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Original Paper

Effect of humic substances on the production parameters of pheasant hens

Igor Sopoliga, Alena Hreško-Šamudovská, Mária Demeterová, Pavel Naď*,
Andrej Marcin, Magdaléna Skalická
University of Veterinary Medicine and Pharmacy in Košice, Slovak Republic

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There were observed the effects of administration of humic substances on health, feed conversion, production parameters, egg quality and hatchability of pheasants. The supplement of humic substances at the concentration 0.5 % in the feed mixture significantly influenced the hatchability percentage of pheasant chicks. The hatchability 72.9 % was achieved in the group without addition of humic substances. On the contrary, the hatchability 83.4 % was achieved in the experimental group in the case of addition of humic substances. The pheasants of the experimental group had a higher consumption of feed by 0.27 kg per 1 kg of produced eggs. The average production per one hen was lower by 0.85 egg and the average weight of egg was lower by 1.15 g in comparison to control group.

Keywords: pheasant, humic substances production, eggs, hatchability

1 Introduction

Humic substances are organic compounds found in high quantity in peat, lignite and oxihumolite as the final degradation product of plant and animal residues (Stevenson, 1994; Skokanová and Dercová, 2008). At present time, the humic substances are utilized in agriculture, in industry, in veterinary and human medicine, pharmacology as well as in environmental protection (Veselá et al., 2005). The highest quality fractions of humic substances are humic acids which are used in veterinary medicine for the treatment of diarrhea, malnutrition, dyspepsia and acute intoxication (EMEA, 1999). The positive effect of humic substances on the growth of animals, feed conversion (Kocabağli et al., 2002; El-Husseiny et al., 2008; Ozturk et al., 2012; Mirnawati and Marlida, 2013), hatchability of hens (Yörük et al., 2004; Kucukersan et al., 2005) and the viability of animals (Eren et al., 2000; Karaoglu et al., 2004; Esenbuğa et al., 2008) were observed in many studies. Because of their ability to promote the animal growth they could be suitable alternative for antibiotic growth promoters which utilization is prohibited in animal nutrition in the EU since 2006. The reason is creation of bacterial resistance to antibiotics. The aim of study was to investigate the effect of humic substances on the production parameters, egg quality and hatchability of pheasants.

2 Material and methods

The experiment was performed with pheasant hens in the pheasant's nursery in Rozhanovce – facility of the University of Veterinary Medicine and Pharmacy in Košice. There were used 160 pheasants – 20 roosters and 140 pheasant hens in the experiment. The time of observation of the production parameters lasted for 79 days. The laying period lasted for 61 days. The control group contained 10 laying flocks of pheasants (1 rooster and 7 hens were in one flock) which were kept under standard conditions in pheasant nursery during the entire laying cycle. Pheasants were fed with the complete feed mixture (manufacturer Purina) ad libitum with the free access to water. The experimental group contained 10 laying flocks of pheasants with the equal gender representation as in the control group as well. The experimental group was fed with the complete feed mixture for laying hens (manufacturer Purina) with the addition of 0.5 % natural humic substances in the feed mixture. The supplement was added in the form of oxihumolite with the content of 68 % humic acids and 48 % of them were free humic acids. At the beginning and in the course of experiment the analyses of the feed mixture were performed for the determination of nutrient content. The composition of feed mixture is declared in Table 1. The health state of laying hens and eventual mortality were monitored daily. As far as the production parameters is concerned, there were

***Corresponding Author:** Pavel Naď, Department of Nutrition, Dietetics and Animal Breding, University of Veterinary Medicine and Pharmacy in Košice, Komenského 73, 041 81 Košice, Slovak Republic. E-mail:pavel.nad@uvlf.sk

observed the consumption of feed mixture and the feed conversion in the laying period. The quantity of egg production, their weight and size were observed daily. Shape index was calculated according to equation $SI = W / L \times 100$ (W – width of egg in mm, L – length of egg in mm). The eggs from the week egg-laying from the control and experimental groups were placed into hatchery and the hatchability was observed. The results were statistically evaluated with unpaired *t*-test using Graph Pad Prism5 software.

3 Results and discussion

The laboratory analysis of feed mixture showed slight differences in nutrient content compared to the values declared by the manufacturer. Following the recalculation to absolute dry matter, the content of crude protein was lower by 3.8 %, fat by 19.6 %, ash by 11.41 % and metabolizable energy by 7.04 %. On the other hand, the content of crude fibre was higher by 29 % and nitrogen free extract by 3.52 %. Subsequently, lower content of calcium and sodium in comparison to declared values resulted from lower ash content. The valid content of nutrients in the feed mixture is presented in the Table 1.

In the time of laying period the mortality of two pheasant hens (mortality 2.8 %) was observed in the control group. The mortality (5.8 %) of 4 pheasant hens was observed in the experimental group during the same period. The daily feed consumption per one hen was 62.9 g in the control group. However, the daily feed consumption per one hen was by 7.0 g higher in the experimental group. Yörük et al. (2004) observed the administration of humates and probiotics in hens in the later laying period. He stated that the administration of humates did not have any effect on the mortality of hens at the concentrations 0.1 or 0.2 % in the feed mixture. They registered the improvement of parameters of feed conversion and the increase of production compared to the control group with not any differences in the egg quality. Hayirly et al. (2005) observed the effects of humates in the process of stress elimination of laying hens in cages with higher stocking density and demonstrated the positive effect of the application of humic substances in concentration 0.3 % in feed. Lower feed consumption was registered while maintaining production, egg quality and some metabolic parameters. The total amounts of laid eggs were 2730 in the control and 2381 in the experimental groups, whereas the average egg production per hen were 39.8 in the control and 38.95 eggs in the experimental group. The egg production was higher in the experimental group in the first three weeks of experiment, this parameters was balanced in weeks 4 to 6, whereas it was at the same level in the control group. More pronounced decrease of egg laying was observed in the experimental group in the interval of week 7 to 9 which nonsignificantly decreased the egg production in experimental group in the whole laying period in comparison to control group. The only significant difference at the level $P < 0.05$ was observed in the week 8 (Figure 1).

The feed consumptions per one produced egg were 125.1 g in the control and 142.3 g in the experimental group. The feed conversion calculated in kilograms per 1 kg produced eggs were 3.47, resp. 3.74. Worse results of the observed parameters in the experimental group could be caused by higher concentration of

Table 1 Composition of feed mixture for the pheasant hens – 19 (PURINA) and the content of nutrients in absolute dry mater

Component	%	Dry mater	g kg^{-1}	1000
Maize	47	CP	g kg^{-1}	196.1
Soybean meal (GMO)	18	Fat	g kg^{-1}	51.9
Wheat	8	Crude fibre	g kg^{-1}	54.3
Sunflower meal	6	Neutral detergent fibre	g kg^{-1}	157.4
Calcium carbonate	5.5	Acid detergent fibre	g kg^{-1}	77.7
Dark distillers´ draff	5	Ash	g kg^{-1}	96.3
Rapeseed meal	3	Nitrogen free extract	g kg^{-1}	601.4
Wheat feed	2.3	Metabolizable energy	MJ kg^{-1}	12.26
Pork lard	2.3	Ca	g kg^{-1}	19.68
Monocalcium phosphate	0.6	P	g kg^{-1}	8.25
Sodium chloride	0.26	Na	g kg^{-1}	1
Natuphos 5000G enzyme 3-phyt	750 FTU	Zn	mg kg^{-1}	174.73
Premix feed additives	2.04	Mn	mg kg^{-1}	130.02

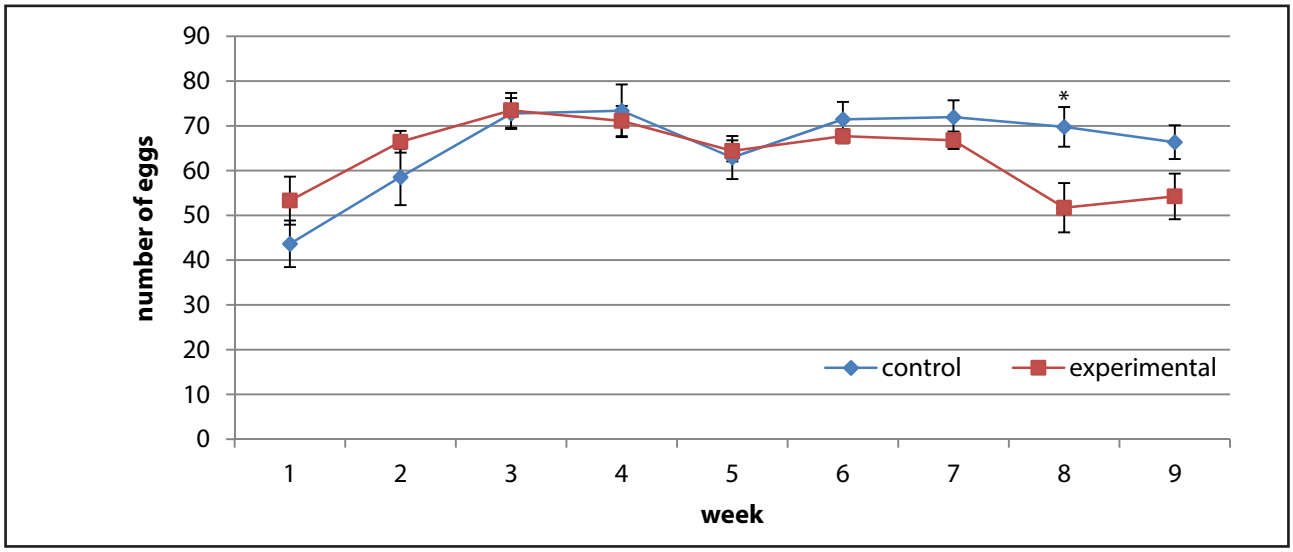

Figure 1 Eggs production in the time of reporting period
* P <0.05

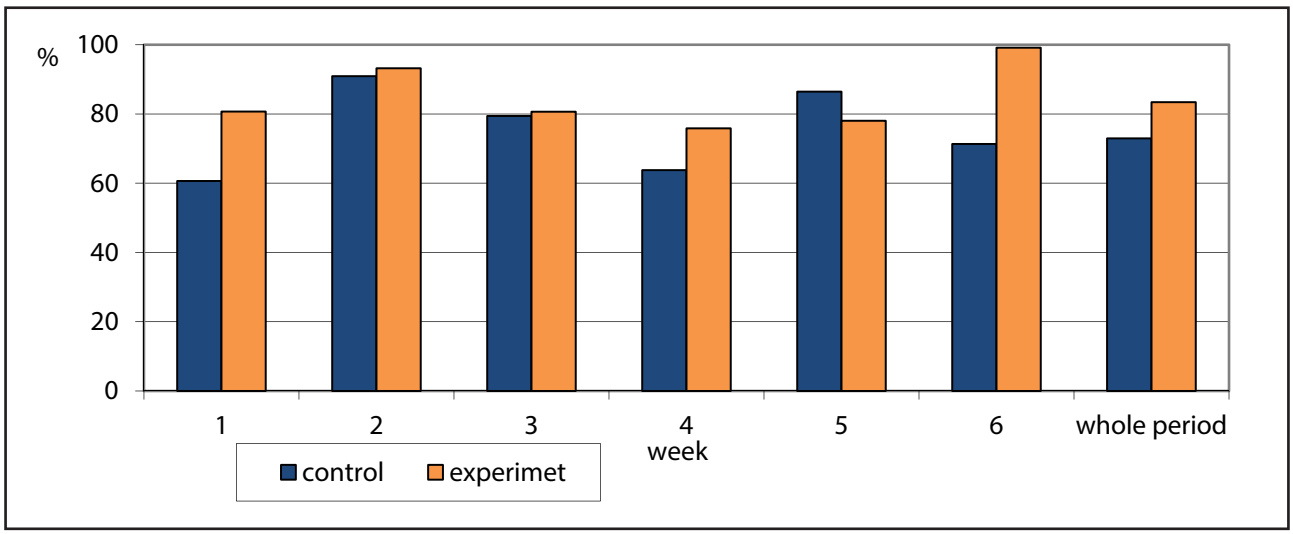

Figure 2 Pheasant hatchability in the particular weeks and in the whole period

humic substances in the feed mixture, whereas the basic information for dosage was the recommendation for the fattening of chickens from the manufacturer of oxihumolite. The humic substances were administered at a level of 30–90 mg per kg feed (Ozturk et al., 2009) or 2–6 mg per kg body weight in the case of administration into water (Arafat et al., 2015) in a number of works dealing with the observation of the effect of humic substances on the laying hens at the time of laying peak and post-peak as well as on the production parameters and the egg quality. The mentioned authors confirmed favourable effect of humic substances at these concentrations in several observed parameters (feed conversion, egg size, shell strength, etc.). Kucukersan et al. (2005) observed nonsignificant differences of egg quality between control and experimental groups. They confirmed that the dietary supplementation of humic acids at doses 30 and 60 g t^{-1} of feed can be used to improve egg production, egg weight and feed efficiency.

The average weight and the size ratios of eggs in our experiments are demonstrated in Table 2. The weight of eggs from the experimental group was lower by 1.15 grams compared to eggs from hens from the control group. At the equal width of eggs in the both groups, the eggs in the control group were longer by 1.4 mm.

There were observed higher weights of eggs, greater thickness of the shell, higher percentage of weight of shells and higher percentage of hatchability in the experiments with quails after dietary intake of humic substances at the level 10 and 20 ml kg^{-1} feed since day 1 till the end of laying period (Abdel-Mageed, 2012).

Table 2 Average weight and size ratios of eggs

	Weight (g)	Length (mm)	Width (mm)	Shape index (%)
Control	31.704	45.20	34.54	76.54
Experimental	30.558	43.80	34.83	79.56

The humic substances were added into compound feed at the level 50 g kg^{-1} in our experiment and thereafter 2,412 eggs from the control and 2,261 eggs from the experimental groups were used for hatching. There were hatched 1,759 in the control and 1,886 pheasant chicks in the experimental group which corresponded to the hatching rate of 72.9 % and 83.4 %, respectively.

4 Conclusions

The effects of humic substances on the production and quality of eggs are evaluated favourably by several authors. We did not confirm a positive effect of intake of humic substances in feed mixture in the concentration 0.5 % on feed consumption, feed conversion per kilogram of produced eggs and the quantity of produced eggs and their weight in our experiment with the pheasant laying hens. The application of humic substances has a positive, statistically nonsignificant effect on the hatchability. The hatchability of the pheasant laying hens was by 10.3 % higher after intake of humic substances in comparison to hens fed with the conventional feed mixture.

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References

ABDEL-MAGEED, M.A.A. (2012) Effect of dietary humic substances supplementation on performance and immunity of Japanese quail. *Egyptian Poultry Science*, vol. 32, no. 3, pp. 645–660.

ARAFAT, R.Y. et al. (2015) Effect of dietary humic acid via drinking water onthe performance and egg quality of commercial layers. *American Journal of Biology and Life Sciences*, vol. 3, no. 2, pp. 26–30.

EL-HUSSEINY, O.M., ABDALLAH, A.G. and ABDEL-LATIF, K.O. (2008) The influence of biological feed additives on broiler performance. *International Journal of Poultry Science*, vol. 7, no. 9, pp. 862–871.

EMEA (1999) *Committee for veterinary medicinal products. Humic acids and their sodium salts.* [Online] Last modified April 21, 2008. Retrieved October 10, 2015 from http://www.emea.eu.int/pdfs/vet/mrls/055499en.pdf

EREN, M. et al. (2000) Broyler yemlerine katilan humatlarin besi performansi, serum mineral konsantrasyonu ve kemik külü üzerine etkileri. *Ankara Üniversitesi Veteriner Fakültesi Dergisi,* vol. 47, no. 3, pp. 255–263.

ESENBUĞA, N. et al. (2008) Effects of dietary humate supplementation to broilers on performance, slaughter, carcass and meat colour. *Journal of the Science of Food and Agriculture,* vol. 88, no. 7, pp. 1201–1207. doi:http://dx.doi.org/10.1002/jsfa.3199

HAYIRLI, A. et al. (2005) Nutrition Practice to Alleviate the Adverse Effects of Stress on Laying Performance, Metabolic Profile and Egg Quality in Peak Producing Hens: I. The Humate Supplementation. *Asian-Australian Journal of Animal Science,* vol. 18, no. 9, pp. 1310–1319.

KARAOGLU, M. et al. (2004) Effect of supplemental humate at different levels on the growth performance, slaughter and carcass traits of broilers. *International Journal of Poultry Science,* vol. 3, no. 6, pp. 406–410.

KOCABAĞLI, N. et al. (2002) The effects of dietary humate supplementation on broiler growth and carcass yield. *Poultry Science,* vol. 81, no. 2, pp. 227–230.

KUCUKERSAN, S. et al. (2005) The effects of humic acid on egg production and egg traits of laying hen. *Veterinary Medicine* (*in Czech*), vol. 50, no. 9, pp. 406–410.

MIRNAWATI, Y.R. and MARLIDA, Y. (2013) Effects of humic acid addition via drinking water on the performance of broilers fed diets containing fermented and non-fermented palm kernel cake. *Archiva Zootechnica*, vol. 16, no. 1, pp. 41–53.

OZTURK, E. et al. (2009) Effects of dietary humic substances on egg production and egg shell quality of hens after peak laying period. *African Journal of Biotechnology,* vol. 8, no. 6, pp. 1155–1159.

OZTURK, E. et al. (2012) Performance, carcass, gastrointestinal tract and meat quality traits and selected blood parameters of broilers fed diets supplemented with humic substances. *Journal of the Science of Food and Agriculture,* vol. 92, no. 1, pp. 59–65. doi:http://dx.doi.org/10.1002/jsfa.4541

SKOKANOVÁ, M. and DERCOVÁ, K. (2008) Humic acids. The origin and structure. *Chemické listy,* vol. 102, no. 4, pp. 262–268 (in Slovak).

STEVENSON, F.J. (1994) Humus Chemistry: Genesis, composition, reactions. 2nd ed. New York: Wiley.

VESELÁ, L. et al. (2005) Structure and properties of natural humic substances type oxihumolit. *Chemické listy,* vol. 99, no. 10, pp. 711–717 (in Czech).

YÖRÜK, M.A. et al. (2004) The effects of supplementation of humate and probiotic on egg production and quality parameters during the late laying period in hens. *Poultry Science,* vol. 83, no. 1, pp. 84–88.