

## REVIEW

of the official reviewer,

**ANDRIY BUTENKO**

for the dissertation of

**Tao Ye «Plant-breeding Value of Wheat is Depending on the Functional Features of Powdery Mildew Phytopathogens»,**

submitted for a for a Doctor Philosophy Degree (PhD)

Field of study: 20 «Agricultural sciences and food», specialty 201 «Agronomy»

**Relevance of the dissertation topic.** The common wheat is hexaploid wheat. Common wheat (*Triticum aestivum* L) is one of the most important food crops in the world. Wheat provides about a fifth of our food calories and protein. According to FAO data, from 2014 to 2016, the global average wheat planting area was 220 million hm<sup>2</sup>, the yield per unit area was 3,323 kg/hm<sup>2</sup>, and the total output was 738 million tons. China's annual wheat output accounts for about 17 percent of the global total, making it the world's largest wheat producer. China's wheat planting area is widely distributed throughout the country. In recent years, the planting area has stabilized at about 24 million hm<sup>2</sup>, ranking first in the world. Wheat powdery mildew caused by *Blumeria graminis* F. sp. *tritici* is one of the increasingly serious fungal diseases in wheat production in China and other countries. Powdery mildew is a kind of living parasitic fungi, which has the characteristics of short life cycle, easy long-distance transmission of spores and strong sexual recombination ability. After powdery mildew infection, the wheat plant is easy to lay down, the leaf is dry, the death rate is fast, seriously affects the normal growth and development of wheat. The development of wheat varieties with the ability to resistance to powdery mildew can effectively increase resistance to powdery mildew, fundamentally solving the problem of its resistant variety by plants. A promising approach in modern breeding in the combination of molecular genetic developments with traditional breeding methods.

**Scientific novelty of the results.** The scientific novelty lies in solving an important scientific problem of creating and evaluating the source material of winter wheat with a resistance to powdery mildew.

For the first time. Discovering new resistance genes and analyzing their molecular mechanism is the key to control powdery mildew. The purpose of this study was to clone the *TaGDSL* gene from wheat, explore its role in powdery mildew resistance by using modern molecular biological methods, and analyze its function, so as to provide theoretical basis for the creation of wheat powdery mildew resistance varieties.

It was improved. the scheme of evaluation of selection material of winter

wheat on the indicator of resistance to powdery mildew.

The issue of improving the quality of the crop by controlling certain breeding traits has been further developed.

**Relationship of the work to scientific programs, plans, topics.** The research was carried out in accordance with the thematic plans of research works of the National Natural Science Foundation of China in the framework of the topic «Function of Tamlo-B1 interacting protein TaANKs of powdery mildew gene in wheat» (Nos. 31901538, 202001-202212).

**Practical significance of the results.** Based on the results of the research, a working collection of winter wheat samples with resisting to powdery mildew was transferred to the laboratory of selection and seed production of Henan Grain Crop Genome Editing Engineering Technology Research Center of China; Materials of study are included in educational programs on disciplines of educational level of Bachelor of 4 Agronomy at Henan Institute of Science and Technology. We identified a gene, *TaGDSL*, that plays an important role in the resistance to powdery mildew. This gene is induced by powdery mildew and plays an important role in wheat resistance to powdery mildew.

**The main results obtained personally by the applicant.** The authors identified the adult disease resistance of powdery mildew of 86 new wheat line. The experiment was conducted at the Wheat Test Base in Henan Province in 2020-2022. The test materials were from 45 relevant breeding units in China. There are 86 new wheat line. The test carried out powdery mildew resistance identification. And analyzing the source of disease resistance genes. Using pedigree analysis and parental resistance to disease to derive disease resistance genes for varieties that are resistant to disease. The mechanisms of powdery mildew resistance in winter wheat plants were investigated at the molecular and genetic level.

An analysis of the plagiarism check report for the presence of textual borrowings (Strike Plagiarisma Program) was done and it was proved that the dissertation work of Tao Ye "Plant-breeding Value of Wheat is Depending on the Functional Features of Powdery Mildew Phytopathogens" is the result of the applicant independent research and does not contain elements of plagiarism and borrowing in accordance with the resolution of the Cabinet of Ministres of Ukraine dated 12.01.2022 No. 44, paragraph 9. The used ideas, results and texts of other authors have a link to the corresponding source.

**Number of scientific publications.** The results of the dissertation research are presented in nine publications, of which nine are articles (three in specialized Ukrainian publications of the "B" category, and four in publications included in the international scientometric database Scopus, two in specialized scientific journals

of the EU). The results were also published in four abstracts of international scientific conferences. The materials of the publications reflect the main provisions of the dissertation.

**The dissertation is presented** on 145 pages of typewritten text, includes 7 tables, 41 figures. It consists of an annotation, an introduction, 4 chapters, conclusions, proposals for breeding and 4 appendices. The list of literature includes 176 items.

**Remarks for the thesis content.** Positively evaluating the work, it is necessary to point out the presence of certain discussion points, provisions that require additional arguments and comments of a technical nature:

1. Field research methods need to be further detailed. In subsection 2.1.2 "Methods of research", it would be desirable to indicate the technological methods of growing winter wheat in experiments, namely: design of experiments, phenological observations, records and evaluations, harvesting according to generally accepted methods, describe the size of the plots, the predecessor, the distance between rows, placement of repetitions, etc.

2. In Chapter 2, item 2.1.3. "The grade of the disease was 0-9, in which grade 0 was Immunity, grade 1-2 was High resistance. Grade 3-4 was Medium resistance, grade 5-6 was Medium susceptible, grade 7-8 was High susceptible, and grade 9 was Extremely susceptible (Fig. 2.2)". How are the characteristics of each grade of powdery mildew defined?

3. Research methods are formed in a general way. It is desirable to indicate the used scientific research methods and to note exactly which phenomena and parameters were studied by each of the methods; to justify the choice of methods that ensure the reliability of the obtained results and conclusions..

4. In chapter 4, Table 4.1. it is noted that the grain physical properties. However, there is no clear explanation of this phenomenon in the text of the conclusion.

5. There are typographical and stylistic errors in the text.

These remarks do not diminish the scientific value of the dissertation and some of them only reflect the reviewer's scientific position, which can also serve as a reason for discussion.

**General conclusion.** To sum it up, the dissertation of Tao Ye «Plant-breeding Value of Wheat is Depending on the Functional Features of Powdery Mildew Phytopathogens», submitted for defense to the specialized academic council for the degree of Doctor of Philosophy in the field of knowledge 20 «Agricultural sciences and food» in the specialty of 201 «Agronomy» in terms of relevance, scientific and theoretical level, main results of validity, provisions and results published in professional publications, novelty of the formulation and

practical significance meets the requirements of the order Ministry of Education and Science of Ukraine No. 40, January 12, 2017 «On approval of requirements for the preparation of a dissertation» and Resolution of the Cabinet of Ministers of Ukraine of 12-th January, 2022, No. 44 «On approval of the Procedure for awarding the degree of Doctor of Philosophy and cancellation of the decision of the one-time specialized academic council of the institution of higher education, scientific institution on awarding the degree of Doctor of Philosophy» with changes introduced in accordance with Resolution of the Cabinet of Ministers, No. 341 dated 03/21/2022. Tao Ye deserves to be awarded the scientific degree of Doctor of Philosophy in the specialty of 201 «Agronomy».

**Official Reviewer:**

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