

REVIEW



on a dissertation for obtaining the educational and scientific degree "PhD" in: field of higher education 6.0 Agricultural sciences and veterinary medicine, professional direction 6.3 Stock-breeding, the scientific specialty Zoohygiene.

Author of the dissertation: Smilyana Alexandrova Tasheva -

full-time doctoral student at the Department of Animal Sciences at the Agricultural University, Plovdiv

Topic of the dissertation: «Influence of basic microclimatic and technological parameters on some parameters characterizing the comfort of loose housing dairy cows»

Reviewer: Prof. Zhivka Ilieva Gergovska DSc, retired (Trakia University, Faculty of Agriculture, Stara Zagora).

Field of higher education 6.0 Agricultural sciences and veterinary medicine, Professional direction 6.3 Stock-breeding.

Scientific specialty: for Doctor of Science "Breeding of agricultural animals, biology and biotechnology of reproduction"

For Professor: "Cattle and Buffalo Breeding".

appointed as a member of the scientific jury by order No. RD-16/123, dated 21.11. 2022 by the AU Rector.

1. Brief introduction of the candidate.

Doctoral student Smilyana Tasheva completed her higher education at the Agricultural University, Plovdiv. In 2016, she was awarded the educational qualification degree "Bachelor" with the professional qualification of zooengineer, and in 2017 she graduated from the educational qualification degree "Master" with the professional qualification "Animal Breeding and Reproduction". Since 2018, he has been a full-time doctoral student in the Department of "Animal Sciences", at the Faculty of Agriculture of the Agricultural University of Plovdiv. As part of the training at the educational science degree "Doctor", the doctoral student completed with excellent and very good success several courses that are extremely useful for scientific and work - "Working with scientific databases", "Experimental data processing", "Basic clinical - laboratory analyzes " and those directly related to the subject of the dissertation work - "Good production practices in dairy cattle breeding" and "Problems of health care in cattle breeding"

2. Relevance of the problem.

The topic of the dissertation is relevant not only for our country in two aspects. On the one hand, there are climate changes reported in a global aspect, related to an

increase in maximum temperatures and their impact on both humans and animals, on the other hand, there are changes regarding the farming systems applied and the requirements for the welfare and humane treatment of dairy cows. The dissertation has tried to cover these aspects in many ways. On the one hand, the survey included farms with the most frequently applied rearing systems (loose in its various variants) and type of buildings in recent years. The farms are located in an area with manifested climatic features characteristic of almost the entire southern part of the country - relatively high summer temperatures, which occur over a rather long period - from June to September. In a number of other European countries, especially from Southern and Central Europe, similar problems are also reported for 4 to 5 months of the year. An attempt was made for a complex assessment and analysis of the influence of these factors on milk cows, taking into account various indicators related to the behavior, physiological and blood parameters and health problems of the animals. The obtained results can be of practical use both for correcting the conditions in the existing cattle farms in our country, and for recommendations for the construction of new ones so as to ensure to the maximum extent the requirements for welfare and humane treatment of milk cows, which from in turn, it will also be related to increasing the efficiency of production - good health, long productive life and higher productivity.

3. Purpose, tasks, hypotheses and research methods.

The purpose of the study is formulated clearly and concretely, and the 6 tasks set are maximally consistent with the set goal. Material and methods is presented concisely. The section is developed correctly, and for each of the tasks the devices and research methods and the statistical model of information processing are specified in detail. The object of the study are three cattle farms from one region of Southern Bulgaria with typical climatic conditions,, especially in terms of high temperatures. The three farms are for loose housing of the animals in the two widely applied variants – with free stalls and loose group. The type of buildings has also been preferred in recent years in dairy farming - semi-open and closed. 8 indicators of the climate and microclimate of the buildings were reported, three times a day and monthly for three seasons of the year. Modern devices were used for their reading.

Basic behavioral activities of the animals were recorded, on the basis of which the three comfort indices were calculated. For 18 cows (6 each from a farm, three times per season, for 3 seasons), the main physiological indicators - respiration, rectal and skin temperature, pulse - were recorded monthly. Blood was also taken from the same animals (108 samples in total), and a total of 16 blood parameters were examined. The health status of the animals on the farms was reported, some of the problems were accounted for by the doctoral student (lesion on the limbs and lameness) and the rest were taken from the veterinary diaries of the farms.

Modern methods of information processing have been applied, enabling a better assessment and analysis, as well as a more correct accounting of the factors.

During the development of the dissertation work, the dissertation student has mastered a significant number of methodologies and research methods, which is a reason to consider that she has acquired the necessary methodological experience for conducting a scientific experiment, and also that the educational task of this scientific work has been fulfilled degree.

4. Transparency and presentation of the obtained results.

In terms of volume and structure, the work presented project meets the requirements for a dissertation - 153 standard pages, with well-structured and developed sections, respectively: Introduction - 2 pages, Literature review - 23 pages, Aim and tasks - 1 page, Material and methods - 16 pages, Results and Discussion - 69 pages, Summary - 4 pages, Conclusions - 2 pages, Recommendations - 1 page, Contributions - 1 and References - 27 pages. The work is well illustrated - 34 figures and 28 tables. According to the structure and ratio of the sections, the dissertation work has been developed according to the requirements. The attached own photo material also makes a very good impression - 22 photos representing the conditions in the studied farms, technological elements and animals with various health problems.

5. Discussion of results and used literature.

The literary overview includes 258 authors, of which 30 are in Cyrillic. The literature review is mainly focused on the field of the study. The PhD student shows a very good awareness of both the modern achievements in the field of the subject of the study and some fundamental positions in this field. Over 80% of the literary sources are after 2000, and 23% are from the last 5 years. This is an indication of the PhD student's good awareness of new trends and contemporary views in the field of welfare and humane treatment of dairy cows. This shows a good interest and monitoring of the latest developments in studies in this field, which also provided a good basis for the analysis of the obtained results and their comparison with the literary sources.

A good impression is made by the brief summary of the literature review, which argues the need for the study.

The "Results and Discussion" section has been developed in detail in accordance with the purpose and the tasks set. A detailed analysis of the obtained results was made, and the good literary awareness of the doctoral student made it possible, not only for the adequate analysis, but also for appropriate comparisons with results obtained by other authors. Systematically and thoroughly conducted research and their analysis are aimed at the main thesis of the dissertation - namely the influence of the type of building, breeding technology, microclimate and the

relationship of these factors with the comfort and welfare of dairy cows. The interpretation of the obtained results is at a very good scientific level.

Based on the measurements of the climate indicators in the area of the three farms, a good characterization of the climatic factors by seasons (temperature, relative humidity and speed of airflow) was made, as well as the reported extreme values, as a prerequisite for stressful climatic conditions except in summer and in the spring. A detailed architectural and constructional description of the three buildings subject to the study was made. It was established that the heat balance of the three buildings is insufficient, and logically it is better with the closed type, but this building has unfavorable conditions in the summer - high values of THI in the summer. In the case of the semi-open type building, but with deep bedding, temperature stress in the reared animals in the spring and summer due to the effect of the deep bedding is considered a prerequisite. Better microclimatic conditions are established in the semi-open building with free stalls for rest. Providing better and adequate ventilation would significantly improve the microclimate in these buildings.

In addition to the microclimate in the buildings, the comfort of the cows was also analyzed in detail when using the comfort indices, depending not only on the rearing technology and on the microclimatic conditions in them. A significant dependence of the comfort index values on the reported THI values was established. High THI values result in a lower percentage of cows using the stalls for rest and more lying animals. This discomfort in dairy cows affects both their health and productivity. Problems with the values of the three indices are also reported in connection with the technological dimensioning of the individual stalls (farm 1). In all seasons, a higher percentage of cows lying in the group housing and deep litter building was reported. The obtained results show that the comfort indices are recommended to be applied to evaluate the rearing conditions of dairy cows in order to improve their welfare.

Physiological indicators of dairy cows are also a very accurate indicator of temperature stress in animals, they are also non-invasive, easy to apply, as are the indices. High THI values in the buildings for keeping cows lead to an increase in the values of the respiration rate, heart rate and skin and rectal temperature of the animals.

The values of blood indicators are influenced by a number of factors such as physiological state, lactation period, nutrition, microclimate, health status, etc. Therefore, it is more difficult for them to defer the effect of a certain factor. Despite the complex nature of the influence of the factors, the influence of the farm (which also includes the level of nutrition) and the high values of THI - decrease the levels of blood sugar, total protein, cholesterol and sodium and potassium and increase those of creatinine (more than twice) and of cortisol in the blood. All this indicates that high daytime temperatures act as a depressing factor that increases the functional tension of the overall metabolic rate of dairy cows.

As a final part of the study, the dependence between the reported values of the three comfort indices with the various sufferings and diseases of the cows in the three farms was analyzed. It was found that considering low values of the indices of comfort and use of free stalls and high values of the index of standing in the stalls increases significantly the risk of lameness, joint lesions, mastitis and metabolic diseases. This shows that comfort indices can be a very good indicator of the risk of health problems in dairy cows and could be promoted more widely in practice as non-invasive, easy to apply and accurate indicators related to ensuring welfare and humane treatment of dairy cows.

The section ends with a very good summary summarizing the overall study and specific conclusions from the results obtained.

On the basis of the conducted research, 12 conclusions were drawn, which derive from the results. 4 recommendations for the practice were also made, which correspond to the obtained results and are adequate for our conditions.

The doctoral student Smilyana Tasheva has mastered various methods of research and processing of the received information, she has shown skills for proper planning and conducting experiments, as well as skills for professionally analyzing the obtained results and formulating logical conclusions and recommendations.

6. Contributions of the dissertation work.

Scientific and applied contributions

A complex methodology was applied to assess the comfort conditions for dairy cows, including a study of the influence of the natural-climatic conditions of the area, the construction-constructive and technical-technological features of the buildings, their thermal-technical capabilities, quality and efficiency of the ventilation system, physical, biological and mental condition of animals and possibilities for prevention of basic diseases.

The assessment of the manure environment has been extended, with THI data being compared and supplemented with Benezra's and Dmitriev's temperature tolerance coefficients.

Changes in biochemical parameters and metabolic processes associated with seasonal fluctuations in temperature and THI were found.

A correlation was established between THI and comfort indices in buildings for dairy cows.

A correlation was established between the comfort indices and the percentage of suffering and diseases caused by technopathies of cows. The highest dependence of all sufferings and diseases included in the study is found with the low values of IKK and IIB, and the high values of the standing index of the cows in the box (ISB) is an indicator of an increased risk of metabolic diseases and different forms of mastitis.

7. Critical Notes and Questions.

To correct the use of the phrase "comfort indices have an impact on diseases ..." in both conclusion 12 and the last contribution. It is more correct to use "a high statistical dependence is established between the values of the indices and technopathies"

8. Published articles and citations.

A total of 5 scientific articles have been published on the dissertation work. Two of them are in a scientific publication registered in Web of science. Also three of the publications were reported at international scientific conferences.

The presented abstract reflects objectively the structure and content of the dissertation work.

CONCLUSION:

Based on the different research methods learned and applied by the doctoral student, the correctly performed experiments, the generalizations and conclusions made, I believe that the presented dissertation meets the requirements of the ŽRASRB and the Regulations of the Agrarian University for its application, which gives me the reason to rate it **POSITIVELY**.

I take the liberty of proposing to the honorable Scientific Jury to also vote positively and award Smilyana Alexandrova Tasheva the educational and scientific degree "Doctor" in the scientific specialty of Zoohygiene.

Date: 19.12.2022

Plovdiv

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