

REVIEW

of the Official Opponent **Serhii Stankevych** Candidate of Agricultural Sciences, Associate Professor, Head of the Litvinov Department of Zoology, Entomology, Phytopathology, Integrated Plant Protection and Quarantine for PhD Thesis of **Shunxiao Liu** "*Molecular Mechanism of Reproductive Isolation of Bemisia Tabaci Species Complex is for Plant Protection and Quarantine Services*"

Submitted for a Doctor Philosophy Degree (PhD) Field of Study: 20 – Agricultural Sciences and Food, Specialty: 202 – Plants Protection and Quarantine

Relevance and justification of the research topic. *B. tabaci*, also known as cotton whitefly and sweet potato whitefly, belonging to *Homoptera*, *Aleyrodidae*, and *Bemisia*, is one of the major pests in tropical and subtropical regions. In recent years, with the rapid development of greenhouses and facility horticulture in China, *B. tabaci* has occurred in large numbers in some areas. With the development of modern agriculture, we must understand the occurrence law of *B. tabaci* and predict the damage degree of *B. tabaci* to ensure high yield, high quality and high efficiency of agriculture. Develop scientific and effective control measures, and carry out the prevention and control of *B. tabaci* in a timely manner.

Connection of the research with scientific programs, plans, and topics. This paper is a scientific plan of research work on the comprehensive management of harmful organisms in Henan Institute of Science and Technology. The studies of Shunxiao Liu were carried out in accordance with the thematic plans of scientific research works of the Sumy National Agrarian University for 2019-2022: «Molecular

mechanism of reproductive isolation of *Bemisia tabaci* species complex is for plant protection and quarantine services». Shunxiao Liu is a executor of individual tasks of the specified topics.

Scientific novelty of the obtained results. For the first time, the author developed and tested 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*.

The practical significance of the obtained 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. Research indicates that we can choose 20% mefenproper suspending agent, which is used in conjunction with 22.4% spirotetramat suspending agent and 5% diprofenac dispersible liquid agent to control *B. tabaci*, which has a good control effect in facility vegetables.

Reliability and approbation of research results. Field research was carried out in accordance with current methods, taking into the temperature tolerance of *B. tabaci* in the study area. Laboratory experiments were conducted in certified laboratories using modern analytical equipment. Primary digital material was mathematically processed. The conclusions made in the work are based on the results of statistically reliable dependencies.

Based on the results of the dissertation work, the author published 13 scientific works, including 2 publications in professional journals of Ukraine, 3 articles in international journals(the United States and Singapore), 3 publication in a scientific publication included in the Scopus and WoS, 5 abstracts of reports at scientific conferences.

According to Clause 8 of the CMU Resolution No. 44 of January 12, 2022, the estimated number of publications in which the results of the dissertation work are highlighted is 1.2.6. The content of articles and theses and the chronology of their

publication correspond to the declared stages of work on the dissertation.

The structure and content of the work. The dissertation has a traditional structure for natural science research. There are 5 separate Chapters that reveal the study level of problem, the research methodology, and the results of field and laboratory experiments. The conclusions drawn correspond to the tasks, the progress of research and intermediate results are highlighted in the relevant chapters.

Chapter 4 is thoroughly presented, 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.

Chapter 5, is rich in information with a detailed scheme of conducting experiments.

Chapter 6 analyse 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.

The presentation of the material of Chapter 7 is successful in the applied aspect of the work. In the Chapter material on the results of testing the created selection material for field control effect of *B. tabaci* is summarized in tabular form. The conclusions of the Chapter are the logical basis of the proposals made by the author.

Taking into account the large volume and significant level of differentiation of the conducted research (laboratory and field), the work contains separate debatable provisions, as well as statements and conclusions that require clarification or additional justification in the process of protection. In the process of analysis with the content of

the dissertation, some editorial flaws were also revealed.

1. Discussion clauses:

- The work is based on reproductive isolation of *Bemisia tabaci* species complex . Why did not another type of *Bemisia tabaci* be added for comprehensive comparison in the experiment ?;
- Why not choose to continuously track the control of *Bemisia tabaci* for two years?

2. Provisions requiring additional comments and explanations:

- The introduction provides information about *Bemisia tabaci*, but it is more correct to use words combinations “*whitefly, Bemisia tabaci*”.
- In the methodology and research results, the author uses the indicator of comparative study on the tolerance of *Bemisia tabaci* to adverse low and high temperatures. How is this approach justified?
- Despite the saturation of the dissertation with the results of laboratory studies, the work does not contain indicators of the effect of humidity on the development and reproduction of *Bemisia tabaci*. Have such studies been conducted and if not, why?

3. Remarks on the design of the text

- As a result of converting the text into PDF format (or other operations with the text), pages 2 of section (-1), some tables and figures in other sections were shifted;
- Some parts of the text in figures of Chaptars 6 and 7 (6.1-6.5; 7.1) have a size of less than 10 pt., which makes it difficult to perceive them.

General conclusion. 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. Based on the above, I believe 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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