

REVIEW

of the Official Reviewer **Olena Osmachko** Candidate of Agricultural Sciences, of the Associate Professor of the Department of Gardening, Park and Forestry 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

1. Relevance 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. At present, *B. tabaci* is widely distributed in more than 90 countries and regions around the world, and is the main pest of cotton, vegetables and garden flowers in many countries. In recent years, with the rapid development of greenhouses and facility horticulture in China, *B. tabaci* has occurred in large numbers in some areas.

2. Connection of thesis with scientific programs, plans, 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.

3. The structure and content of the dissertation. The work contains 6 tables

and 22 figures. The manuscript is structured according to a traditional scheme for natural science research. The structure fully corresponds to the goals and objectives of the research. When forming chapters and subchapters, the author followed the rules of proportionality in presenting general and specific issues.

The first chapter reveals the main normative indicators of dissertation. The title of the work corresponds to the purpose. Headings and content of chapters correspond to the list of tasks and the general direction of research.

The second chapter reviews the distribution, harm, prediction technology, field investigation, and heat shock proteins of *Bemisia tabaci*. The material of the chapter is based on the use of more than 273 scientific sources, most of which were published for the last 10 years.

The third chapter contains data on *B. tabaci* of the research area, and description of the research methods.

The fourth chapter presents gene amplification of HSF1 regulatory factor of *B. tabaci*.

The fifth chapter deals with the study of Full-length sequence analysis of Hsp60 gene of *B. tabaci*.

The sixth chapter presents the result quantitative detection of hsf1 factor and hsp60 gene at different temperatures of *B. tabaci*.

The seventh chapter reveals field control effect of *B. tabaci*.

The conclusions are presented in a logical sequence in accordance with the tasks and structure of the work. Proposals for selection practice take into account the current state of *B. tabaci* and are quite realistic for implementation.

4. Validity and reliability of the scientific provisions of the dissertation.

The validity of the conclusions and the main provisions of the dissertation is ensured by the logical structure of experimental studies performed in accordance with the accepted methods. The correspondence of the methods of *B. tabaci* is confirmed by acts of experiment acceptance (2019-2022). Laboratory studies were performed in the conditions of a certified laboratory. The selected research methods are modern, highly informative and sufficient for adequate achievement of the set tasks. The reliability and logical justification of the conclusions drawn is based on statistically confirmed dependencies.

5. 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*.

6. The practical significance of research and its implementation in practice.

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. The field control test of 10 insecticides against *Bemisia tabaci* on facility vegetables has been successful from October 13 to 20, 2020. Research indicates that we can choose 20% mephenproper 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.

7. Absence (presence) of violation of academic integrity. There are no signs of academic plagiarism, falsification or other violations that could call into question the independent nature of the author's performance of the scientific research presented in the peer-reviewed dissertation work. The text is original, all references to primary sources are made correctly.

The provisions of the dissertation submitted for defense are set out in 13 scientific works, 2 articles - in professional publications of Ukraine, 3 articles in international journals (the United States and Singapore), 3 articles in the international scientometric database Scopus and WoS, 5 theses based on the results of participation in

international scientific conferences. Published scientific works fully reflect the content of the dissertation.

I consider it appropriate to note that the chronology of publications in 2019-2022 corresponds to the stages of work on the dissertation declared by the author.

8. Discussion clauses and remarks on the dissertation. No significant shortcomings were found in the dissertation. The work is designed in accordance with the current requirements, but there are certain comments that need to be paid attention to during the defense:

- In the structure, list and content of the subsections of the second chapter (Chapter 2. Review of the literature), the overview of *Bemisia tabaci* is dominant. The comprehensive control of tobacco whitefly advocates a combination of physical and biological control to protect the ecological environment.;

- The UDC number of the manuscript is too generalized and it does not specify the declared topic.;

- There are inaccuracies in the design of the work (Figure or Fig.), lack of points in the title of subsections p. 80, 81, 84, etc.;

- In conclusions to Chapter 6, it would be desirable to emphasize which growth and development indicators (physiological, morphological) of Evaluating the effects of *Bemisia tabaci* on different temperatures.

9. 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

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 believe that Shunxiao Liu deserves to be awarded the scientific degree of Doctor of Philosophy in specialty 202 "Plants Protection and Quarantine".

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