



SCIENTIFIC OPINION

on PhD thesis about acquirement of the educational and scientific degree "Philosophy Doctor" in the scientific scope of higher education 6. Agricultural sciences and veterinary medicine, professional field 6.1. Plant growing, scientific specialty „Vegetable production “.

Author of the PhD thesis: Alexander Kirilov Trayanov, a full-time PhD student in the Department of Horticulture at the Agricultural university - Plovdiv

Title of the PhD thesis: „ Productivity and quality of the seeds of carrots by optimization of nutrient regime in their seed production “

Prepared by: Assoc. Prof. Dr. Velichka Yordanova Todorova, Maritsa Vegetable Crops Research Institute, Plovdiv, scientific scope of higher education 6. Agricultural sciences and veterinary medicine, professional field 6.1. Plant growing, scientific specialty "Breeding and seed production of cultivated plants", member of the Scientific Jury appointed pursuant to order № РД-16-282/15.03.2021 by the Rector of the Agricultural university of Plovdiv.

1. Relevance of the problem.

Carrots are the leader among all vegetables in terms of beta-carotene content, which is mainly associated with the health effects of their use. They also contain vitamins from group B, K1, various minerals - potassium, sodium, calcium, magnesium and other valuable ingredients. They are ones of the most widely consumed root vegetable crops in the world, a major part of baby, children's, dietary and functional foods. In this sense, the problems developed in the dissertation are significant and relevant, and the results obtained regarding the possibilities for increasing seed productivity and seed qualities in carrots are of both scientific and scientific-applied value.

2. Purpose, tasks, hypothesis and research methods.

The main purpose of the dissertation is to increase the seed productivity and improve the quality of carrot seeds, as well as to improve the vegetative and generative development of seed plants by optimizing the nutrient regime during the carrot seed production by evaluation of the different levels and terms of fertilization with nitrogen, phosphorus and potassium, as three tasks are formulated for its implementation.

During his training and in fulfilment of the aim and tasks, Alexander Trayanov has mastered and applied many various research methods. The obtained experimental data are processed using different statistical methods - analysis of variance, correlation analysis and regression analysis. All this allows the PhD student to apply a comprehensive approach to research and to draw reliable results and conclusions.

3. Visualization and presentation of the obtained results.

The dissertation is written on 218 pages. It is well structured by chapters according to the

requirements, and the results of the research are illustrated in 58 tables and 13 figures.

4. Discussion of the results and used literature.

The chapter "Results and discussion" is systematized and well formed, including the results of the study on the influence of different fertilizer rates and timing of fertilization on: phenological manifestations of carrot seed plants, important traits characterizing the vegetative and generative development of seed plants, seed productivity, seed qualities, chemical composition and preservation of the carrot seeds. An economic evaluation of the different fertilization options in carrot seed production has also been made/done/studied. The experimental results are presented and discussed in detail, both by years and on average for the period, on 144 pages, which is more than 66% of the dissertation content. Based on the conducted research and the summarized results, 15 conclusions are formed.

The chapter "Literary review" is well-written on 24 pages, including the results of previous studies assessing the impact of mineral fertilization on the production and seed production of carrots, as well as on the quality of seeds. The dissertation cites 158 literary sources, 37 in Cyrillic and 121 in Latin, which testifies the good theoretical knowledge of the PhD student.

5. Contributions of the PhD thesis.

Five scientific and four scientific-applied contributions are formulated, as some of the main ones are:

Scientific contributions

✓ For the first time in the conditions of Bulgaria, a stronger influence of the twofold application of mineral fertilizers, compared to the single fertilization, on the development and productivity of the plants in seed production of carrots is established.

✓ A polynomial regression is determined between evenly increasing levels of fertilization with the yield of carrot seeds and their germination, with high coefficients of determination.

✓ It was found that the productivity of carrot seeds and their sowing qualities are formed mainly by the seeds formed in the umbels of the first and second order.

✓ Strong positive correlations are found between vegetative and generative manifestations of the carrot seed plant and seed yield, as well as between the number of umbelaters in an umbel with the number of flowers and the diameter of the umbel.

Scientific and applied contributions

✓ It is emphasized that the best productivity from carrot seeds is obtained with twice application of $N_9P_9K_{10}$ and once use of $N_9P_9K_{20}$, which is recommended to be applied in practice.

✓ It is proved that the carrot seed storage has been improve most strongly as a result of a once application of $N_5P_{19}K_{20}$ as well as twice fertilization with $N_9P_9K_{20}$ and $N_9P_{19}K_{20}$.

✓ It has been found that the viability of carrot seeds can be improved by the applied fertilization methods and regimes, especially after single application of $N_5P_9K_{10}$ and twofold application of $N_9P_9K_{10}$.

6. Critical remarks and recommendations.

My recommendation is, that the PhD student future research work should use studies published predominantly in the last 5-10 years,

It would be more appropriate if the correlation coefficients were presented in separate

tables (correlation matrices).

It would be better to be studied the presence of the dependencies between all analysed traits.

A proposal for future research work is to validate the formulated conclusions to other varieties of carrots, widely used in practice.

7. Published articles and citations.

In connection with the problems developed in the dissertation, a PhD student Alexander Trayanov summarized and presented some of the results in four articles, one of which is in a co-authorship. The three publications of which he is the sole author, are proof that the PhD student has successfully mastered the stages of conducting the research, summarizing the results and presenting them in prestigious scientific journals. One of the articles, of which Alexander Trayanov is an only author, is published in a journal ("Agricultural Science and Technology") indexed in world databases, and the others - in peer-reviewed and refereed editions.

There is no information about the citations presence of the publications.


The abstract is prepared according to the requirements, objectively reflecting the structure and content of the PhD thesis. It is written on 40 pages, including 22 tables and 16 figures.

CONCLUSION:

Based on the learned and applied by the PhD student the various methods of research, the correctly performed experiments, the summaries and the conclusions done, the dissertation submitted meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Rules of the Agricultural university for its application, and this gives me a reason to assess it **POSITIVE**.

I allow myself to offer the respected Scientific Jury also to vote positively and to award Alexander Kirilov Trayanov a full-time PhD student at the Department of Horticulture at the Agricultural university – Plovdiv with the educational and scientific degree of "**Philosophy Doctor**" in the scientific scope of higher education 6. Agricultural sciences and veterinary medicine, professional field 6.1. Plant growing, scientific specialty „Vegetable production “.

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