OPINION

on a PhD thesis for awarding the educational and scientific degree "doctor" in: field of higher education 5. Technical Sciences, professional range 5.13. General Engineering, scientific specialty "Mechanization and Electrification of Plant Growing"

Author of the PhD Thesis: M. Sc. Eng. Petya Angelova Genkova, PhD student in independent training at the Department of Agricultural Mechanization at the Agricultural University, Plovdiv;

PhD Thesis Topic: Comparative study of active disk working bodies for surface soil cultivation;

Member of the scientific jury: Prof. Dr. Eng. Violeta Dimitrova Rasheva, University of Food Technologies - Plovdiv (retired); field of higher education 5. Technical Sciences, professional range 5.4. Energy, scientific specialty "Industrial Thermal Engineering", appointed as a member of the scientific jury by order No. RD-16-1272/16.12.2025 by the Rector of the Agricultural University - Plovdiv.

1. Actuality of the problem. Surface tillage is the oldest operation in agriculture, and accordingly, soil cultivation machines have the longest development path and the greatest diversity of types and types. These machines must cultivate the soil in a way that provides the best conditions for the development of the cultivated crop. Another important requirement is to preserve soil fertility and create equal conditions for the development of agricultural crops. Last but not least is the economic aspect of the operation - it must ensure a reduction in production costs and an increase in income from the grown crop. The creation and improvement of machines for surface soil cultivation is an important factor in increasing the efficiency of cultivation and achieving high quality of production. All this makes the research relevant and aimed at sustainable and economically efficient development of agriculture.

2. Purpose, tasks, hypotheses and research methods.

Based on the conclusions from the analysis of the situation, the goal of the PhD thesis and the tasks for their achieving have been correctly determined. The goal is to conduct a comparative study of two innovative working bodies for surface cultivation of the soil. They have a different profile and active drive, combining the kinematics of a soil tillage machine with a horizontal axis of rotation and the horizontal displacement of the soil by a disk working element. To achieve the set goal, 6 specific tasks have been identified for solving.

The determination of soil composition was carried out according to the method of Kaczynski (1970). The conducted studies were carried out in three repetitions for each of the soil backgrounds – plowed and stubble, with disks 1 and disks 2. Soil moisture was measured with a soil moisture meter, and the measured values were within the range for both soil backgrounds. The mathematical modeling of the trajectory of movement of points from the disk was performed with the GEO GEBRA program. A regression analysis was conducted to track the relationships between speed, humidity and the specified processing depth. The obtained results were statistically processed using specialized software STATISTIKA 7. The summaries obtained in the study are presented visually through tables and figures and correspond to the set goal.

3. Visualization and presentation of the results obtained.

The structure of the PhD thesis is correctly proposed, ensuring the achievement of the set goal. It includes: a table with the symbols and designations used; a list of publications on the PhD thesis; an introduction; 5 chapters describing the analysis of the state, the goal, the tasks and the object of the study, mathematical modeling of the trajectory of movement of points from the disk, the research methodology, the results of the experimental studies, conclusions from the study, contributions of the PhD thesis and the references used.

The dissertation is developed in a volume of 129 pages, illustrated with 66 figures, 1 diagram, 25 tables and 17 equations. I noticed gaps in the numbering of the equations – after equation (8) follows equation (11), and there are also some equations used without numbering. The presented PhD thesis abstract objectively reflects the structure and content of the dissertation, but the numbers of the figures and tables in the abstract do not correspond to those in the dissertation. My recommendation is that this be corrected.

The PhD thesis was checked for similarity (plagiarism) using specialized software "StrikePlagiarism", based on Art. 46, item 9 of the "Regulations on the organization and activities of the Agricultural University of Plovdiv" and a report from the inspection, as well as Protocol No. 32/2025 for the presence of 5.2% similarity and a decision of the relevant committee "To proceed with the PhD thesis" have been submitted. A declaration of originality and authenticity of the results by the PhD student has also been submitted.

4. Discussion of the results and references used.

Two new actively driven working bodies for surface tillage have been developed. Mathematical modeling of the trajectory of movement of points on the disk has been performed and experimental studies of the operation of two innovative working bodies for surface tillage have been conducted. The applicability of the model for engineering design has been proven. The results obtained, presented in the dissertation, are summarized in a separate chapter called conclusions. As a result of these conclusions, the contributions of the PhD thesis are formulated.

To develop the dissertation, a review of 101 literary sources was conducted, 88 of which are in Cyrillic language and the remaining 13 - in Latin language. About 33% (33 items) of the references used are from the last 10 years. Overall, the PhD student is well prepared for the research problem - she graduated with a Bachelor's degree in "Agricultural Engineering" and a Master's degree in "Financial Management and Accounting" at the Agricultural University of Plovdiv. Since 2022, she has been working as an assistant professor in the Department of Agricultural Mechanization of the same university, conducting exercises and teaching practice and supervising thesis projects with students.

5. Contributions of the dissertation work.

As a result of the dissertation, 11 contributions have been derived, 5 of which are formulated as "scientific-applied" and the remaining 6 - as "engineering-applied". In general, I accept the PhD student's claims for these contributions and I believe that they relate to the enrichment of existing knowledge in the field of research. The results obtained can also be used for student training.

6. Critical notes and questions.

I have given my recommendations and notes in each point of this opinion, and here I will only add that the formulation of the contributions could be made a little tighter and in fewer points.

7. Published papers and citations.

The results of the dissertation research have become available to the scientific and professional community through 3 scientific publications in English. In two of them, the PhD student is the sole author and they have been published in a scientific journal in Bulgaria.The third publication was reported at a scientific conference at the Agricultural University - Plovdiv, but has not yet been published. It is co-authored with one of the scientific supervisors, with engineer Genkova as the first author. There are no data on publications citing the papers on the PhD thesis. My recommendation is that the results of future scientific research be published in isses indexed in the global databases Scopus and WoS. An Opinion on verification of the PhD student by the Commission for verification of the scientometric indicators of PhD students of the Agricultural University of Plovdiv, as well as a certificate of compliance with the minimum national requirements according to the "Law on the Development of Academic Staff in Bulgaria", the Act for its Implementation and "Act on the Development of Academic Staff at the Agricultural University of Plovdiv" in the scientific field of "Technical Sciences", have been provided. The minimum number of points required from dissertation publications for registering the PhD student with NACID is 30, and through the 2 published papers on the PhD thesis, 40 points have been achieved.

CONCLUSION:

Based on the various research methods studied and applied by the PhD student, the correctly conducted experiments, the generalizations and conclusions made, I believe that the presented dissertation meets the requirements of the the "Law on the Development of Academic Staff in Bulgaria", the Act for its Implementation and the "Act on the Development of Academic Staff at the Agricultural University of Plovdiv", which gives me reason to evaluate it **POSITIVELY**.

I would like to propose to the esteemed Scientific Jury to also vote positively and award Eng. Petya Angelova Genkova the educational and scientific degree "Doctor" in the field of higher education 5. Technical Sciences, professional range 5.13. General Engineering, scientific specialty "Mechanization and Electrification of Plant Growing".

Date: 10.01.2026
Plovdiv

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