et al. (2003), Haščík et al. (2004, 2007, 2013, 2014), Bobko et al. (2006, 2009), Baracho et al. (2006), Chekani-Azar et al. (2008), Kim et al. (2009), Marcinčák et al. (2009), Mihok et al. (2010)** in

Table 2 Sensory evaluation of chicken breast muscles

	Control	E1	E2	E3	E4
Smell	4.20 ±0.41^{a}	4.13 ±0.39^{a}	4.00 ±0.65^{a}	4.10 ±0.60^{a}	4.16 ±0.52^{a}
Taste	4.06 ±0.46^{a}	4.10 ±0.54^{a}	3.83 ±0.81^{a}	4.10 ±0.60^{a}	4.13 ±0.63^{a}
Juiciness	3.76 ±0.65^{a}	3.73 ±0.62^{a}	3.53 ±0.72^{a}	4.26 ±0.53^{b}	4.00 ±0.71^{ab}
Tenderness	3.83 ±0.52^{a}	3.86 ±0.69^{a}	3.70 ±0.75^{a}	4.36 ±0.55^{b}	4.03 ±0.55^{ab}
Suma	15.86 ±1.70^{ab}	15.83 ±1.97^{ab}	15.06 ±2.65^{a}	16.90 ±1.57^{b}	16.33 ±1.94^{ab}

n = 15 pcs per group, E1 - Agolin Poultry at doses of 100 $mg.kg^{-1}$, E2 - Agolin Tannin Plus at doses of 500 $mg.kg^{-1}$, E3 -Biostrong 510+FortiBac at doses of 1000 mg. kg^{-1}, E4 - Agolin Acid at doses of 1000 mg. kg^{-1}, ^{a,b}- means with different superscripts differ significantly ($P \le 0.05$).

Table 3 Sensory evaluation of chicken thigh muscles

	Control	E1	E2	E3	E4
Smell	4.40 ±0.54^{a}	4.43 ±0.37^{a}	3.96 ±0.51^{b}	4.13 ±0.54^{ab}	4.10 ±0.54^{ab}
Taste	4.10 ±0.54^{a}	4.16 ±0.41^{a}	3.93 ±0.62^{a}	4.20 ±0.56^{a}	4.00 ±0.56^{a}
Juiciness	3.93 ±0.67^{a}	4.33 ±0.55^{a}	4.10 ±0.43^{a}	4.23 ±0.59^{a}	4.10 ±0.66^{a}
Tenderness	4.13 ±0.58^{a}	4.26 ±0.53^{a}	4.23 ±0.41^{a}	4.13 ±0.44^{a}	4.06 ±0.59^{a}
Suma	16.56 ±2.04^{a}	17.20 ±1.47^{a}	16.23 ±1.69^{a}	16.96 ±1.94^{a}	16.26 ± 1.85^{a}

n = 15 pcs per group, E1 - Agolin Poultry at doses of 100 $mg.kg^{-1}$, E2 - Agolin Tannin Plus at doses of 500 $mg.kg^{-1}$, E3 -Biostrong 510+FortiBac at doses of 1000 mg. kg^{-1}, E4 - Agolin Acid at doses of 1000 mg. kg^{-1}, ^{a,b}- means with different superscripts differ significantly ($P \le 0.05$).

application of different feed additives in chicken nutrition.
In general, we found higher score of tenderness in thigh muscle than in breast muscle in the experiment. It is in accordance with results published by **Scholtyssek and Sailer (1986), Kofrányi and Wirths (1994)** and **Guéye et al. (1997)**, **Haščík et al. (2013, 2014)** because thigh muscles contain more internal fat and blood capillaries.
Authors stated that availability and correctness of technological, nutritional as well as sensory quality in chicken meat is possible to achieve only by verified feed supplements, because any additive substances have not a positive impact on sensory properties of meat and may show an opposite trend, which somewhat reflected ($p \geq 0.05$) in the group E2 with the addition of Agolin Tannin Plus for both breast and thigh muscle both breast and thigh meat.

CONCLUSION

In this experiment, we examined the influence of feed additives applied in chicken nutrition on sensory properties of breast and thigh muscles after meat baking. Based on obtained results, we can conclude we did not find negative influence on sensory properties of breast and thigh muscles after application of chosen feed additives in Cobb 500 chicken nutrition. The best of tested feed additive was group with application of Biostrong 510+FortiBac at doses of 1000 mg. kg^{-1}.

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Acknowledgments:

This work was supported by grant VEGA 1/0129/13.

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