



REVIEW

on dissertation work for obtaining the educational and scientific degree "doctor" in: field of higher education 6. Agrarian sciences and veterinary medicine, professional field: 6.1 Crop science, scientific specialty: Crop science

Author of the dissertation: **Rumyana Georgieva Georgieva** regular PhD student at the Department of Crop Science at the Agricultural University, Plovdiv.

Thesis topic: "Variety specificity of triticale (x *Triticosecale* Wittmack) when treated with plant stimulants under different soil nutrition regime".

Reviewer: Prof. Dr. Radka Veleva Ivanova, Agricultural University, Plovdiv. Crop Science Department, professional field: Crop science, scientific specialty: Crop science, appointed from the Rector of the Agricultural university as a member of the Scientific Jury with Order No. RD-16-1125 / 24.10.2019.

1. Short introduction of the applicant.

Rumyana Georgieva Georgieva was born on 23.02.1988 r. in Haskovo. She completed her secondary education in 2007 at the Geo Milev language school, Dobrich, with first foreign language german and second, english. In 2011 she graduated Agronomy at the Agricultural University of Plovdiv, and in 2013 she completed her Master's degree in Plant protection at the University of Applied Science and Applied Resources BOCU in Vienna. After completing her master's degree, in order to further her qualification Rumyana Georgieva practiced at the Food Safety Agency AGES, Vienna, Austria.

After returning to Bulgaria she worked as an agronomist at SGS Bulgaria, Varna.

From 2016 to 2019, she is a regular PhD student at the Department of Crop Science.

During her doctoral studies Rumyana Georgieva fulfilled the tasks included in the individual curriculum and mastered the training modules „Statistical software in agricultural sciences and practices”, Agricultural university – Plovdiv,(2016); „Data base”, Agricultural university – Plovdiv, (2018); „Teaching methodology” Agricultural university – Plovdiv, (2018); and „Processing of experimental data “,Agricultural university – Plovdiv, (2019). She successfully took the doctoral exam. The doctoral student has very good ability in german (level C1), english (level B2), and spanish (level A1).

Rumyana Georgieva also has the necessary computer literacy, uses a wide range of software products *Word*, *Excel*, *Power Point*; and statistical processing programs: *SPSS 19.0*, *Internet*/.

2. Relevance of the problem.

Triticale is an artificial-made cereal crop along the path of hybridization between wheat and rye. This crop is suitable for growing under different soil and climatic conditions, including areas with poorer and more acidic soils. It combines rapid growth; complex resistance to disease, drought and cold; cultivation in short monoculture; high productivity and grain quality.

Triticale grain is used mainly for the production of concentrated feed, but in recent years, thanks to the selection of new varieties, characterized by high nutritional value and good baking qualities, the culture is gaining popularity as a raw material for the food industry.

Triticale grain contains 1-1.5 to 3-4 more digestible protein than wheat and rye, more fiber, phospholipids, polyunsaturated fatty acids, enzymes, vitamins and essential amino acids such as lysine and tryptophan, with easier carbohydrate and protein digestibility, compared to wheat. Despite the higher protein content of triticale grains, the amount of gluten is significantly lower and of a different quality compared to that of wheat. Therefore, triticale can successfully replace common wheat in the preparation of dietary foods for people with intolerance to wheat gluten, overweight and diabetics /for bread, noodles, cookies, biscuits, etc. /.

In recent years, there has been an increased interest in the use of triticale for biogas production.

Namely for this reason the doctoral student is aware that the crop will find a growing place in our agriculture and offers ways to further increase of the productivity and quality of triticale, through balanced fertilization, relevant with the characteristics of the soil, combined with leaf fertilization and the varietal needs of the crop.

The limited developments in this area make the topic of the dissertation up-to-date, and the study for triticale conducted in the Plovdiv region is one of the few in the country.

3. Purpose, tasks, hypotheses and methods of research.

The purpose of the study is formulated clearly and precisely, namely, to establish the influence of plant stimulants on some quantitative and qualitative indicators of triticale varieties under different soil nutrition.

The purpose is achieved through the implementation of 4 main tasks::

- To study the growth and phenological development of triticale, to determine the biomass accumulation and the duration of the interphase periods depending on the variety, soil nutritional regime and treatment with plant stimulants.

- To study the effect of the treatment with the plant stimulants VitaferAlgi and VitaferGreen on the dynamics of plant growth, grain yield and its components under different soil nutritional regime.

- To determine the chemical composition and energy productivity of the grain by the varieties Kolorit, Musala and Trismart under conditions of different soil nutritional regime depending on the effect of the treatment with plant stimulants.

- To study the physical and chemical properties of the grain under different nutritional regime of the soil by triticale varieties depending on the treatment with plant stimulants.

The experiment was performed methodologically correctly, for three years, at the educational and implementational base of the Crop Science Department at the Agricultural University - Plovdiv. The study included two varieties of triticale selected in different regions of the country Musala and Trismart, using the Kolorit variety as a standard.

The plants have been grown at two levels of soil nutrition /N6P5K2, N12P10K4 /. They have been treated twice with two growth stimulants /VitaferAlgi and Vitafer Green/.

A large number of indicators have been monitored and reported: biological, biometric, productive, physical, chemical, as the energy nutrition of the grain.

In the course of the research the doctoral student is acquainted with a number of methods, soil and chemical analyzes, as well as programs for mathematical processing of the obtained results, SPSS and "BIOSTAT©".

4. Visualization and presentation of the results obtained.

In terms of composition, the thesis is structured correctly and consistently according to the traditional scheme. The results of the study are presented on 175 pages, of which 53 are tables and 9 figures. The research data are summarized in tables and graphs, which shows the ability of the PhD student to systematize and illustrate scientific information.

5. Discussion of results and literature used.

On the topic has been made a detailed and immersed literature review, outlining the views of a number of our and foreign researches on the described problem.

There have been cited 248 authors, 26 of them in cyrillic and 222 in latin.

A complete soil and agro-meteorological characteristic of the area in which the study was conducted, namely, the experimental field of the Crop Science Department at the Agricultural University-Plovdiv, has been made.

The main section "Results and Discussion" presents extensive experimental material obtained from field experiments and laboratory analyzes.

On the basis of the obtained results the doctoral student formulates 11 conclusions, the more important of which can be specified as follows:

- For the conditions of the Plovdiv region Musala variety has the shortest growing season (average 109 days and temperature sum of 1927°C), followed by the standard (118 days) and Trismart variety (121 days). Fertilization rates and

treatment with the plant stimulants VitaferAlgi and VitaferGreen do not affect the duration of the growing period.

- In the case of short-term negative temperatures, the varieties show good winter hardiness during the first year of testing. In terms of logging, the Kolorit and Trismart varieties are more resistant than the Musala variety.

- At the higher level of fertilization, the Trismart variety is distinguished with the highest tillering rate. The treatment with the plant stimulants VitaferAlgi and VitaferGreen increases the number of stems per unit area between 3% and 8% for the lower and higher fertilization rates. The same tendency is observed in regard to the rate of productive tillering.

- The most intensive plant growth by the varieties Musala and Trismart was observed at the higher fertilization level in combination with the VitaferGreen treatment, while by Kolorit variety, the treatment with VitaferAlgi achieved the best result. By this variety, the higher fertilization rate decreases the specific growth force by 13-15% compared to the lower fertilization level.

- When analyzing the results obtained regarding the biological productivity of the crop, the doctoral student found, that by the three varieties, the higher fertilization rate increases the parameter with 9%. As a result of the treatment with the plant stimulants VitaferAlgi and VitaferGreen the absolutely dry mass grows by 8% over the untreated variant.

- Of particular interest are studies related to the basic structural elements of the yield. The largest number of grains per spike produce the varieties Musala and Trismart (62 grains), followed by the standard (60 grains). By the Kolorit variety, the highest grain mass of one spike was registered by the variant treated with the higher fertilization rate and the stimulant VitaferAlgi (2.81 g). By the Musala and Trismart varieties, the treatment with VitaferGreen leads to the highest values of this index, of 2.91 g and 2.74 g.

- For the conditions of the Plovdiv region, in the years of the study the highest grain yield was obtained from Musala variety (509.01 kg/da), followed by the standard and the Kolorit variety (450.12 kg/da). The lowest yield was recorded by the Trismart variety (415.67 kg/da).

- The values of the indicator mass per 1000 grains by Trismart variety decrease because of the higher rate of fertilization and treatment with plant stimulants, while by the other two varieties the parameter increase as a result from the same treatment. The test weight of the grains is not affected by the fertilization and the treatment with plant stimulants.

- Chemical analysis of protein content shows that higher fertilization rates have been shown to increase its amount. Treatment of plants with the stimulator VitaferGreen increase the amount of crude protein by 1.07% and with VitaferAlgi by 0.69%. Trismart variety has the lowest percentage of crude protein in the grain (9.15%). Between the amount of crude protein and non-nitrogen extracted compounds is determined an inverse relationship.

- The use of plant stimulants at both fertilizer levels increases the gross

energy. At higher fertilization rates and as a result of treatments with plant stimulants, the yield of metabolic energy decreases. By the Trismart variety, the higher fertilization rates and VitaferAlgi treatments help to increase the values of NEL and NEG.

6. Contributions to the thesis.

Based on the experimental work done and the results obtained, the PhD student Romyana Georgieva formulates the following contributions:

I. Scientific - theoretical contributions:

1. Varietal differences in the phenological development of Musala, Trismart and Kolorit varieties have been established for the conditions of the Plovdiv region.

2. The differences in the accumulation of absolutely dry mass have been found by the three varieties depending on the fertilization levels and the treatment with plant stimulants.

3. It has been found that the most intensive growth by the Musala and Trismart varieties was observed in the conditions of better soil nutrition and treatment with VitaferGreen, while by the variety Kolorit the treatment with VitaferAlgi achieved the best result.

II. Scientific and applied contributions:

1. The average grain yields of the tested varieties, the variants of fertilization and treatment with plant stimulants in the conditions of the Plovdiv region have been established. The highest yields were recorded by Musala variety (509.01 kg/da).

2. It has been found that the greatest influence on the yield has the factor - fertilization followed by the variety. Treatment with plant stimulants has the weakest effect on the yield.

3. It has been found that the better soil nutrition and treatment with plant stimulants have a positive effect on the structural elements of the yield.

4. Factor fertilizing has been found to have the greatest effect on the amount of crude protein, and proven increase the amount of the protein. The application of VitaferGreen results in a lower increase in the amount of crude protein than the treatment with VitaferAlgi. Trismart variety differs with the lowest percentage of crude protein in the grain.

5. The energy nutrition of the grain has been found.

7. Critical notes and questions.

Regarding the thesis I have a few notes and recommendations to the doctoral student:

- In the section "Material and research methods" it is recommended an outline of the experience and a number of the variants to be included.

- It is a good idea to include the year as a factor in the statistical analysis of the results.

- It is better to end each section with a summary of the data.

- In addition to the obtained results for the future research work the doctoral student should pay more attention when explaining the results obtained and looking for relationships between the different indicators. It is recommended to use the researched literature on the issue and to compare the own data with those of ours and foreign authors.

- It is recommended to make an economic assessment of the results.

To the PhD student I have two questions:

1. How did you choose the stages in which you treated the plants with the stimulants?

2. To what extent will the results of the dissertation work in practice?

Despite the mentioned omissions and the recommendations made, the merits of the dissertation work do not diminish.

8. Published articles and citations.

In connection with the dissertation, the doctoral student presents 4 scientific publications, two of which are co-authored with the supervisor, published in the collection of the 9th International Agricultural Symposium in Bosnia and Herzegovina "Agrosym 2018", and the other two self-published in the *Journal of Mountain Agriculture on the Balkans*.

During the PhD study, Romyana Georgieva also participated in two conferences, one international and one national.

- IX International Agricultural Symposium "Agrosym 2018", Jahorina, 4-7 October 2018, Bosnia and Herzegovina.

- 22nd Scientific Conference with international participation "EcoMountain-2019" on the topic: "*Ecological issues of Mountain Agriculture*" RIMSA-Troyan, 16.05. – 17.05.2019, Troyan

The total number of points is 30 and meets the minimum scientometric requirements for obtaining the educational and scientific Doctor degree in accordance with the Law for the Development of the Academic Staff of Republic Bulgaria and the Regulations of the Agricultural University.

The presented self-report objectively reflects the structure and content of the dissertation.

No article citation has been submitted.

CONCLUSION:

Based on the made analysis of the scientific and applied activity of the doctoral student Romyana Georgieva Georgieva, I consider that she meets the requirements of the Law for the Development of the Academic Staff of Republic Bulgaria and the Regulations of the Agricultural University for the acquisition of the educational and scientific degree "Doctor".

The doctoral student has acquired basic knowledge and skills necessary for conducting of scientific research, researching and summarizing the scientific literature on a specific scientific problem, arranging and conducting of field

experiments, taking into account the results of the performed experiments and chemical analyzes, as well as the most important summarizing the results obtained and the formation of scientifically reasoned conclusions.

During the working process the doctoral student has mastered and applied modern methods for statistical analysis of the results.

All this gives me a reason to evaluate her overall activity **POSITIVELY** and to offer the venerable Scientific Jury also to vote positively and to award **Rumyana Georgieva Georgieva** the educational and scientific degree **Doctor** in scientific specialty Crop Science.

Date: 11.11.2019
Plovdiv

REVIEWER: 
(Prof. Dr. R. Ivanova)