Review of the PhD Thesis

Riaba I. A. — "Molecular and biological characterization of raspberry and blackberry viruses and their occurrence in Polissya and Forest-Steppe of Ukraine."

Dissertation for the degree of Doctor of Philosophy in specialty 203 *Horticulture, Vegetable Growing, and Viticulture*.

Institute of Horticulture, NAAS, Kyiv, 2025.

Raspberry and blackberry represent economically important berry crops in Ukraine, where their productivity largely depends on phytosanitary status, particularly on the presence or absence of viral infections. The PhD thesis by I. A. Riaba provides an in-depth and comprehensive study of the viral pathogens affecting *Rubus* species under the agroecological conditions of Polissya and the Forest-Steppe zones of Ukraine.

The author applied a wide range of up-to-date molecular and biological methods to identify and characterize viruses infecting raspberry and blackberry. The obtained results significantly enrich current knowledge on the occurrence, molecular diversity, and biological properties of local viral isolates. Of special importance are the findings on the impact of viral infection on the functional state and productivity of raspberry cultivars, which clearly demonstrate that infected plants exhibit reduced expression of economically valuable traits.

A valuable aspect of the dissertation is the evaluation of antiviral treatments for *in vitro* elimination of viruses from planting material, as well as the formulation of practical recommendations aimed at reducing the spread of infections in commercial plantations. These results have direct relevance for improving the production of virus-free plant material and for strengthening phytosanitary control in Ukraine's berry industry.

The dissertation is well structured, clearly written, and based on sound experimental design and rigorous data interpretation. The conclusions are fully supported by the results obtained and are of both theoretical and applied importance.

Scientific and practical results

Monitoring revealed seven viruses and one phytoplasma in total, with an overall infection rate of 26.5%. Infection prevalence was higher in raspberry (28.4%) than in blackberry (16.7%), and RBDV was dominant (18.2%). The highest rates were found in Vinnytsia (59.3%) and

Kyiv (54%) regions.
Clones of 18 raspberry and 5 blackberry cultivars free from viral infections were identified, suitable for establishing primary sources of healthy propagation material.

Experimental infection studies showed that RBDV significantly impairs the physiological and productive performance of raspberry plants:

- leaf water-holding capacity decreased by 27.8–35.6%;
- photosynthetic pigments (chlorophyll *a* and *b*) were reduced by 18–30%;
- yield loss reached 58–62% depending on cultivar;
- the proportion of marketable (first-grade) fruits dropped to 14–17.6%, and in some cultivars to zero;
- drupelet number decreased by 50–61%.

The infection altered fruit biochemical composition: ascorbic acid decreased by up to 9.6%, total sugars by 11.8%, while titratable acidity and anthocyanin content increased markedly. Economic analysis revealed a strong reduction in profitability — 11.2–11.9% for 'Brusviana' and 'Sugana', and a negative return (−3.7%) for 'Joan J'.

Regulatory and methodological implications

Based on monitoring results and analysis of Ukrainian and EPPO standards, the author justifiably identified the need to revise and harmonize the national certification regulations:

- SSU DSTU 4720:2007 *"Raspberry and Blackberry Planting Material. Technical Specifications"*;
- SSU DSTU 7185:2010 *"Fruit and Berry Crops. Methods for Determining the Phytovirological Status of Planting Material of Berry Shrubs"*;
- EPPO PM 4/10 *"Certification scheme for Rubus."*

It is proposed that *Raspberry leaf blotch virus* (RLBV), not currently listed, be included among mandatory testing pathogens, given its expanding spread and negative effect on yield and fruit quality.

Evaluation and conclusions

The dissertation is logically structured, methodologically sound, and demonstrates the author's high professional competence in molecular diagnostics, virology, and horticultural biotechnology. The obtained data have both theoretical and applied importance for virus control, certification, and the improvement of raspberry and blackberry production systems in Ukraine.

The work presents **new scientific results**, particularly regarding virus – host relationships, molecular variability, antiviral treatments, and economic consequences of viral infections in *Rubus* crops. The conclusions are well substantiated by experimental data.

Overall assessment:

The dissertation presents novel scientific findings, particularly the detection of new virus–host combinations in Ukraine, and contributes to the improvement of virus detection and management strategies in *Rubus* crops. It meets the academic and methodological standards required for the PhD degree.

I give the thesis a positive evaluation and strongly recommend it for defense.

In Holovousy 15.10.2025

Prof.Dr.Ing.Boris Krška

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