



REVIEW

of doctoral dissertation for awarding the educational and scientific degree of “**Doctor**” in area of higher education: *6. Agrarian sciences and veterinary medicine*; professional field: *6.1. Horticulture*, scientific specialty Horticulture.

Author of the doctoral dissertation: Radko Petrov Hristov - a self-study doctoral student at the Department of Horticulture, Agricultural University of Plovdiv

Topic of the doctoral dissertation: Effect of some foliar treatment products on the grain yield and grain quality of common wheat varieties

Reviewer: Reviewer: Prof. Dr. Dragomir Gospodinov Valchev, Institute of Agriculture in Karnobat, area of higher education: 6. Agrarian sciences and veterinary medicine; professional field: 6.1. Horticulture; scientific specialty 04.01.05. Selection and seed production of cultivated plants, appointed as a member of the scientific jury with Order No RD 16-263/ 14.03.2022 by the Rector of the Agricultural University.

1. Short introduction of the candidate.

Radko Petrov Hristov was born on 15.12.1987 in Yambol. He graduated from Vasil Levski High School with specialty in biology and chemistry. In 2010 he graduated from the Agricultural University - Plovdiv with a bachelor's degree in Plant Protection. In 2012 he graduated from the Agricultural University - Plovdiv with a master's degree in Plant Protection. Since 2019 he has held the position of Product Manager - Wheat and Rapeseed in Bayer, Bulgaria.

2. Relevance of the problem.

Over the last years, a large number of fertilizers for foliar feeding of common wheat have been mass-produced and marketed. Foliar nutrition is especially important in the case of stress (caused, for example, by low temperatures, hail, drought, etc.) or in case of deficiency in soil of certain nutrients and mainly microelements. It has a complementary and corrective nature, as a component of the overall system of mineral nutrition of plants. Foliar fertilization is recommended as an effective method for stimulating the biological potential of plants. It has been established that foliar fertilizers have a positive effect on grain yield and quality. Plant resistance to low temperatures and drought, as well as production during

storage and transportation increases.

The increased interest in foliar fertilizers in Bulgaria requires further research in this area. In this regard, the topic is extremely dissertable and is of interest to science and practice.

3. Aim, tasks, hypotheses and research methods.

The aim of the study is well defined - to determine the impact of foliar treatment products Plantafol and Bombandier on the yield and grain quality of common wheat varieties Enola, Annapurna, Ginra and Biliana. To achieve this aim, several tasks were set to determine the impact of foliar treatment products on the growth and development of common wheat varieties, to establish the impact of the tested foliar treatment products on the structural elements of yield of common wheat varieties, to establish the impact of the tested products for foliar treatment on the productivity of common wheat varieties, to establish the changes in grain quality indicators (physical and chemical) of common wheat varieties Enola, Annapurna, Ginra and Biliana under the influence of the tested foliar treatment products Plantafol and Bombandier.

4. Visualization and presentation of the obtained results.

The results from the study are presented on 155 pages, organized into 10 sections and include a total of 49 tables, 1 figure, 9 pictures and literature list. In terms of composition the dissertation is correctly and logically organized and follows the traditional structure: Introduction (3 pages), Literature Review (26 pages), Relevance of the Topic (2 pages), Aim and Tasks (1 page), Methods of the Experimental Work (27 pages), Agroclimatic Conditions (7 pages), Results and Discussion (79 pages), Conclusions (3 pages), Contributions (2 page), Literature (12 pages). The tables are well structured and visualize well the statistically and mathematically processed results from the study by all included traits.

5. Discussion of results and used literature.

A detailed literature review was conducted, including 79 authors, of which 3 in Cyrillic and 76 in Latin scripts. Thematically, it corresponds to the problems the dissertation works on. The literature review shows that Radko Hristov is very well informed about the achievements in this field in Bulgaria and abroad. This allows him accurately and objectively to interpret the results obtained over the years of the study.

Comprehensive soil and agroclimatic characterization was made for the region where the experimental work was performed - the training and experimental fields of the Horticulture Department at the Agricultural University of Plovdiv. The main section, Results and Discussion, presents extensive experimental material obtained from conducted field research and physiological and laboratory analyses.

On the basis of the obtained results the doctoral student established that:

In terms of phenological development, the tested varieties of common wheat did not differ significantly in length of a growing season. The reason for this is that all four varieties are medium early in maturing and ripen almost simultaneously under the same climatic conditions. The interphase period between stem elongation and ear emergence was longest for the Annapurna variety (30 days), followed by the Ginra and Biliiana varieties (29 days) and the Enola variety (27 days).

Ginra variety with 441 stems/m² had the highest number of productive tillers, followed by varieties Enola 434 stems/m², Annapurna 431 stems/m² and Biliiana with 419 stems/m². The applied foliar feeding products had a positive effect on the structural elements of yield, both alone and combined.

The better development of the tested varieties of common wheat treated with the studied foliar treatment products (alone and combined) compared to the accepted controls B₀ and B₁ was proven by statistically significant differences in terms of structural elements of yield: spike length, number of spikelets per spike, number of grains per spike, grain weight per spike, which determine the economic productivity of the variety .

Radko Hristov found proven differences between grain yields in the tested varieties of common wheat, as reported on average for the study period in the treated variants, alone and combined, compared to controls B₀ and B₁.

In the complex impact assessment of the variety and foliar feeding factors, the doctoral student established that the variety most strongly influenced by the applied foliar treatment products was Annapurna (A₂). With the other varieties, the variants to which Bombandier (B₃) was applied alone and combined (B₄) also showed a proven higher yield. Significantly lower yields, regardless of the used foliar products, were reported for common wheat variety Ginra (A₃).

The greatest 1000-grain weight in all four tested varieties of common wheat was reported in the combined application of foliar preparations Plantafol and Bombandier (B₄). The second and third place in the hierarchy were occupied by the variants treated with Bombandier (B₃) and Plantafol (B₂).

In variety Enola (A₁) was demonstrated the positive effect on the hectoliter mass by alone application of Bombandier. In variety Annapurna (A₂) it was found that the combined application of the preparations had a significant effect on the readings of hectolitre mass. Higher values of hectolitre mass in Ginra variety (A₃) were reported for both alone and combined application of foliar treatment products. In variety Biliiana (A₄) only the difference between the combined effect of the studied factors compared to the two controls was proven with a significance level P 5%.

The doctoral student found that the rate of photosynthesis increased in

common wheat varieties Enola and Annapurna, and the highest values compared to the control were obtained after the combined variety application of Plantafol and Bombandier to variety Annapurna (31.4%). In variety Ginra, alone application of Plantafol increased the photosynthetic activity (5.3%), whereas in Biliana the highest values compared to the control were obtained after alone application of Bomnardier (32.4%), as well as in combination with Plantafol (20 %).

Transpiration was found to increase in Enola and Annapurna as a result of the tested preparations, while with Ginra was observed a decrease in transpiration in the variants treated with Plantafol, Bombandier, or combined. In Biliana, transpiration was reduced only in variants Bombandier and Plantafol + Bombandier.

In variety Enola there was reported an increase in the content of nitrogen, proteins and gluten compared to the control after treatment with Plantafol, as well as after the combination Plantafol + Bombandier. With the Annapurna variety, a positive effect on the content of the same indicators was observed when treated with Bombandier alone and combined with Plantafol. With Ginra, the application of Plantafol and Bombandier alone and combined also led to an increase in the content of nitrogen, proteins and gluten. With Biliana, alone application of Plantafol and combined with Bombandier also led to an increase in the content of nitrogen, proteins and gluten.

6. Contributions of the doctoral dissertation.

On the basis of the conducted experimental work and obtained results Radko Hristov formulates his contributions as follows:

Scientific-theoretical contributions:

1. The effect of foliar treatment products Plantafol and Bombandier on the growth and development of common wheat varieties Enola, Annapurna, Ginra and Biliana was established.
2. The effect of the tested products for foliar treatment Plantafol and Bombandier on the structural elements of yield of common wheat varieties Enola, Annapurna, Ginra and Biliana was established.
3. The effect of the tested products for foliar treatment Plantafol and Bombandier on the productivity of common wheat varieties Enola, Annapurna, Ginra and Biliana was established.
4. The changes in the quality indicators of grain (physical and chemical) of common wheat varieties Enola, Annapurna, Ginra and Biliana as affected by the tested foliar treatment products Plantafol and Bombandier were established.

Applied science contributions

1. The effect of foliar treatment products Plantafol and Bombandier in the tested rates on wheat varieties: Enola, Annapurna, Ginra and Biliana was established.

2. The productivity of common wheat varieties: Enola, Annapurna, Ginra and Biliana was established as affected by the alone and combined application of the tested products for foliar treatment Plantafol and Bombandier.

3. The positive effect of foliar treatment products Plantafol and Bombandier was proven, both in alone and combined treatment, on the studied indicators, whose values were higher compared to the untreated controls.

4. The optimal combinations were determined between the tested common wheat variety and the applied products for foliar treatment Plantafol and Bombandier depending on its biological features and weather conditions during the growing period.

5. Under this cultivation regime, wheat cannot reach its genetic potential for gluten formation, which changes the area of production.

6. The results of the conducted study make it possible to apply the products for foliar treatment Plantafol and Bombandier in the cultivation technology for the tested varieties of common wheat Enola, Annapurna, Ginra and Biliana

7. Critical notes and questions

Some mistakes and inaccuracies can be seen in the dissertation:

There are typographical errors on pages 5, 14, 17, 18, 44, 141, etc.

I have the following questions:

How does treating plants with Plantafol in the tillering phase increase the seed germination rate?

Are the data on the biological and economic traits of Annapurna taken from the Executive Agency of Variety Testing, Field Inspection and Seed Control?

Can foliar fertilization on wheat replace soil fertilization?

These critical notes in no way diminish the contributions of the dissertation, but aim to improve the future work of Radko Hristov.

8. Published articles and citations.

Radko Hristov submitted five scientific and two popular science publications related to the dissertation. The scientific articles were published in *Journal of Mountain Agriculture on the Balkans, Scientific Papers. Series A. Agronomy and Научни трудове на Съюза на учените в България – Пловдив (Scientific Papers of the Union of Scientists in Bulgaria – Plovdiv)*. The doctoral student is the first author of all the articles. No document was submitted on the cited articles.

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

CONCLUSION:

On the basis of the various methods of research learned and applied by the doctoral student, the correctly performed experiments, the summaries and conclusions made, I consider that the presented dissertation meets the requirements of the Development of Academic Staff in the Republic of Bulgaria Act and the regulations of the Agricultural University for its application, which gives me reason to evaluate it **FAVOURABLY**.

I allow myself to suggest that the honourable Scientific Jury also vote favourably and award Radko Hristov the educational and scientific degree of "Doctor" in scientific specialty Horticulture.

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Karnobat

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