

## REVIEW

of the Official Opponent **Anna Kryvenko** Doctor of Agricultural Sciences, Professor of the Department of Plant Protection, Genetics and Breeding 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 (PhD) Field of Study: 20 – Agricultural Sciences and Food Specialty 202 – Plant Protection and Quarantine

**Actuality of theme.** The relevance of the topic of the dissertation research lies in the fact that *Bemisia tabaci* (Gennadius) is one of the main pests in tropical, subtropical and adjacent temperate regions. As an invasive organism, researchers at home and abroad have been keen to study the heat resistance of *B. tabaci*. 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.

**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.

**The validity of the scientific statements and conclusions formulated in the dissertation, their reliability and novelty.** The title, purpose and content of the dissertation correspond to the specialty 202 - Plants Protection and Quarantine. The conclusions drawn are based on statistically confirmed results of experimental studies. The list and number of conclusions corresponds to the tasks.

According to the results of the author's work:

1. Through RACE technology, a part of the *hsf1* gene sequence (about 900bp) of *B. tabaci* was amplified.
2. The research results show that high temperature leads to a decrease in the reproductive fitness of *B. tabaci* (reduced egg production), which will affect the survival of the offspring of the population scale.
3. Different high and low temperature had no obvious effect on the expression of Hsp60.
4. Hsp 60 gene plays an induced protective role through Hsf1 regulatory factors. It provides a reference for studying the population expansion of other invasive species.
5. In the field control process, 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. We can select to use in facility vegetables.

**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.

**Evaluation of the content of the dissertation, its completeness, general characteristics of the work and publications of the author.**

The Chapter 4 is devoted to the study of gene amplification of HSF1 regulatory factor. The author has developed more than 200 scientific sources. two articles were prepared and published in a professional publication of Ukraine. According to the results of the analysis of the available scientific literature, a conclusion was made about the perspective and insufficient level of experimental research in this scientific direction.

The Chapter 5, is rich in information with a detailed scheme of conducting experiments. The Chapter contains the full-length cDNA of *B. tabaci* hsp60 was obtained by homologous cloning and electronic splicing clone verification technology. The structuring of the section in accordance with the performed



research deserves attention.

The Chapter 6 presents high temperature stress can reduce the developmental fitness of *B. tabaci*, resulting in reduced survival rate, decreased egg production, reduced proportion of female adults and prolonged developmental duration of *B. tabaci*. The research was conducted in a certified scientific laboratory using modern scientific equipment.

The Chapter 7 shows the purpose of this experiment is to understand the level and development of *B. tabaci* resistance and to provide a basis for rational use of pesticides and delaying the development of *B. tabaci* resistance.

**General comments and discussion provisions regarding the materials of the dissertation work.** Positively evaluating the presented dissertation research, it is appropriate to point out to the author some debatable statements and shortcomings in the design of the work.

1. The second chapter is based mainly on the publications of European, Asia and Chinese researchers. The works of domestic scientists remained underexposed;
2. The main remark about Chapter 3 is the lack of a unified scheme in which the number of selection samples in each individual experiment is indicated;
3. Why were samples with an average (in the collection) level of manifestation of the trait not studied?;
4. Quantitative detection of hsf1 factor and hsp60 gene at different temperatures(Chapter 6) is definitely interesting from a theoretical point

of view. However (in my opinion) this task is currently far from a practical solution;

5. It would be advisable to make the recommendations for field control of *Bemisia tabaci* more detailed, since they reflect the prospect of using the results obtained by the researcher in the further work of author herself and other scientists.

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.** In general, the work makes a positive impression. The direction and list of research are relevant and performed at a high scientific and methodological level. The conclusions drawn contain scientific novelty and expand the theoretical basis for *Bemisia tabaci*. The remarks made are not fundamental, and the identified flaws in the design are quite acceptable for handwritten scientific works. 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 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.

**Official Opponent:**

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Professor of the Department of  
Plant Protection, Genetics and  
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**Anna KRYVENKO**

*Засвідчується*  
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