INFLUENCE OF SOME HERBAL ESSENTIAL OILS ON PRODUCTIVITY, NATURAL HUMORAL IMMUNITY AND OXIDATIVE STATUS IN BROILER TURKEYS

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Abstract

The banning of the use of antibiotics as feed additives has accelerated and led to investigations of alternative feed additives in animal production. As one of the alternatives, herbal extracts are already being used as feed supplements to improve growth performance. In this context, the use of herbal growth stimulants as a natural alternative to antibiotic growth stimulants occupies a very important place in the diet of birds. Moreover, in recent years, these feed additives have gained widespread attention in the feed industry. In the present study were investigated the effect of essential herbal oils of: *Hypericum perforatum*, *Lavandula angustifolia*, *Matricaria chamomilla*, *Thymus vulgaris*, *Origanum vulgare*, and *Rosmarinus officinalis* on productivity and health status in broiler turkeys.

The experimental part of this study was conducted in the production and experimental base of the Agricultural Institute - Stara Zagora in the period May- September 2019. A total of 105 one- day- old female broiler turkeys were weighed, marked and divided into 7 groups of 15 turkeys (each group was divided into 3 subgroups of 5 turkeys). The turkeys were reared in boxes, flooring on sawdust from 1 day to 126 days of age in controlled conditions (12 h light/dark cycles), the temperature of 18- 23^{0}C and humidity of 40- 70%, with free access to tap water and standard laboratory chow. For the first seven days, temperature circles and corrugated cardboard were used to limit sawdust bites. The groups were divided into seven: one control (C) and six experimental (T1, T2, T3, T4, T5, T6). The control group of turkeys received feed that met the age requirements without the addition of essential herbal oils (EO). The experimental groups together with age- appropriate feed received at T- 0.01% *Matricaria chamomilla* oil; T2- 0.01% *Rosmarinus officinalis* oil; T3- 0.01% *Lavandula angustifolia* oil; T4- 0.01% *Origanum vulgare* oil; T5- 0.01% *Thymus vulgaris* oil; T6- 0.01% *Hypericum perforatum* oil. At the end of the experimental period, body weight (BW) was reported, for the whole period the feed conversion (FCR) and the average daily feed consumption (AFC) for the whole growing period (126 days) were calculated. Serum lysozyme concentrations from mentioned herbal oils were determined by method of alternative pathway of complement activation (APCA). To determine the blood parameters used an automatic biochemical analyzer, using reagents from the company "Biomed": glucose- GOD- PAP-; cholesterol- Peg 6000; total protein Plus. Standard ELISA kits were used to determine the levels of the antioxidant enzyme superoxide dismutase (SOD), reduced glutathione (GSH), and malondialdehyde (MDA). All enzyme- linked immunosorbent assays were performed according to the procedure described in the respective kit. Based on the methods of Yoshioka and Yokoyama we developed and adapted the electron paramagnetic resonance (EPR) spectroscopy method for evaluation the levels of •NO radicals in serum. The levels of •NO radicals were calculated as double integrated plots of EPR spectra and results were expressed in arbitrary units. The Asc• measurement was according to modificied Bailey method. The ROS level measurement was according Zheleva, et al., 2012. The real-time formation of ROS in the serum was investigated by mixing the samples with PBN spin trapping. Statistical analyses were conducted with STATISTICA program, ver. 10 (StatSoft, Inc., 2011). One-way analysis of variance (ANOVA) tests were performed to compare means of all data. Dependent on the variance homogeneity (evaluated by Levene's test), identification of significant differences was carried out making use of the LSD post-hoc test, while for nonparametric analysis was used the Kruskal-Wallis test.

The biochemical parameters of the blood, the concentration of serum lysozyme, the activity of the alternative pathway for complement activation and betalysin and the oxidant/antioxidant status in broiler turkeys consuming 0.01% of essential oils in them were established. The addition of 0.01% essential oils of these herbs to the feed of broiler turkeys did not have significant effect on the final live weight up to 126 days of age.

The studied herbal oils have a serious immunomodulatory potential in turkeys. The studied oils had a positive effect on the levels of glucose, total protein, creatinine, cholesterol in turkey serum compared to the control ($P > 0.05$). The serum activity of antioxidant enzymes registered in the groups is affected by the intake of various essential oils. The free radicals levels measured as nitrogen and ascorbate radicals showed a statistically significant decrease compared to the control ($P < 0.05$).

The addition of 0.01% essential oils to the feed of broiler turkeys did not have a significant effect on the final body weight at 126 days of age. The studied essential oils have serious immunomodulatory potential in turkeys, if used in animal husbandry can contribute to improving their health status and thus increase their productive qualities. The essential oils (EECO) addition has a positive effect on the levels of glucose, total protein, creatinine, cholesterol in turkey serum compared to the control group at ($P> 0.05$). Essential oils of oregano have been shown to have an effect on triglycerides, ie a lowering effect. There was no statistically significant difference in the serum activity of SOD when adding 0.01% essential oil of herbs to the diet of the turkeys studied. The serum activity of GSH and the concentration of MDA suggest that the active substances of the phytogenic product may improve the antioxidant status of turkeys due to the antioxidant properties of EO from rosemary, oregano, lavender, and St. John's wort by increasing the activity of antioxidant enzymes. The levels of ROS products, NO, and ascorbate radicals show a statistically significant decrease compared to the control ($P < 0.05$) in groups treated with 0.01% EO from rosemary, oregano, and lavender.

Key words: *Turkey, Herbal essential oils, Lysozyme, Complement activity, Betalysin, Antioxidant enzyme activities, Oxidative status.*