Opinion

on a dissertation for obtaining the educational and scientific degree "Doctor" in: field of higher education: 6. Agricultural sciences and veterinary medicine, professional field: 6.2 Plant protection, scientific specialty "Entomology".

Author of the dissertation: **Maria Valerieva Hristozova, full time PhD student at the Department of Entomology, Agricultural University, Plovdiv**

Topic of the dissertation: **„Biology and control options of the southern green stink bug *Nezara viridula* (Linnaeus) and the brown marmorated stink bug *Halyomorpha halys* (Stål)(Hemiptera: Pentatomidae)"**

Reviewer: **assoc. prof. Atanaska Stoeva, PhD**, Agricultural University – Plovdiv, field of higher education: 6. Agricultural sciences and veterinary medicine, professional field: 6.2 Plant protection, scientific specialty "Entomology", appointed as a member of the scientific jury by Order No РД-16-1262/06.12.2023 of the Rector of the Agricultural University

1. Relevance of the problem

Climate change and globalization are intensifying the problem of invasive species, in particular invasive pests of crop plants. The global costs of dealing with these species are increasing. The southern green stink bug *Nezara viridula* and the brown marmorated stink bug *Halyomorpha halys* are two invasive pests that accidentally entered the territory of our country, but succeded to spread everywhere and in high population density. In this sense, the chosen topic is relevant, having a direct application in practice.

2. Aims, tasks, hypothesis, research methods

The objective is clearly formulated, and the tasks specify the main moments of the study of the biology and control options of the two invasive species of phytophagous bugs. The in-depth and detailed literature review, as well as the correctly selected research methods, allow the PhD student to formulate and develop the working hypotheses, as well as to make the relevant generalizations and conclusions.

3. Visualization and presentations of the obtained results

The obtained results are presented on 53 pages, which constitutes about 42% of the entire dissertation work. The results are illustrated with 18 tables and 95 original color photographs and figures, correctly labeled and titled. The obtained data are statistically analyzed and competently interpreted.

4. Discussion of the results and used literature

Based on my own impressions, I can claim that the original results obtained are the personal work of the doctoral student. Despite the large volume of factual material, the data is systematized and presented concisely in an understandable form.

The results are grouped into 5 subsections: Host plant preference; Morphological

features of the two invasive pests; Study of biology; Predatory and parasitoid species from natural populations and their regulating capacity; Biological efficacy of PPPs under laboratory conditions. On the basis of 26 types of examined plants, a list of the most preferred of them for the conditions of southern Bulgaria was compiled. For the first time in Bulgaria, under field conditions, it was reported that *N. viridula* develops two generations, and *H. halys* only one.

The research on the natural enemies of the two invasive species is extremely original, as a result of which the doctoral student reported 5 species of parasitoids on *N. viridula*, 4 of which she reported for the first time in Bulgaria on this host, and 5 species on *H. halys*, all of them reported for the first time in our country. The study on the natural entomophagous populations of the two invasive species is extremely original.The doctoral student identified 5 species of parasitoids on N. viridula, 4 of which she reported for the first time in Bulgaria on this host, and 5 species on H. halys, reported for the first time in our country.

Seven biological plant protection products were tested and Preferal was found to have the highest biological efficacy against *N. viridula* nymphs, and NeemAzal and Biopren Plus against *H. halys* nymphs.

The main conclusions of the studies (13 in total) correctly summarize the obtained results. The literature review used 252 sources, of which 1 in Cyrillic and 251 in Latin.

5. Contributions of the dissertation

Scientific contributions

I fully accept the scientific contributions of the dissertation:

- For the first time in the country, different morphological forms of the southern green stink bug are reported, as well as their percentage ratio.
- For the first time in the country, the phenology of *N. viridula* and *H. halys*, the duration of the development stages and the number of generations per year under field conditions were studied.
- Four parasitoids of *N. viridula*, respectively *Trissolcus basalis, Ooencyrtus telenomicida, Ooencyrtus sp. and Trichopoda pennipes* and five parasitoids of *H. halys*, respectively *Trissolcus cultratus, Trissolcus basalis, Anastatus bifasciatus, Ooencyrtus telenomicida* and *Ooencyrtus sp.*, are reported for the first time in Bulgaria.
- The rate of egg parasitism of the southern green stink bug and the brown marmorated stink bug, as well as the rate of parasitism of adults and 5th instar nymphs of the southern green stink bug, was studied for the first time in Bulgaria.
- The biological efficacy of PPPs based on plant extracts and microorganisms, for which there are no previous studies in our country, have been tested against two invasive pests.

Scientific and applied contributions

The obtained results on the biological efficacy of the tested PPPs can find practical application in designing IPM programs. The data on the phenology of the two invasive species, and more specifically on the beginning of the nymph hatching, can be used when choosing the moment for treatment with PPPs - for the southern green stink bug,

it is most suitable after the first ten days of May, and for the brown marmorated stink bug - after mid-June.

5. Critical remarks and questions

I have no critical remarks on the dissertation.

7. Published articles and citations

The doctoral student indicated 1 publication related to the dissertation work, carrying 30 points, thus meeting the requirements. The publication is indexed by Web of Science. There are currently no citations.

The presented Abstractof the dissertation reflects objectively the structure and content of the dissertation work.

CONCLUSION:

Based on the fact that the PhD student has learned and applied various research methods, performed experiments correctly and made relevant generalizations and conclusions, I believe that the presented dissertation meets the requirements of Law for the development of academic staff in the Republic of Bulgaria and the corresponding Regulations of Agricultural University, which gives me reason to evaluate it **POSITIVELY**.

I propose to the honorable Scientific Jury to also vote positively and to award Maria Valerieva Hristozova the educational and scientific degree "Doctor" in the professional field **6.2 Plant protection**, scientific specialty **Entomology**.

Data: 8.02.2024 г.
Plovdiv

Reviewer:
(assoc. prof. Atanaska Stoeva)