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PRODUCTIVITY ASPECTS OF TURKEY WELFARE AFTER *IMMUNOBETA* SUPPLEMENTATION

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Summary

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The aim of the present study was to monitor the effect of supplementation of yeast immunomodulator *Immunobeta* on some productive aspects of turkey welfare during the hot summer period. For this purpose, plasma corticosterone concentrations, egg production, live body weight and daily consumption per turkey were determined during the thermoneutral and hot summer period (27.71 ^{o}C). The plasma corticosterone levels were assayed by means of commercial ELISA kit. The dietary Immunobeta-supplementation contributed to statistically higher egg production during the thermoneutral and hot summer period ($P<0.01$ and $P<0.05$). The immunomodulator did not affect corticosterone concentrations, live body weight and daily consumption per turkey during both study periods.

Key words: corticosterone, egg production, turkeys, yeast additive

INTRODUCTION

Alternative methods to reduction the antibiotic use in poultry are particularly relevant. This is due to the antibiotic resistance of the microorganisms, which is rapidly spreading. Since 2006, the European Union has imposed a total ban on the use of nutritional antibiotics as growth promoters in poultry farming. All this determines the increasing pressure of the public opinion on limitation of the use of antibiotics. The application of yeasts and their active products is ab important alternative to antibiotic's excessive use. In this way the natural resistance of the birds increases, their productivity improves and the produce is free from antibiotics.

The high ambient temperature has a negative impact on poultry (Kucuk, 2008) especially on the daily laying capacity, growth and development of broiler chickens and adult poultry (Sahin *et al*., 2006; Oblakova *et al.,* 2009).

Wang *et al.* (2015) reported an increased laying capacity during the hot summer period by supplementation with 0.25% yeast with bacteriocin for 20 weeks. Cai *et al.* (2016) provide data for a significant increase in egg production and egg quality in laying hens after five weeks treatment with the *Saccharomyces cerevisiae* at doses of 0.500 g and 1 g per 1 kg

of feed given after the maximum laying capacity.

Studies on the immunomodulators' impact on turkey welfare, in particular with respect to improvement of their productivity during hot periods, are limited. The purpose of the study was to investigate the effect of the yeast preparation *Immunobeta* on laying capacity, blood corticosterone levels, live weight, feed consumption of turkey hens during the hot summer period (27.71 ^{o}C).

MATERIAL AND METHODS

The experiments were performed in the turkey farm in the village of Malko Kadievo in a hall with 700 turkey breeders, divided into group boxes. Thirty female turkeys at the age of 34 weeks from the egg-laying light line were randomly selected, and divided into 2 groups of 15 birds – control and experimental group, put in separate boxes of 10.50 m^2. They were kept on litter floors at a density of 1.43 birds per 1 m^2 (with the norm being 1.7 per m^2 according to Regulation 44/ 2006). The turkeys from both groups were fed the same balanced compound feed adapted to that category of birds and produced by the Stara Zagora Fodder Plant. The feed contained metabolisable energy 9.40 MJ/kg; crude protein 17.084%; crude fat 5.479%; calcium 2.90%; phosphorus 0.875%; Zn 119.79 mg/kg; methionine + cysteine 0.906%. The feed of te experimental turkeys was supplemented with the *Immunobeta* yeast product at dose of 4 kg/ton for 5 months – during the thermoneutral and hot period. Feed and drink front of 23 cm (norms 15 cm and 4 cm respectively) were provided. Ventilation was natural. The turkeys were grown at a light ratio of 1:10. The nests were 60/60/50 cm. Present surveys have been conducted according to animal welfare documents (Regulation 44/2006).

Blood samples for corticosterone determination were collected during the thermoneutral period – on May 8 and during the hot summer (July 8), from v. subcutanea ulnaris in sterile vacutainers. The plasma corticosterone levels were assayed with ELISA kit and ELISA-reader in the Laboratory of Innate Resistance Investigation in Faculty of Veterinary Medicine – Stara Zagora.Laying capacity was determined as: Legg = (Negg/N hens)×100%

Live body weight and feed consumption per turkey was determined by weighing with precision up to 0.001 kg during the thermoneutral and hot period. Feed consumption was defined as the difference between the amount of delivered and the amount of food left over.

Microclimatic conditions were determined by routine methods. The temperature and the relative humidity of air were measured by a with a weekly thermohygrograph; the velocity of the air motion − with a catathermometer, the light intensity – with a digital luxmeter, the concentration of ammonia – with indicator tubes and Drager ammonia sensor and calculatedin ppm. Statistical analysis of the results was performed by means of one-way ANOVA using the GraphPad InStat 3.06 software at level of significance $P<0.05$.

RESULTS

During the termoneutral period (April – May) microclimate conditions were within the norm (Regulation 44/2006): temperature (t^o) =18.57±0.20 ^{o}C; humidity (R) – 65.71±2.02 %; air velocity – 0.29±0.03 m/s; light intensity – 15.71±0.30 lx; NH_3 concentrations were 6.86±1.01 ppm. During the hot summer period, the temperature was 27.71±0.18 ^{0}C e. g.

Table 1. Blood corticosterone levels and production traits in turkey hens after *Immunobeta* supplementation during the thermoneutral and hot summer period. Data are presented as mean ± SEM (n=9).

Indices	Thermoneutral period		Hot summer period	
	Control group	*Immunobeta* group	Control group	*Immunobeta* group
Corticosterone, nmol/L	88.33±8.43	82.50±9.46	100.00±12.97	85.83±6.11
Daily consumption per turkey, g/turkey	158.00±2.62	157.33±2.06	131.00±1.96	130.00±1.89
Daily laying capacity, %	48.91±1.69	56.25±1.78**	36.57±3.60##	47.24±3.07*#
Live body weight, kg	8.307±0.248	8.498±0.227	8.227±0.192	8.451±0.200

*P<0.05; **P<0.01; ***P<0.001 statistically significant difference for a given type of behaviour between control and treated groups. # P<0.05; ##P<0.01; ###P<0.001 indicates statistically significant difference for a given type of behaviour between thermoneutral and hot periods.

higher than the norm (15–17 ^{o}C); humidity – 67.14±1.01 %; air velocity – 0.84± 0.03 m/s; light intensity – 45.71± 1.54 lx – higher than norm (20 lx); NH_3-concentrations were 8.57±0.92 ppm.

Table 1 presents the averaged results for the corticosterone levels, daily consumption per turkey, daily laying capacity and live body weight of turkey hens .

During thermoneutral and hot periods blood corticosterone levels were not statistically significantly between control and *Immunobeta* groups. During both periods, the laying capacity of turkeys from the *Immunobeta* group was significantly higher than in control one (P<0.01, P<0.05). The live body weight of turkeys and daily consumption per turkey were not statistically significantly between groups during both periods.

DISCUSSION

During the hot summer period, the temperature was higher than the normal one. This provoked heat stress in turkeys. The stress response in birds is mediated by activation of hypothalamo-pituitary-adrenal system. The increased blood corticosterone could be reliable indicators for the level of stress and therefore, could indicate a poor welfare (Popova-Ralcheva *et al.,* 2002, Mormède *et al.,* 2007). *Immunobeta* affects, albeit unreliably, a decrease in corticosterone levels in turkeys. A significantly higher laying capacity was found in turkeys receiving *Immunobeta* supplementation during the thermoneutral and hot summer period (P<0.01 and P<0.05).

Similar data are provided by Yalçin *et al*. (2010), Gürbüz *et al.* (2011) and Cai *et al.* (2016) who found that supplementation of yeast lysate (*Saccharomyces cerevisiae*) increased the laying capacity, the weight of eggs, and the absorption of feed in hens. In addition, Wang *et al.* (2015) reported an increase in egg production of single comb White Leghorn hens that received 0.25% yeast additive with bacteriocin for 20 weeks during the hot summer.

These positive changes in laying capacity could be linked to the better humoral resistance of the turkeys that received *Immunobeta*. The immunomodulator was obtained from selected yeast strains (*S. cerevisiae*) through enzyme autolysis and a process of natural extrac-

tion of yeast cell components. It contains three active ingredients: 30% beta-glucans, 25% mannan oligosaccharides and 5% nucleotides. Our unpublished data reveal an increase in lysozyme activity in turkey hens during the two study periods. During the thermoneutral period this factor was highly elevated ($P<0.001$) in the experimental poultry. Given that lysozyme is active primarily against Gram-positive bacteria and some viruses, we could point out that humoral nonspecific turkey resistance was increased in experimental birds. This reflects on better laying capacity in turkeys. It is known that mannan oligosaccharides and beta-glucans have a stimulating effect on the immune system in birds (Shanmugasundaram *et al.*, 2013; Czech *et al.*, 2014). In addition, Muzaffar *et al.* (2016) found an increase in the serum cytokine concentration which regulated the activity of heterophils and lymphocytes after addition of beta-glucans and mannan-oligosaccharides isolated from *S. cerevisiae* in broilers infected with *A. fumigatus*.

All these facts provided evidence that *Immunobeta* supplementation (4 kg/ton) improved turkey's laying capacity during thermoneutral and hot summer periods.

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