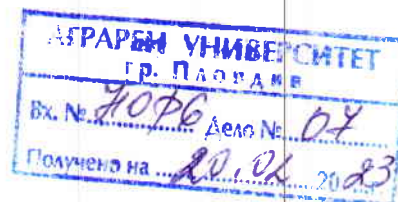


REVIEW



of a dissertation for obtaining the educational and scientific degree "Doctor of Philosophy" in the field of higher education 6 "Agricultural sciences and veterinary medicine", professional direction 6.1. "Crop Production", scientific speciality 04.01.13 "Meliorations (including soil erosion and its control)"

Author of the dissertation: Nadya Stoyanova Hristova

full-time PhD student at the Department of Meliorations, Land Management and Agrophysics, Agricultural University, Plovdiv, Bulgaria.

Dissertation topic: „Regulated Irrigation Regime“

Reviewer: Prof. Dr. Eng. Kouman Smilkov Koumanov, emeritus, field of higher education 6 "Agricultural sciences and veterinary medicine", professional direction 6.1. "Crop Production", scientific speciality 04.01.13 "Meliorations (including soil erosion and its control)" and 04.01.15 „Fruit Growing“, appointed as a member of the scientific jury by the Rector of the Agricultural University, Plovdiv, order No. RD-16-1308/19.12.2022.

1. Brief presentation of the candidate

The PhD student Nadya Stoyanova Hristova graduated from the Agricultural University, Plovdiv in 2007 with a Bachelor's degree in "Agronomy-Hydromeliorations", and a Master's degree in "Viticulture and Winemaking". In the 2014-2023 she worked as a senior expert-agronomist (Seed production) at the Maritsa Vegetable Crops Research Institute, Plovdiv, and since 01.02.2023 she has been worked as an Assistant Professor at the Fruitgrowing Institute, Plovdiv. In 2019, she was enrolled as a full-time PhD student at the Department of Meliorations, Land Management and Agrophysics, Agricultural University, Plovdiv, Bulgaria. The doctoral student has an intermediate level (spoken and written) of German and English.

2. Actuality of the problem

The unprecedented scope and scale of human activity at the beginning of the 21st century is accompanied by a disruption of the natural balance on ever-larger territories and an unregulated depletion of natural resources. The movement of huge volumes of water in space and time, associated with water management, causes changes in the climate of large areas. Irrigation is often accompanied by deterioration of soil fertility, compaction and degradation of the soil, its secondary mineralization, waterlogging and swamping, pollution of natural waters and their depletion. Water shortages are exacerbated by competition between irrigation and other water users. Efforts are ongoing to overcome the adverse consequences by improving the irrigation systems and improving the management of the irrigation process. The subject of the present research are technological solutions ensuring high and stable yields, high quality of

production, economical use of resources and cultural practices in harmony with the environment. The study is up-to-date and useful for practice.

3. Purpose, tasks, hypotheses and research methods

The research aims to optimize the irrigation regime of the salad variety "Winter Butterhead" under drip irrigation and micro-sprinkling, based on experimental data, statistical and mathematical analyzes of the productivity and evapotranspiration of the crop, the parameters of the "water-yield" relationship and the economic efficiency of the applied techniques and irrigation rates. In the course of two growing seasons, the hypotheses of irrigation efficiency of two micro-irrigation methods were studied at three levels of irrigation rates (100%, 80% and 60% of the conventionally optimal) in comparison with a non-irrigated control, the soil moisture being measured with the EU-5 FDR sensor (Decagon). With a view to the practical management of irrigation regimes, the collected information was used to calibrate three empirical formulas relating crop evapotranspiration to particular meteorological characteristics. The values of the corresponding biophysical coefficients for the two micro-irrigation techniques were determined for ten-days intervals. Mathematical models describing the dependence of yield on both the irrigation rate and the evapotranspiration have been calibrated. A number of relationships illustrate in detail the effect of the studied irrigation regimes and irrigation techniques. The effectiveness of the studied impacts is determined based on a detailed economic analysis. The methods and approaches used are scientifically sound, and the field experiment has provided impartial and reliable data to achieve the goal of the dissertation.

4. Visualization and presentation of the obtained results

The dissertation has a volume of 142 pages, of which 28 pages are set aside for a literature review, the material and methods section occupies 9 pages, and 81 pages are devoted to the research results and their discussion. The information processed, the methods used and the results obtained are illustrated by 49 figures and 46 tables. The dissertation is presented in a form and volume corresponding to the requirements of Art. 27 of PPZRASRB and Art. 46 of PPZRASRB in AU.

5. Discussion of results and references

The results of the study are presented in detail and illustrated through a large number of figures and tables, and the comments clarify them further while helping to form and justify the conclusions of the research. The discussion of the results is thorough, detailed and with the necessary knowledge regarding the biology of the crop, the processing of the experimental data and the novelties in the scientific field of the dissertation. The list of used literature includes 226 titles, of which 28 in Cyrillic and 198 in Latin. The doctoral student shows that she has mastered the means and methods for processing experimental data at a good level, she has mastered the specific matter of mathematical models and is able to analyze and summarize the obtained results.

6. Dissertation Contributions

The dissertation's main contribution is that, with modern means, it affirms, albeit in the

conditions of one region, the universal need for Bulgaria to develop and implement economically efficient resource-saving technologies, techniques and irrigation regimes. The contributions of the implementation of the individual research tasks can be summarized as follows:

Scientific contributions

1. The scientific basis for optimizing the irrigation regime of lettuce, variety "Winter oilhead" in the conditions of water shortage, has been created by calibrating mathematical models describing the dependence of the yield on the irrigation rate and evapotranspiration.

Applied-science contributions

1. The scientific basis for effective planning and management of the irrigation process for micro-irrigation of lettuce has been established;
2. It was found that the highest yields are obtained when irrigated with 100% of the conventionally optimal irrigation rate;
3. Methods for practical management of the irrigation regimes have been adapted for lettuce, variety "Winter oilhead" after calibrating three empirical formulas relating crop evapotranspiration to individual meteorological characteristics, including reference evapotranspiration (FAO-56), temperature and air humidity.
4. I consider the established strong correlation between the fresh and dry mass of the leaves, as well as between the fresh mass and the leaf area, as a methodological contribution, since through these relationships the otherwise time-consuming biometric studies are significantly eased.

7. Critical notes and questions

1. The title "Regulated irrigation regime" is too general and does not correspond to the content. I assume it has something to do with the term "regulated deficit irrigation (RDI)" appearing in several places in the text, but its use in the context of this particular study is inappropriate. A suitable short title, for example, would be "Irrigation regime optimization in micro-irrigation of lettuce (*Lactuca sativa* L.)"
2. In optimization trials, a wider range of the variable factor is preferable. Hence, it would be better if one of the treatments had provided higher irrigation rates than those of the conventionally optimal (100%).

The critical remarks made do not detract from the contributions of the dissertation work, but are intended to improve the future research work of the doctoral student.

8. Published articles and citations

The doctoral student is the first author of three articles related to the dissertation work, published in *Journal of Mountain Agriculture on the Balkans*.

Няма данни за цитирания на публикациите, свързани с темата на дисертацията.

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

CONCLUSION:

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

I take the liberty of proposing to the honorable Scientific Jury to also vote positively and award Nadya Stoyanova Hristova the educational and scientific degree "**Doctor of Philosophy**" in the scientific speciality **04.01.13 "Meliorations (including soil erosion and its control)"**

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