



## REVIEW

by

Professor, Krum Vladimirov Nedelkov, PhD, DVM, Trakia University,  
Faculty of Veterinary Medicine, Member of the Scientific Jury appointed by  
the Order ZPS-170/01.04.2024 of the Rector of University of Forestry

**Subject:** dissertation for the award of educational and scientific degree “Doctor of Philosophy - PhD” in the scientific specialty „Animal Pathology“, professional field 6.4. „Veterinary Medicine“, field of higher education 6. „Agrarian sciences and veterinary medicine“.

**Topic:** Impact of Dietary Supplementation with Different Herb Species on Body Performance, Meat Quality and Health Status in Broiler Chickens.

**Author of the dissertation:** part-time PhD student Roger Hanna Al Hanna, Department of “Animal Sciences”, Faculty of Veterinary Medicine at University of Forestry, Sofia.

**Scientific supervisors:** Assoc. Prof. Krasimira Genova, PhD from Department of “Animal Sciences” at FVM and Prof. Boulos Aljamal – Faculty of Agronomy and Veterinary Medicine, University of Lebanon.

### 1. Materials for the procedure.

A copy of the dissertation and abstract in electronic version for the award of the educational and scientific degree "Doctor of Philosophy - PhD" in the doctoral program "Animal Pathology", prepared by the doctoral student in accordance with the requirements of the Regulations for the Development of the Academic Staff at the University of Forestry.

### 2. Biographical data.

The author of the thesis for the award of the educational and scientific degree "Doctor of Philosophy - PhD" in the scientific specialty "Animal Pathology", Roger Hanna Al Hanna was born on 26.05.1994 in Lebanon. He received bachelor degrees first from the Faculty of Sciences in 2015 and later in 2016 from the Faculty of Agriculture of the Lebanese University. The doctoral student is fluent in written and spoken English, French and German, has computer skills and competences for working with the Microsoft office package and some programs for statistical processing. In 2018, he obtained a master's degree at the Faculty of Agriculture of the Lebanese University. He started working at Bluefield Co., Lebanon – Iraq in 2015 where he successively held the positions of Technical Trials and Field Officer (2015-2018), Seeds Unit Assistant Manager (2018-2021) and Project Associate (2022 to date). At the beginning of 2019, he was enrolled as a part-time doctoral student at the "Animal Science" department of the



Faculty of Veterinary Medicine at the Forestry University, Sofia with order No. 77/26.02.2019 in the scientific specialty "Animal Pathology", professional field 6.4. "Veterinary Medicine", field of higher education 6. "Agrarian Sciences and Veterinary Medicine". At the end of 2022, the doctoral student received Order No. ZSD-478/ 24.10.2022 for deduction with right of defense.

### **3. Evaluation of the dissertation work.**

#### **3.1. Structure.**

The dissertation on the topic "Impact of Dietary Supplementation with Different Herb Species on Body Performance, Meat Quality and Health Status in Broiler Chickens " is written in 152 pages, structured according to generally accepted requirements and includes the following sections: introduction - 3 pages, literature review - 37 pages, aim and tasks – 1 page, material and methods – 13 pages, results and discussion – 49 pages, conclusions and recommendations – 2 pages, scientific contributions – 1 page, bibliography – 36 pages. There are 3 publications related to the dissertation work, one of them is published a journal indexed in the Scopus database - Journal of World's Poultry Research, and two of them posted in the proceedings of an international scientific conference in Bosnia and Herzegovina. The dissertation contains 30 figures in the form of photographic material and 10 tables. 407 literary sources are cited only in English, most of which are articles and reports published after 2010. The dissertation contains 30 figures, a small part of which is presented in the form of photographic material and 10 tables. 407 literary sources are cited only in English, most of which are articles and reports published after 2010.

#### **3.2. Actuality.**

The presented project of a dissertation work represents an up-to-date significant study with a predominant general biological character. The accumulated data on growth, blood and biochemical parameters, feed conversion ratio and the quality of the obtained meat from the carried out in-depth studies are formulated in albeit not very precise contributions, for which it is not clear from the text whether they are of an original or confirmatory nature. Some of them reveal information about the influence of different plant supplements on body condition, meat quality and health status in broiler chickens.

It was established that the use of certain natural herbs included in minimal concentrations in poultry feed leads to improvement of productive indicators by stimulating the endocrine system and intermediate metabolism of nutrients. The dietary supplements used in the present trials show potential to stimulate the immune system and possess antibacterial, coccidiostatic and anti-inflammatory activities that could reduce dependence on the use of antibiotics. This dissertation follows modern trends to limit the use of antibiotics in animal husbandry, not only because of the creation of antibiotic resistance, but also because of the desire to obtain quality and healthy products of animal origin. It is evident that the research methods used for the effect of some dietary supplements both on growth indicators and on some blood, biochemical indicators and the immune response in general contribute to clarifying the mechanisms of action and have a



positively influence in a number of directions. In this regard, I believe that the dissertation contains elements of applied research, which has an important contribution to the accumulation of new knowledge in the field of broiler nutrition.

### **3.3. Literature review.**

The literature review is fully comprehensive and contains an analytical part, which represents a good basis for the research that has been conducted. The information presented in this section demonstrates the good literature awareness of the PhD student and his in-depth knowledge over the current topic. A very good impression is made by the use of modern and up-to-date scientific literature dedicated to the issues laid out in the current dissertation work. The PhD student also made a good justification for the choice of experimental methods and analyzes.

### **3.4. Aim and tasks.**

As a result of the analyzed data from the literature review, the doctoral student brings to the fore the unsolved scientific problems, as a result of which he formulates the main aim and tasks of the conducted studies. For the implementation of the set tasks, relatively modern and sufficient methods were used.

### **3.5. Material and methods.**

In this section, the experimental design of the two experiments and the methods for determining the investigated indicators are clearly and comprehensively described. The statistical analysis of the obtained results is also described in details, which shows the doctoral student's skills in working with certain types of software products.

### **3.6. Results, discussion, conclusions and contributions.**

The obtained results correspond in a large extent to the set tasks, they are described clearly and comprehensively for the reader and demonstrated visually with the help of 7 tables and 22 figures. The graphs correctly reflect the results, which are presented for the most part as means with standard deviation. It would be useful to give a little more detail in the legend and text to the individual figures, which would make them more comprehensive. A sufficiently competent discussion has been made based on the results obtained. 7 conclusions and recommendations for practice were formulated, as well as 5 contributions, for which it is not clear from the text what nature they are - original or confirmatory.

The results of the conducted studies reveal that the inclusion of some natural herbs in the ration of broiler chickens in a low concentration at inclusion level of 1% has a number of positive effects. The use of chamomile has been shown to have the potential to increase feed palatability and acceptability by improving the overall palatability of the ration, and the addition of rosemary and thyme has a positive effect on feed conversion. The use of rosemary in a low concentration resulted in an improvement of the growth performance of the birds. For the first time are reported results about the effect of a mixture of chamomile and rosemary on the blood



parameters of birds, the inclusion of which in the diet increased the hematocrit, hemoglobin, eosinophil cell count, total protein and albumin. In addition, the use of this herbal mixture increases the level of ALT, low and high density lipoproteins (LDL and HDL) and lowers lipid hydroperoxides (LOOH) and malondialdehyde (MDA), which are directly related to oxidative stress. It was also found that the addition of rosemary in the ration of broiler chickens increased the level of lymphocytes, monocytes and mean corpuscular hemoglobin, while the use of chamomile increased the concentration of globulin. An increase in the body's immune response has also been reported after the inclusion in the ration of some herbal plants such as mint, thyme, chamomile and garlic. It was also reported for the first time a positive influence of mixtures of herbal supplements (chamomile and rosemary, garlic and onion) on the levels of immunoglobulins G and M (IgG and IgM).

A number of indicators related to the quality of the meat *получен* from the birds were monitored, including tenderness, color, drip loss and cooking loss 24 hours after cooling and 1 month after freezing. For example, in the meat of birds that received a thyme supplement with the main ration, a lower drip loss was found after 24 hours of cooling. Meat from birds that received an onion supplement in their rations had the lowest percentage of cooking loss. In the "Results and discussion" section, other positive effects of the use of various plant supplements on meat quality were found, which unfortunately were not reflected in the conclusions and recommendations for practice, nor in the contributions to the dissertation. The comprehensive research conducted on the quality of meat should be indicated in the conclusions and contributions, which will give the author of the dissertation the basis to draw more complete and comprehensive conclusions on the effects of the addition of the various plant supplements.

#### **4. Dissertation-related publications.**

The presented publications related to the dissertation are sufficient and meet the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria. One of the works was published in an edition indexed in the fourth quartile (Q4) of the world-famous database Scopus (Journal of World's Poultry Research – SJR<sub>2022</sub> 0.175). Two other papers were printed in the proceedings of a prestigious international scientific conference held in Sarajevo - Bosnia and Herzegovina. In all publications, the doctoral student is the leading author, and in the first article he is also the sole author. This is a reflection of the importance of the work that has been done by the PhD student and reflects his personal contribution to the preparation of the publications.



## **5. Abstract.**

The abstract is written on 40 pages, properly structured and relatively well-formed. The content of the abstract fully reflects the aims, objectives, results and discussion, but repeats the weaknesses in drawing the main conclusions and contributions of the research.

## **6. Critical notes.**

- Some of the figures and tables lack detailed information in the legend and text. A more detailed description of the studied parameters and established statistical values will make the figures and tables more clear and comprehensive.

- Conclusions and recommendations for practice are usually presented separately, so the reader will get a clearer idea of the most important results of the conducted studies. In addition, the conclusions are too extensive, and the first of them repeats the aim of the dissertation. They could be summarized and consolidated without unnecessary repetition of the main results of the studies. The conclusions also lack some important results related to the parameters reflecting the quality characteristics of the meat. Most of the results show some significant changes in a number of indicators related to the quality of the meat obtained from the birds. Some of them should be formulated as important conclusions from the conducted research, especially since the influence of various herb species on meat quality is also present in the very title of the dissertation.

- The scientific contributions are not formulated correctly enough and it is not indicated which of them are original and which are confirmatory. In some of them, a too general description of the benefit of using plant supplements in poultry rations is made without indicating the specific scientific contribution and its scientific and practical value. Again, the deviations in meat quality indicators that can be deduced in several original or confirmatory contributions are omitted. It can be seen that from the presented results, significant changes are found in the investigated parameters of the meat, so the contributions are there and it only remains to be formulated and indicated in the relevant section of the dissertation.

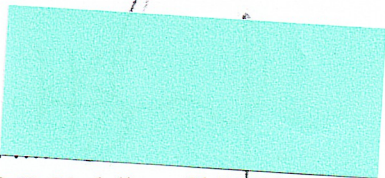
- Minor author formatting errors are noted in the attached bibliography.

The indicated critical notes do not reduce the scientific value of the presented dissertation work and I believe that a huge amount of research work has been done for its preparation.

### **Conclusion.**

The critical notes made do not detract from the merits of the thesis submitted to me for review and I believe that, with few exceptions, it represents a fully completed scientific work with a significant contribution to the enrichment of knowledge in the field of broiler nutrition. The dissertation work fully meets the minimum requirements of the the Regulations for the Development of the Academic Staff in the Republic of Bulgaria, as well as the Regulations of the University of Forestry. I give **a positive assessment**, by which I consider that Roger Hanna Al Hanna is a worthy and reliable candidate for the acquiring of the educational and scientific degree "Doctor of Philosophy - PhD" in "Animal Pathology", professional field 6.4. "Veterinary Medicine". I propose to the members of the Scientific Jury to vote in **positively** of awarding Roger Hanna Al Hanna an educational and scientific degree "Doctor of Philosophy - PhD".

Date: 10.05.2024 r.  
Stara Zagora

Signature:   
/Prof. K. Nedelkov, PhD, DVM/