

REVIEW

of the Official Reviewer **Viktor Demenko** Candidate of Agricultural Sciences, Associate Professor of the Department of Plant Protection for PhD Thesis **Shunxiao Liu** «*Molecular mechanism of reproductive isolation of Bemisia tabaci species complex is for plant protection and quarantine services*», Submitted for a Scientific Degree of a Doctor of Philosophy Field of Study: 20 – Agricultural Sciences and Food Specialty 202 – Plant Protection and Quarantine

On the basis of a detailed study of the dissertation work of Shunxiao Liu on the topic "Molecular mechanism of reproductive isolation of *Bemisia tabaci* species complex is for plant protection and quarantine services" and his scientific works published on the topic of the study, I state the following:

Relevance of the research topic. *Bemisia tabaci* (Gennadius) is one of the main pests in tropical, subtropical and adjacent temperate regions. Heat shock proteins (HSPs) are a group of proteins produced by cells under the induction of stressors, especially high temperature, to help each cell maintain normal physiological activities. In this study, RACE technology and insect ecology technology were used to reveal the effects of different temperatures on the expression of heat shock protein and the growth and development characteristics of *B. tabaci*. The control effects of different chemical treatments on *B. tabaci* were clarified.

General characteristics of work. The dissertation is presented on 139 pages of computer text, including 106 pages of the main text. The work is illustrated with 6 tables and 22 figures. The manuscript is structured according to a scheme that is

traditional for natural science research, with an abstract, eight chapters, conclusions, a general list of references and appendices.

The Chapter 1 is devoted to highlighting the purpose, objectives, and technical route of research on *B. tabaci*.

The Chapter 2 contains the author's experiments and observations with reference to the used methods. This indicates the planning of the research and the methodological validity of the obtained experimental results.

The Chapter 3 illustrates research materials and methods, as well as reagent preparation and instrument sterilization.

The chapter 4 confirms the sequenced *B. tabaci* hsf1 and the original conserved gene sequence were compared and verified by DNAMAN, and the similarity of the results was about 60.55%, which satisfies the RT-PCR primer design and can be used for quantitative detection.

The Chapter 5 presents the full-length cDNA of *B. tabaci* hsp60 was obtained by homologous cloning and electronic splicing clone verification technology.

The Chapter 6 can be seen that both genes have obvious expression levels at low temperature, but no significant expression at high temperature. *B. tabaci* have a wide temperature ecological range, and it can be seen that the expression of hsf1 is positively correlated with the expression of hsp60, and they are induced at low temperature at the same time, which can clearly show that the hsp60 gene plays a protective role through the hsf1 regulatory factors. It provides a reference for studying the population expansion of other invasive species.

The Chapter 7 shows we can choose 20% Mevirpirazone suspension

concentrate, which can be used in combination with 22.4% Spirotetramat suspension concentrate and 5% Diprofen dispersible concentrate to achieve better control effect.

The digital and text content of the named sections corresponds to their title, is consistent with the purpose and tasks of research defined by the author. According to the nature of the research, the structure and content of the sections, as well as the conclusions, the work fully corresponds to the specialty 202 - Plants Protection and Quarantine.

The validity and reliability of the scientific provisions of the dissertation.

Based on the relevance of the topic, the author set a goal and formulated the main material and expand the theoretical basis of *Bemisia tabaci*. Scientific provisions, conclusions and recommendations, which are given in the dissertation work, are reliable, new and properly scientifically substantiated. The reliability of research results is confirmed by the use of mathematical statistics methods, the introduction of research results into production, and sufficient coverage of the results in scientific publications and publication at international scientific conferences. The main scientific results obtained by the author independently based on research results are reflected in points of conclusions.

Scientific novelty of the obtained results. According to the results of the author's work for the first time:

The sequenced *B. tabaci* *hsf1* and the original conserved gene sequence were compared and verified by DNAMAN, and the similarity of the results was about 60.55%, which satisfies the RT-PCR primer design and can be used for quantitative

detection.

The full-length cDNA has a 1372 bp open reading frame (ORF), which can encode 608 amino acids, and its predicted isoelectric point is 9.28, the protein molecular weight is about 49446 Da. The 5'UTR of the gene contains 145 bp, and the 3'UTR contains 840 bp.

According to the comparison of Hsf1 regulatory factor and hsp60 gene expression levels in *B. tabaci* at different temperatures, it can be seen that both genes have obvious expression levels at low temperature, but no significant expression at high temperature. Analyzing the adaptability of *B. tabaci* biotype B to high temperature stress is also important for predicting the geographical distribution of *B. tabaci* population and formulating effective control strategies.

Compared with chemical control, screening effective aerial enemy for biocontrol of *B. tabaci* in different areas is an important method for effective control of *B. tabaci*.

Practical significance of the results. The results of this study provide a basis for the study of *B. tabaci* stress resistance adaptation, and further verify that the conserved functional gene heat shock protein can be used as one of the means to study the development of biological systems. Studying the production and changing laws of HSP in *B. tabaci* can understand the relationship between its growth and development and the changes of various influencing factors, and provide new ideas for comprehensive control in agricultural production. China has established a quantitative PCR method, and quantitative detection of imported products has been carried out at some ports.

Presentation of the main results of the dissertation work. Based on the results of the dissertation work, 13 scientific works were published, including 2 publications in professional journals of Ukraine, 3 publications in international journals (the United States and Singapore), 3 publications in the scientific edition of the database Scopus and WoS, 5 abstracts of reports at scientific conferences.

Information on compliance with academic integrity. According to the expert opinion on the check for the presence of academic plagiarism, carried out with the help of the license program Strike Plagiarizm, the level of similarity meets the current requirements. Borrowings found in the work are legitimate and do not constitute plagiarism. The results submitted to the defense are new and properly substantiated.

Discussion clauses and remarks. With an overall positive evaluation of the dissertation, it is necessary to point out the presence in the text of the work of certain debatable clauses, as well as clauses that require additional argumentation:

- The effect of temperature on the development, survival, and reproduction of *Bemisia tabaci* should be revealed in more detail.
- *Bemisia tabaci* (Gennadius) is a worldwide pest, therefore an important task is to vigorously develop natural enemies to control *B. tabaci* and reduce the use of insecticides.
- In chapter 7, subsection 7.4. it is noted that in the presence of biological control of *Bemisia tabaci*. However, there is no clear explanation of this phenomenon in the text of the chapter or in the conclusions.
- It is advisable to give a broader analysis of the obtained data in figures s

6.1-6.5, which would contribute to a better presentation and perception of research results.

- 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 conclusions. The dissertation work of Shunxiao Liu "Molecular mechanism of reproductive isolation of *Bemisia tabaci* species complex is for plant protection and quarantine services", submitted for defense to the specialized academic council for obtaining the degree of Doctor of Philosophy in the field of knowledge 20 - "Agricultural sciences and food" in the specialty 202 - "Plants Protection and Quarantine" in terms of its relevance, scientific and theoretical level, main results of validity, main provisions and results published in professional publications, and novelty of the setting and practical significance meets the requirements of the order of the Ministry of Education and Science of Ukraine No.40 dated January 12, 2017 "On approval of requirements for registration dissertation" and the Decree of the Cabinet of Ministers of Ukraine dated January 12, 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 higher educational institution, scientific institution on awarding the degree of "Doctor of Philosophy" with amendments made according to the Resolution of the Cabinet of Ministers No.341 dated 03.21.2022.

On the basis of the above, I suppose that Shunxiao Liu deserves to be awarded a scientific degree of Doctor of Philosophy in the specialty 202 "Plants Protection and Quarantine" of the field of knowledge 20 – Agrarian sciences and food.

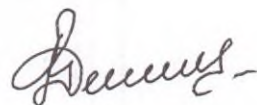
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