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Biopesticides of the Future: The Use of Compounds from Cinnamon Bark in the Control of Agricultural Pests

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Extended Abstract

The widespread use of synthetic pesticides in agriculture has contributed to a significant increase in food production, but has also led to environmental pollution, increased pest resistance and negative health effects for humans. In response to these problems, there is a growing demand for organic farming methods and sustainable plant protection management, especially in the context of the European Union strategy, which assumes reducing the use of synthetic pesticides by 50% and increasing the use of their natural equivalents by 2030 [1]. This requires the search for and implementation of biopesticides - compounds of plant origin that are characterized by low toxicity to nontarget species and effectiveness in places where synthetic pesticides cannot be used, including grain warehouses and grocery stores.

A promising source of biopesticides in accordance with the provisions of Art. 23 of Regulation (EC) No 1107/2009 [1] is the bark of the Ceylon cinnamon tree (*Cinnamomum verum* J. Presl), containing eugenol, cinnamaldehyde and *trans*-cinnamaldehyde. These compounds can be used to fight *Tenebrio molitor* larvae (Coleoptera, Tenebrionidae) [2], which are the main pests causing huge losses in the food industry by contaminating grain warehouses and the products contained therein with molts and feces [3]. However, *T. molitor* larvae, in addition to being model organisms in laboratory tests, are also a potential source of animal protein that can be used in the animal breeding, and in human diet. However, the precise mode of action of these compounds is not fully known.

This presentation will display the results of the research on the alterations of protein content in the body of *T. molitor* larvae after administration of compounds from cinnamon bark. In addition, the results of the research on potential attractant-repellent and/or anti-feedant activity of eugenol, *trans*-cinnamaldehyde and cinnamaldehyde will be presented, carried out using a Y-shaped tube, which allowed to determine whether they can be used in agriculture to reduce losses caused by *T. molitor*. The results of the effectiveness of the tested compounds will also be presented in relation to two other insect species - *Zophobas atratus* (Coleoptera, Tenebrionidae) and *Gromphadorhina coquereliana* (Blattodea, Blaberidae) which, although they are not typical agricultural pests, can serve as models for testing a wide spectrum of action of repellent and attractant compounds. It may contribute to a better understanding of the possible impact of these substances against insects.

References

[1] Biodiversity strategy for 2030, https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en. Accessed 30 August 2023.SANCO/10069/2013 rev.3 https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides_ppp_appproc_basic-subst_list-candidates.pdf. Acc. 25 May 2024.

[2] A. Dzięgelewska, J. Lubawy, Z. Adamski (2024) "Insecticidal Effects of Substances from Cinnamon Bark – Eugenol, Trans-Cinnamaldehyde and Cinnamaldehyde to *Tenebrio Molitor*". Available at SSRN: https://ssrn.com/abstract=4758773 or http://dx.doi.org/10.2139/ssrn.4758773 (in review).

[3] R. Ahmad, S. Hassan, S. Ahmad, S. Nighat, Y.K. Devi, K. Javeed, S. Usmani, M.J. Ansari, S. Erturk, M. Alkan, B. Hussain (2022) "Stored Grain Pests and Current Advances for Their Management", Postharvest Technology - Recent Advances, New Perspectives and Applications. IntechOpen, Apr. 28, 2022. doi: 10.5772/intechopen.101503.