



PHD THESIS POSITION

Concerning PhD Thesis for awarding an educational and scientific degree
“Doctor” of:

Field of higher education 6 – Agricultural Sciences,
Professional field 6.1 – Crop Science
Scientific specialty – 04.01.04 – Agrochemistry

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**Title of the PhD Thesis: EFFECT OF NITROGEN FERTILIZATION ON
YIELD AND QUALITY OF GRAIN SORGHUM**

Reviewer: *Assoc. Prof. Phd Grozi Delchev Delchev,*

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Field of higher education 6 – Agricultural sciences, Professional orientation 6.1
– Crop science, Scientific specialty – 04.01.15 – Crop science*

A member of a scientific jury appointed with order № РД-16-145/26.02.2021
from the Rector of the Agrarian University

1. Relevance of the problem

Sorghum (*Sorghum bicolor* Moench.) is one of the five most cultivated crops in the world and is grown for various purposes: as food (grain), fodder (grain and biomass), fuel (bioethanol), fiber (paper production)), fermentation (methane production), organic fertilization (use as a by - product). The reaction to nitrogen fertilization of modern sorghum hybrids for grain in Bulgaria has been insufficiently studied. Scientific information related to the general absorption and distribution of dry biomass and essential nutrients in sorghum is quite scarce. Globally, the current indicators for efficient use of sorghum nitrogen are poorly studied, and in Bulgaria there are no such studies. All of the above mentioned determine the studied in the dissertation problems as indispensable.

2. Aim, tasks, hypothesis and methods of research

The aim of this study was to study the influence of nitrogen fertilization on the productivity, quality and efficiency of nitrogen use in sorghum for grain.

For achieving the formulated aims, the following tasks have been completed:

- To establish the influence of different levels of nitrogen nutrition on the formation of dry mass, export of nitrogen, phosphorus and potassium and their distribution in sorghum under conditions of pot experiments.

- To study the productivity and the main quality indicators of sorghum grain depending on nitrogen fertilization.
- To establish the influence of nitrogen fertilization on the accumulation, distribution and reuse of dry biomass, nitrogen and phosphorus in plants.
- To study the main indicators for agronomic, energy and economic efficiency of nitrogen fertilization in sorghum.
- To establish mathematical dependences of productivity, grain quality and basic parameters for nitrogen efficiency in order to optimize nitrogen fertilization in grain sorghum.

3. PhD Thesis structure

The submitted dissertation is written on 208 pages, and is accompanied by abstract with 39 pages. It is structured as required and contains the following sections: Introduction - 2 page; Literature Review - 28 pages; Purpose and tasks - 1 pages; Materials and methods - 18 pages; Results and discussion - 121 pages; Conclusions – 2 pages, Recommendations for practice - 1 page; Contributions – 2 page and Literature cited – 26 pages. The major part is occupied by the PhD student's own research – 60.6 %.

The set field trials were methodologically correct. The results were mathematically processed and significant differences were demonstrated. The results are described in 108 tables and 10 figures.

4. Results, discussion and literature

The influence of the level of nitrogen nutrition on the dry mass and the content of nitrogen, phosphorus and potassium in young sorghum plants have been established. The influence of the level of mineral nutrition on the yield and the content of nitrogen, phosphorus and potassium in sorghum have been established. Data on the productivity of sorghum depending on nitrogen fertilization in the conditions of field fertilization experience are presented. The main quality indicators of sorghum depending on nitrogen fertilization have been studied. The efficiency of nitrogen fertilization in sorghum depending on nitrogen fertilization has been determined. A mineral balance of nitrogen, phosphorus and potassium in sorghum has been made.

The obtained from the study results are summarized in 9 conclusions. The conclusions are realistic, objectively describing the researches interpreting the data included in the dissertation and the abstract.

The literature review is exhaustive and covers a long period of time. The list of cited literature includes 276 literature sources, of which 31 are in Cyrillic and 222 are in Latin.

5. Contributions of the PhD Thesis

Based on the results of the research, 7 applied contributions have been formulated:

- The EC variety Alize stands out as promising in terms of grain and protein yields and has a high harvest index despite years with values differing sharply from long-term values and varying hydrothermal conditions.

- The influence of deficient, optimal and high nitrogen fertilization under different hydrothermal conditions on the productivity and quality of sorghum grain has been established.

- The complex influence of meteorological factors on the formation of biomass, yield and quality of sorghum grain has been established. The obtained data can be used in the development of quantitative assessments of the impact of current and expected agrometeorological conditions on condition and productivity.

- The obtained new information on the concentration, content, distribution, recycling and export of nitrogen, phosphorus, potassium and dry mass and their cost for the formation of 100 kg of grain with a corresponding accumulation of biomass can be used in compiling models for fertilization and process control when growing sorghum for grain.

- New data on physiological efficiency, as well as other indicators of agrochemical efficiency of nitrogen, show that sorghum effectively converts fertilizer nitrogen into grain and grain protein yields, including at low levels of nitrogen nutrition.

- Effective fertilization rates for grain sorghum to increase the profitability of production have been substantiated through economic analysis.

- In order to avoid depletion of the soil with nitrogen, an optimal nitrogen balance during annual fertilization in the cultivation of sorghum for grain is created by applying a moderate nitrogen norm of 18 kg N/da. The data indicate that a fertilizer rate of 5 kg P₂O₅/da is insufficient to maintain a positive soil phosphorus balance.

6. Critical notes and questions

Some technical errors in the text and tables were made in the design of the thesis and the abstract. These errors are insignificant and do not reduce the value of the thesis.

7. Published scientific papers and cites

Three scientific publications have been presented in connection with the dissertation. They are written in English language, and have been published abroad. One of the publications is independent, and in the other one the PhD student is being the first author.

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

CONCLUSION:

On the basis of the various methods of research learned and applied by the PhD student, the correctly performed experiments, the summaries made and the conclusions, I consider that the presented dissertation meets the requirements of the law for the development of the academic staff and the regulations of the Agricultural University, which gives me reason to evaluate it as **POSITIVE**.

I allow myself to offer the honorable Scientific Jury also to vote positively and to award **Ivan Dimitrov Velinov** the educational and scientific degree "Doctor" in scientific specialty Agrochemistry 04.01.04, professional field 6.1 – Crop Science, in field of higher education 6 - Agricultural Sciences.

Date: 15.04.2021

Plovdiv

REVIEWER:



(Assoc. Prof. PhD Grozi Delchev)