REVIEW

On a thesis for obtaining the educational and scientific degree "doctor" in: field of higher education 6.0 Agrarian Sciences and Veterinary Medicine, professional field 6.2 Plant Protection, scientific specialty Plant Protection

Author of the thesis: Martin Georgiev Marinov - full-time doctoral student in the Department of Phytopathology at the Agricultural University, Plovdiv

Topic of the dissertation: Epidemiology and control of cylindrosporiosis in cherry and sour cherry (*Blumeriella jaapii* (Rehm) Arx)

Reviewer: Prof. Stoyka Petkova Masheva PhD, Maritsa Vegetable Research Institute, Plovdiv (retired), field of higher education 6.0 Agrarian Sciences and Veterinary Medicine, professional field 6.2 Plant Protection, scientific specialty Plant Protection, appointed as a member of the scientific jury by order No. RD-16 - 1330./22.11.2024. from the Rector of the Agricultural University, Plovdiv.

1. Brief introduction of the candidate.

Martin Georgiev Marinov was born on 1.07.1992. He graduated with a bachelor's degree in 2015 from the Agricultural University, Plovdiv, majoring in Agronomy (Viticulture and Horticulture). He obtained his master's degree in 2016 also from the Agricultural University, majoring in International Master's Course Plant Protection. Since 2018, he has been a full-time doctoral student in the Department of Phytopathology at the Agricultural University. Since 2016, he has been working as an agronomist at the Agricultural University, and since 2021 until now - as an assistant in the Department of Phytopathology. He is fluent in English. He has computer skills in Microsoft Office 365, Zeiss ZEN 3.6 (blue edition), GIMP, QGIS and CorelDRAW.

2. Relevance of the problem.

Cylindrosporiosis (*Blumeriella jaapii* (Rehm) Arx) is one of the most common fungal diseases of cherries. So far, no resistant varieties with good organoleptic and technological characteristics have been created, which is why control is carried out mainly through treatment with chemical agents. As a result, new resistant races of the pathogen have emerged, which is a serious risk for the development of the sector. Reducing the amount of

pesticides used is a major problem in plant production. It is the basis of the developed Strategy of the European Commission (EC) "From Farm to Fork", which is part of the European Green Deal. In this sense, the development and implementation of predictive models in a Decision Support System are considered one of the main methods for reducing chemical treatments. Therefore, the developed dissertation work is particularly relevant and significant for this production.

3. Purpose, tasks, hypotheses and research methods.

The aim of the dissertation is to study new epidemiological features, possibilities for prognosis and control of the disease cylindrosporiosis of cherry and sour cherry caused by *Blumeriella jaapii* (Rehm) Arx.

To achieve the aim, the following tasks have been developed:

1. To study the complete symptomatic picture of the disease in Bulgaria.

2. To study the quantity of ascospores and spring microconidia available in the air and ready to infect.

3. To describe the duration of decomposition in overwintered leaves as a source of infectious background.

4. To validate the disease prognosis model created by the University of Michigan (USA) using control plants.

5. To test a chemical control strategy by applying fungicides at different infectious indices.

In developing the tasks, standard and new methods for disease diagnosis were used; for studying epidemiology; validation of a predictive model using control plants; chemical control (depending on the phenophase of the crop and meteorological conditions, registered fungicides with different mechanisms of action were used). All experiments were methodically correctly set up and performed. Meteorological data were obtained from an Automatic Meteorological Station model iMETOS IMT200 (Pessl Instruments, Weiz, Austria) located 50 m from the orchard.

4. Transparency and presentation of the obtained results.

The state of the problem is analyzed in a 26-page literature review, citing 310 bibliographic sources, including 43 in Cyrillic and 267 in Latin. Half of the cited sources are up to the year 2000, and the rest after 2001. About 25% of the total numbers are after 2011. Therefore, the doctoral student is well acquainted with modern research on the problem.

In the Material and Methods section, the methods used are described in detail. It is located on 20 pages. The Results and Discussion section covers 94 pages with 38 tables and 51 figures and photos included in them. There is an Appendix with 3 tables and 8 figures included.

The doctoral student demonstrates a very good command of scientific terminology and correctly interprets the obtained results. They are statistically processed, which allows for justified and reliable conclusions to be drawn. Data analysis was performed using MS Excel 365. In some of the experiments, the R program version 4.1.2 was used. The following basic packages were applied: agricolae (1.3.5); multcomp (1.4.18); MASS (7.3.54); stats (4.1.2); ggplot2 (3.3.5); dplyr (1.0.7). The Zaitsev method was used to calculate the limit values of the indicators (minimum (min) - maximum (max)), the average, its error and the standard deviation.

5. Discussion of the results and the literature used.

The structure of the presented dissertation meets the requirements for the educational and scientific degree "Doctor". The presented literature review is well structured, very detailed and academically designed. This shows that the doctoral student is able to collect and correctly analyze the reviewed literature and correctly formulate the purpose of his research. The results obtained are very well analyzed and interpreted. They are compared and supported by the results of other researchers. The large number of cited sources shows that the doctoral student is very well informed on the problem. 21 conclusions have been formulated, which are the result of all the studies.

6. Contributions of the dissertation work.

I accept the reference for the main contributions, which are as follows:

Scientific contributions of an original nature – 6

1. For the first time in the world, a precise (hourly) study of the amount of spores in the air was conducted using a 7-day high-class spore trap such as that of Burkard Manufacturing Co Ltd.

2. For the first time in the world, a differentiated reading of the amount of AS and SMC in the air was conducted, this allows to determine their ratio and dynamics of dispersion during the day and the growing season.

3. The dispersion of SMC is possible at any time of the day and does not depend on light.

4. After a laboratory study, the necessary amount of degree days for the maturation of the fruiting bodies apothecia and spring acervuli was calculated.

5. For the first time in the world, a study was conducted to use the Eisensmith and Jones predictive model with a built-in weather forecast, which allows a more flexible approach to decision-making and the implementation of preventive, not only curative treatments.

6. For the first time in Europe, a study was conducted to prove infectious events under field conditions using control plants.

Scientific contributions of a confirmatory nature – 4

1. In Bulgarian conditions, the disease also develops symptoms on cherry stalks.

2. Dissemination of AS in the causative agent of CS is possible at any time of the day.

3. In most years, the amount of AS in CS is greater than that of SMC, but they may also be in equal amounts.

4. It is possible to achieve a high level of protection from CS through chemical treatment at a predicted medium and high infectious index from the Eisensmith and Jones model.

Scientific and applied contributions – 7

1. Epidemiological data on airborne AS and SMC can be used to create a mathematical model that can be part of the assessment of the risk of primary infection.

2. The largest number of events with the first AS and SMK releases occurs immediately after the start of precipitation. A smaller but significant share falls on releases that begin one or two hours after the specified moment. Such results are an indication of the advisability of conducting chemical treatments with contact products against germinated but not yet infected spores during or shortly after precipitation. Such practice is leading in the control of scab on apple or pear.

3. The use of the Eisensmith and Jones model in combination with a built-in weather forecast allows for optimal control of the disease after treatment when a high infectious index is reached, and this leads to a reduction in their total number. A similar strategy is applicable to technology with biologically permitted or conventional products.

4. Data on the dynamics of decomposition in fallen leaves can potentially serve as a component of a predictive model for primary infection in CS.

5. Chemical treatments during flowering and afterwards, aimed at preventing infection on the stipules, are essential for the control of CS throughout the season. During flowering, AS and SMC have been established.

6. Confirmed infection on fruit stalks can become an additional infectious factor in orchards where the produce is harvested mechanically and the stalks remain on the trees until spring.

7. The main stock of primary inoculum is realized by the end of May, but a certain part of it is dissipated by the end of June. This proves the need for preventive spraying even during the harvest period and emphasizes the importance of all included sanitary measures before that, which would reduce the infectious pressure.

7. Critical notes and questions.

I appreciate the presented dissertation work. It testifies to the good information of the doctoral student, skills to conduct scientific research, to collect, process and analyze their results. It represents a complete, well-structured, significant scientific product.

I have the following notes on it:

- There are technical errors in the text;
- In conclusion 9, an abbreviation is used that is not correct;
- Contribution 3.2 – "treatment with contact products during or shortly after precipitation" is impossible or incorrectly formulated.
- In contribution 3.7, what do you mean by the need for protective spraying even during the harvest period?

8. Published articles and citations.

In connection with the dissertation, the doctoral student has independently published one article in a peer-reviewed scientific journal (Agricultural Sciences), thereby satisfying the requirements of the Law on Agricultural Sciences of the Republic of Bulgaria and Rules for its Application of the Agricultural University.

The presented abstract is 58 pages long and includes 28 tables and 23 figures and photographs. It objectively reflects the structure and content of the dissertation.

CONCLUSION:

Based on the various research methods learned and applied by the doctoral student, the correctly performed experiments, the summaries and conclusions made, I believe that the presented dissertation meets the requirements of the Law on the Development of the Academic Staff of the Republic of Bulgaria and Rules for its Application of the Agricultural University, which gives me reason to evaluate it **POSITIVELY**.

I alow myself to proposing to the honorable Scientific Jury also to vote **positively** and award **MARTIN GEORGIEV MARINOV** the educational and scientific degree "**Doctor**" in the scientific specialty "Plant Protection".

22.01.2025
Plovdiv

REVIEWER:
(prof. S. Masheva PhD)