REVIEW

for the acquisition of an educational and scientific degree "Doctor"

The review was prepared on the basis of order No. ZPS-17R dated 01.04.2024 of the rector of LTU Sofia for approval of the composition of a scientific jury.

Reviewer: Prof. Dr. Hristo Yordanov Daskalov, NDNIVMI, Sofia

Author of the thesis: Roger Hanna Al Hanna, MSc

Dissertation topic: ***"Effect of different plant supplements on body condition, meat quality and health status of broiler chickens".***

He is submitted for the acquisition of the educational and scientific degree (ONS) "Doctor" in the scientific specialty "Animal Pathology", field of higher education 6.0 Agricultural sciences and veterinary medicine, professional direction 6.4. Veterinary medicine

Master Roger Hanna Al Hanna was born on 26.05.1994 in Lebanon. He completed his secondary education in the city of Metn and then continued his higher education at the Lebanese University. He first started studying Biochemistry at the Faculty of Biochemistry in 2012, and from 2014 he studied Agriculture at the Faculty of Agriculture of the same university. He successfully obtained bachelor's degrees in both fields. In 2018, he successfully defended his master's degree in Plant Science at the Faculty of Agriculture of the Lebanese State University in the city of Beirut.

Over the years, Master Al Hanna has exercised his knowledge as a teacher of biology and general science; plant specialist in a joint Iraqi-Lebanese company. He worked as an assistant to the general manager of a plant breeding company for the production and sale of seeds, and his current professional occupations are as a person serving a major project in the field of agriculture in Lebanon and scientific research related to the results of this dissertation.

I. General presentation of the dissertation work

The dissertation consists of 165 pages of standard typewritten text. It has Summary – 3 pages, Introduction – 3 pages, Literature review – 38 pages, Own research (aim and objectives – 1 page; material and methods – 14 pages; results and

discussion – 50 pages, conclusions – 2 pages, recommendations for practice – 1 page; literature used – 40 pages. publications in connection with the dissertation – 1 page). The dissertation contains 10 tables and 30 figures. The list of literary sources consists of 408 titles in Latin.

The formulated objective of the dissertation work is directly related to the study of the potential of local natural herbs (thyme, mint, rosemary, chamomile, garlic and onion powder) as growth stimulants and immunostimulators of broiler Ross hybrid chickens aimed at replacing antibiotics, traditionally used in Lebanese broiler production. In addition, the impact of the tested natural herbs on broiler physiology, growth, meat quality, serum biochemical profile, hematological parameters and immunological status was tested. To achieve this goal, the following was done:

- An experiment was conducted with 8 groups of broiler chickens fed rosemary, chamomile, mint and thyme as supplements to the main diets and their effects on health status, body weight, nutrition and feed conversion ratio, slaughter yield, weight of internal organs, meat quality indicators.

- An experiment was conducted with 5 groups of broiler chickens fed garlic and onion powder as supplements to basic diets to evaluate their effects on health status, body weight, nutrition and feed conversion ratio, carcass yield, weight of internal organs and meat quality.

- Blood parameters, serum biochemical profile and immunological status were evaluated in both trials.

A comparative evaluation of the results of the two tests was carried out and the relevant conclusions and recommendations for practice were made.

II. Assessment of the form and content of the dissertation

Trial performances are directly related to the implementation of the intended goal and set tasks. Routine and modern laboratory methods were used to process the materials and the results obtained are beyond doubt. Studies involving mint-thyme-chamomile-rosemary were for 31 days (run-in period) in an open poultry house with windows on both front walls in the Bekaa Valley at Al Hassan Poultry Farm to investigate the effect of feeding baseline rations of broiler chickens without

the introduction of antibiotics and antioxidants on the vitality of the birds during the growth period. Feeding with natural herbs starts on the 20th day from the beginning of the experiment. To conduct the experiment, a group of 440 one-day-old Ross hybrid chicks was formed, obtained from a commercial hatchery and raised under the same conditions of microclimate and rearing and feeding technology, with natural ventilation through the windows and the roof. This group was divided and randomly assigned to eight separate groups and fed initial basal diets based on a corn-soybean meal mixture. All chickens were fed the same starting basic ration for 19 days (run-in period) without the addition of antibiotics and antioxidants, nor herbs and spices. The control group of birds received a basic diet without the presence of antibiotics and antioxidant, and the experimental 7 groups included antibiotic and antioxidant, the respective herbs separately without antibiotic and antioxidant and a mixture of herbs added to the food.

The second experimental setup with garlic powder-onion powder was conducted in Al-Labweh village with a total of 275 day-old broiler chickens of the Ross hybrid line, and it continued until the birds reached 31 days of age - slaughter age. 5 groups of 55 chickens were formed. The attached scheme repeats the previous one, with the difference being in the test supplement of garlic and onion powder.

The present study compared the effects of adding six herbal natural feed supplements with and without antibiotics and antioxidants to soybean- and corn-based broiler diets on broiler growth rate and carcass parameters. Data show that the use of 1% rosemary and 1% chamomile flower meal as a supplement to 100 kg of basic diets in the daily feed of broiler chickens during the growing period has a powerful effect on their growth and vitality. In addition to the achieved results observed in this trial, it is desirable to test these herbs in diets that are fed in the finishing period of fattening to investigate the actual effect of the herbs on the slaughter performance of chickens. The addition of thyme, mint, garlic and onion powder to broiler diets has the potential to improve performance. Although most of the characteristics did not show statistically significant differences in this experiment, positive numerical results were still registered compared to the control group, indicating that these herbs can be included in broiler feed rations and replace antibiotics as stimulants growth (which is already globally prohibited as a practice).

Attempts to use natural herbs in poultry feed as a growth promoter have been for a long time and different countries. It has been proven to be useful for improving production parameters and disease prevention, as they can contribute to meeting the nutritional needs of animals and to stimulate the natural resistance and resilience of their bodies. The beneficial effects of herbs or plants in farm animals may arise from activation of food intake and secretion of digestive secretions, immune stimulation, antibacterial, coccidiostatic, antihelmintic, antiviral or anti-inflammatory activity and antioxidant properties that could reduce dependence on antibiotics such as while providing a cost-effective solution for farmers. Inclusion of a mixture of chamomile and rosemary increased PVC, hemoglobin, WBC, eosinophils, total protein, albumin, ALT, HDL, LDL and decreased LOOH and MDA. Additionally, supplementation of diets with rosemary increased heterophils, lymphocytes, monocytes, and mean corpuscular hemoglobin, while chamomile consumption increased globulin concentration. IgG and IgM levels increased after adding the chamomile/rosemary, garlic/onion diets to both mixtures. Of course, the current studies cannot be exhaustive for final results regarding the use of aromatic plants as natural antioxidants and growth promoters. Trials with higher inclusion rates of thyme, mint, rosemary, chamomile, garlic powder and onion powder per ton of finished feed and for herds in more environmentally controlled farms are imperative to eliminate losses of net energy due to energy loss to maintain and control body temperature and use automatic feeders and drinkers to limit bird feed wastage and narrow feed intake errors and feed loss records.

The obtained research results characterize the dissertation work as possessing the necessary qualities of scientific development for obtaining an educational and scientific degree "doctor", as well as a complete correspondence between the topic, purpose, tasks and factual content. The general impression of the dissertation work testifies to the clarity of the statements in the boundaries of the clearly formulated subject and object, purpose, tasks and hypotheses in the context of the dissertation topic. The dissertation work and the conclusions drawn rest on comprehensive national and foreign literature and factual information. The design of the dissertation work is very good, as an illustration, figures and tabular material and justification of the research results.My overall assessment of the work presented is that it is the result of conscientious work and competent execution in the use of the information

obtained, professional language and style of formulation of the statements, with a distinction of the author's contribution of the study. The scientific studies were conducted in the conditions of Lebanon, where PhD student Roger Hanna lives and works.

3 publications are presented, 1 of them is in a refereed scientific journal Journal of World's Poultry Research, and the other 2 articles in the proceedings of an international scientific conference, which in terms of volume and thematic focus meet the requirements for obtaining an educational and scientific degree "doctor". They are directly related to the problematic of the defended hypotheses, goals and tasks, and represent a successful research activity. It should be noted that Master Roger Hanna is the lead (2 of them) or an independent author (1 of them) - the presented publications, a rare phenomenon for Bulgaria. The abstract is presented in the established form and content. It summarizes the main results of the research and gives the necessary insight into the theoretical and applied achievements of the author.

III. Scientific and scientific-applied contributions of the dissertation work

The dissertation outlines clear scientific contributions with potential for applied impact in broiler poultry nutrition and quality. The main contributions are as follows:

- The utility of incorporating various herbs and plant elements to improve the performance of broiler chickens was evaluated, with natural herbs being widely available at low input costs in feed mixtures, thus reducing the cost of meat production in Lebanon.

- An effect has been reported to replace the stimulating effect of the application of nutritional antibiotics (forbidden to use for such a purpose!) with the application of herbs in small quantities to improve production conditions in the poultry sector in Lebanon.

- The study proves that natural herbs in poultry feed can provide a growth-stimulating effect, which is essential to improve physiological and production parameters and prevent the occurrence of diseases to a certain extent.

- The study found positive effects of including natural herbs in the diet of broiler chickens, improving the taste of food (chamomile), its absorption in the body (rosemary, thyme) and growth (rosemary), as well as improving the immune status (mint, thyme, chamomile, garlic, onion) and blood indicators (rosemary).

In addition to the individual positive effects of natural herbs, the study expands on the positive effects of combining different herbs, essential oils, and others that have been established by other authors. In the present study, there were similar combined effects of some herbs on the body growth of chickens (thyme + mint) or the immune system (garlic + onion, chamomile + rosemary).

IV. Dissertation critical notes, questions and recommendations

Critical notes to the dissertation work are largely also questions to the author. The conducted studies are related to the widely discussed issues of more natural breeding of animals in particular and broiler birds, as well as reducing or stopping the use of antibiotics. The exhibition gives the impression that the practice of administering nutritional antibiotics continues in Lebanon. This was a widespread practice in the last century in Bulgaria, but since the beginning of this century, antibiotics are not used for such purposes, as this is legally prohibited in the EU and other developed countries.

Do you plan to continue with this kind of research in your future research and how do you see the use of probiotics, prebiotics and immunostimulators to address the issue of microbial resistance and improve the immune response and status of conventionally farmed birds.

V. Evaluation of the candidate's personal contribution

A careful reading of the submitted documents shows that Master Roger Hanna is the main driver at all stages of conducting research and presenting scientific results at scientific forums and preparing articles for publication.

VI. Personal impressions

I do not know Master Roger Hanna Al Hanna and have had no meetings with him. But I know his scientific supervisor Prof. Dr. Krasimira Genova, and this is a sign that a serious and thorough Bulgarian scientist worked with him. Considering the

presented documents, dissertation, articles and others, I believe that he has the qualities of a future active researcher in the field of poultry breeding and avian pathology, as well as a successful teacher in the same scientific field.

VII. Summary conclusion and opinion

The overall research activity on the dissertation presented for consideration by Master Roger Hanna Al Hanna shows that it meets the new high requirements related to the change that occurred in the law on the development of the academic staff in the Republic of Bulgaria. The presented voluminous work of data and their skillful interpretation, reflected in the dissertation work, supported by a sufficient number of published scientific works, participation in scientific forums confirms the fact that we have in the person of Master Al Khanna a young and purposeful researcher with proven qualities in the field of poultry breeding and animal pathology. The quality of the scientific production is high and this is confirmed by the publication of 3 scientific articles related to the topic of the dissertation. The PhD student has dared to venture into a very challenging field such as the production of broiler chicken farms and the application of new approaches and methods in their feeding in order to reduce and stop the use of antibiotics and improve their immune status. In the global science of feeding organically and conventionally raised birds, there is an ongoing interest in the inclusion of natural plant components incl. herbs, essential oils and others.

Everything written above gives me full reason to give a positive assessment and propose to the Respected Scientific Jury to vote positively for Master Roger Hanna Al Hanna to receive the educational and scientific degree "Doctor" in the scientific specialty "Animal Pathology", professional direction 6.4. Veterinary medicine, field of higher education 6. "Agrarian sciences and veterinary medicine".

25/04/2024

Sofia **Reviewer's signature:**

(Prof. Dr. Hr. Daskalov, PhD)