# OPINION

**by Prof. Hristina Yakova Kutinkova, PhD**

**Subject: Dissertation work for obtaining the educational and scientific degree "PhD"**

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

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

**Professional field 6.2 "Plant protection"**

**Scientific specialty: "Plant protection" (Entomology)**

**Developed by: Prof. Dr. Hristina Yakova Kutinkova - retired, habilitated in the scientific specialty "Plant Protection" (Entomology), appointed as a member of the scientific jury by order RD-16-1262/ 06.12.2023 from the Rector to the AU.**

## Analysis of the content of the dissertation work

The studies were conducted in the period 2018 - 2021 in the insectarium of the Department of Entomology, Agricultural University, Plovdiv and under field conditions in Pazardzhik and Plovdiv regions. The subject of the research is biology and the possibilities of control of two species of stink bugs from the Pentatomidae family, alien to Europe - the southern green stink bug (*Nezara viridula*) and the brown marmorated stink bug (*Halyomorpha halys*).

The presented dissertation has a volume of 126 standard pages, contains 17 tables and 92 photos and figures. The rich literature review, which includes 252 sources, of which 1 in Cyrillic and 251 in Latin, shows an excellent knowledge of the problem.

The autoabstract, which has a volume of 48 pages, is prepared according to the requirements and is well illustrated with 69 figures and photos and 17 tables. The same correctly reflects in a summarized form the conducted research work, presented in the dissertation work, including and the mentioned scientific and scientific-applied contributions.

## Relevance of the research

Invasive species are one of the great challenges to global development and prosperity, especially for human health, healthy food, sustainable environments and sustainable economies. In a number of cases, these species pose a threat to human health, put food supplies at risk, threaten valuable species, lead to significant economic losses and disrupt ecosystem functions. The southern green stink bug (*Nezara viridula*) and the brown marmorated stink bug (*Halyomorpha halys*) are just two of the numerous examples of alien insect species that accidentally entered the territory of Bulgaria. Then they established themselves as important

pests in different crops. Both bugs are already found ubiquitously and in the highest density compared to all other local representatives of the family Pentatomidae (Hemiptera; Heteroptera). Their harmful activity is present in several aspects: direct injury from sucking juice, leading to a decrease in quantity and quality of production; indirect damage from creating conditions for infection with phytopathogens; as an allergen for people, creating discomfort in households where they hibernate, etc. The problem is extremely relevant, given the importance of these two pests and the lack of information on their biology in Bulgaria and the possibilities for control.

## Knowing the problem

The rich literature review including 252 sources, of which 1 in Cyrillic and 251 in Latin shows that PhD student Maria Hristozova knows the problem very well. The literature review is comprehensive and thorough.

## Purpose, tasks and research methods

The aim of the dissertation work is to study the biology and control options of the southern green stink bug (*Nezara **viridula*** (Linnaeus)) and the brown marmorated stink bug (*Halyomorpha halys* (Stål) for the conditions of Bulgaria.

The goal was accomplished through the following tasks:

1. To conduct observations and establish the most preferred species of cultivated and wild host plants in the Plovdiv and Pazardzhik regions.
2. To study various aspects of the life cycle: duration of development of individual stages, reproductive behavior, egg productivity, number of generations per year, etc. under laboratory and field conditions.
3. To identify predatory and parasitoid species from natural populations associated with the southern green stink bug and the brown marmorated stink bug.
4. To study the regulatory possibilities of the established species of parasitoids.
5. To establish the biological efficacy of selected insecticides authorized for use in the European Union.

Laboratory and field studies were conducted.

Data from the trials were processed using the SPSS Statistics 26 for Windows and Microsoft Excel 365 programs.

## Characterization and evaluation of the dissertation work and contributions.

The studies in the dissertation were conducted at a modern scientific-theoretical and methodical level.

The dissertation is properly structured in sections, and the experimental material is well illustrated with 17 tables and 69 figures and photos.

Formulated conclusions and contributions are well-founded and correspond to the obtained results.

The dissertation meets the requirements for obtaining the educational and scientific degree "doctor". The results are original.

The following contributions stand out in the dissertation work:

### SCIENTIFIC AND SCIENTIFIC-APPLIED CONTRIBUTIONS

## I. Scientific contributions of an original nature

- For the first time in Bulgaria, different morphological forms of the southern green stink bug are reported, which are found in Pazardzhik and Plovdiv regions, as well as their percentage ratio.
- For the first time in Bulgaria, the phenological development of *N. viridula* and *H. halys*, the duration of development of their individual stages and the number of generations per year under field conditions for the Plovdiv region have been studied.
- For the first time in Bulgaria, the following species of parasitoids from local populations that parasitize stages of *N. viridula* are reported: *Trissolcus basalis, Ooencyrtus telenomicida, Ooencyrtus sp.,* and *Trichopoda pennipes*.
- For the first time in Bulgaria, the following species of parasitoids from local populations that parasitize stages of *H. halys* are reported: *Trissolcus cultratus, Trissolcus basalis, Anastatus bifasciatus, Ooencyrtus telenomicida* and *Ooencyrtus* sp.
- The degree of parasitization of the eggs by the parasitoids established for the southern green stink bug and the brown marmorated stink bug in natural conditions in different biocenoses in the Plovdiv and Pazardzhik regions was studied.
- The degree of parasitism of adults and nymphs of the 5th instar of the southern green stink bug in different biocenoses in Plovdiv and Pazardzhik regions was studied.
- The biological efficacy of plant protection products based on plant extracts and microorganisms, for which there are no previous studies in our country, was tested for both pest species.

## II. Scientific contributions of a confirmatory nature

- The established species of host plants in Pazardzhik and Plovdiv regions largely confirm what was observed by other authors in European countries.
- The studies of the life cycle parameters of both species under laboratory conditions at temperature 25 ± 2°C, RH 50 - 60% and photoperiod 16 L:18D rather confirm the findings of other authors.
- It has been confirmed that the egg parasitoid *Anastatus bifasciatus* from natural populations in Bulgaria successfully develops on the eggs of the southern green stink bug.

## III. Applied contributions

- The obtained results on the biological efficacy of the tested plant protection products can find practical application in the development of programs for IPM or in the organic farming.
- The data on the phenological development of the two species and more specifically on the beginning of the hatching of the nymphs can be used when choosing the moment for treatment with PPPs - for the southern green skink bug it is most suitable after the first ten days of May, and for the brown marmorated stink bug – after mid-June.

## Critical notes and recommendations

The term "field conditions" is the most correctly to use.

## Description and evaluation of the presented materials

One article in a scientifically referenced Web of Science journal is presented.

1. Hristozova, M. (2020). Life Cycle Parameters of the Invasive Southern Green Stink Bug (*Nezara viridula*) at Laboratory Conditions. Scientific Papers. Series A. Agronomy, 63(2).

PhD student Hristozova has also participated in 4 conferences. With this, she meets the requirements for obtaining the educational and scientific degree "PhD".

The presented autoabstract reflects objectively the structure and content of the dissertation.

## Conclusion:

The materials presented by PhD student Maria Hristozova meets the requirements with the Law on the Development of the Academic Staff in the Republic of Bulgaria and the rules of the Agricultural University for its application. Bearing in mind the in-depth theoretical knowledge shown in the dissertation work and the results obtained, I give my **POSITIVE** assessment for the presented dissertation work.

I allow myself to suggest to the venerable Scientific Jury also to vote positively and to award **Maria Valerieva Hristozova** the educational and scientific degree **"PhD"** in the scientific specialty "Plant Protection" (Entomology).

Prepared the opinion:

/Prof. Hristina Kutinkova/

Date:

12 February, Plovdiv