

Unveil the modes of action of essential oils on the granary weevil *Sitophilus granarius* to develop new biocides

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BIOLOGICAL CONTEXT

Although synthetic pesticides are still used to control insect pests, greater efforts have been made to develop healthier and more environmentally friendly pesticides¹. Due to their insecticidal properties, botanical essential oils (EOs) are considered as promising alternatives to the use of synthetic insecticides^{2,3}. However, little is known about the mechanisms underlying the insecticidal activity of most these natural compounds. Previous research has reported the insecticidal properties of EOs from plant species of the genus *Mentha*^{4,5,6}. In this study, we 1) evaluated the contact toxicity of *Mentha arvensis* EO against the granary weevil *S. granarius*, a major pest of stored grain in temperate regions and then used a label-free quantitative proteomics approach to decipher the modes of action of *M. arvensis* EO on *S. granarius*.

DISCUSSION

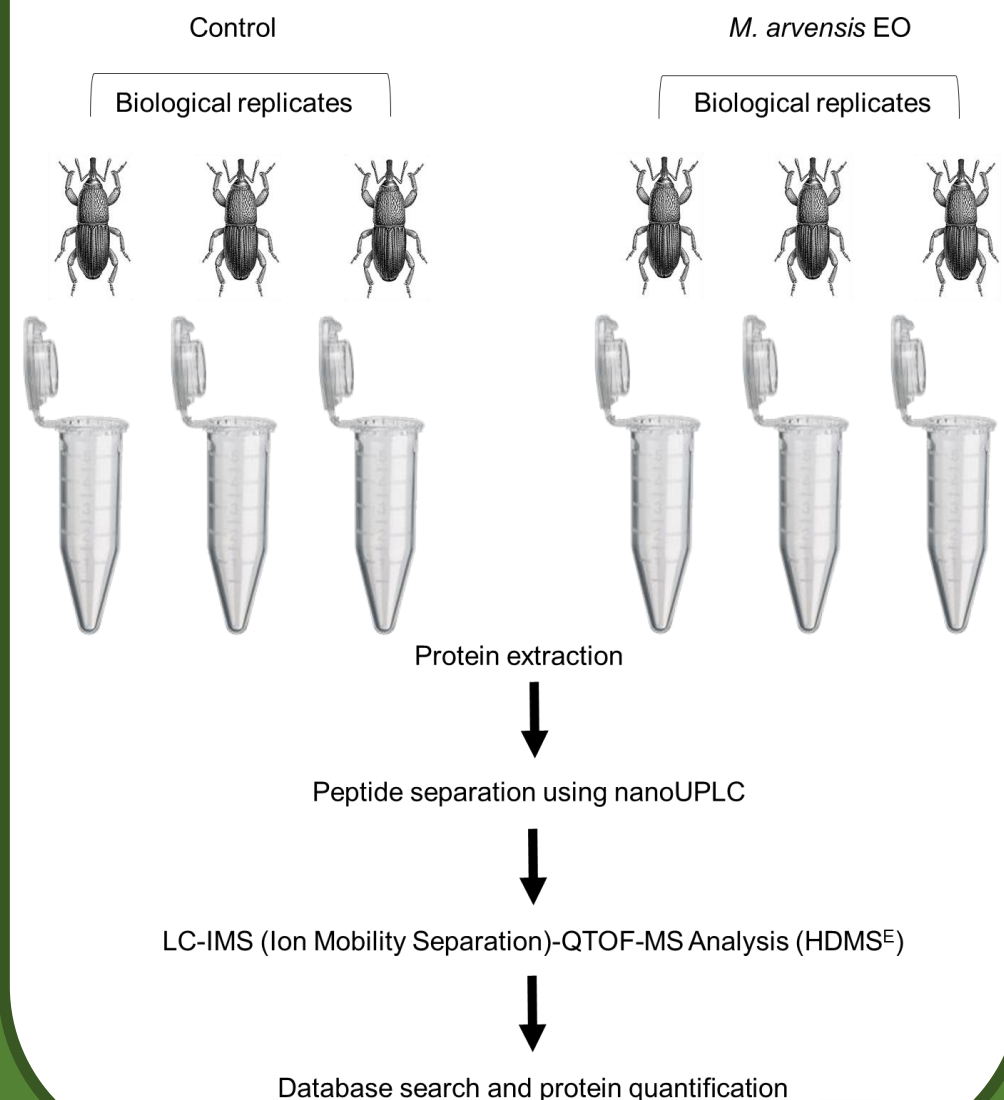
- *M. arvensis* EO induced dramatic physiological changes in *S. granarius* adults;
- DEPs were mostly upregulated and reflect the physiological state of the surviving insects;
- *M. arvensis* EO is capable to affect a variety of biological processes in *S. granarius*;
- Our results shed light on the repair mechanisms put in place in surviving insects to deal with the damage inflicted;

Conclusion: this work highlights the modes of action of a promising EO to control pest of stored cereals and is a first step in the development of novel bio-rational insecticides;

- This work is now published in *Journal of Pest Science*.

MATERIALS AND METHODS

- LD₅₀ of *M. arvensis* EO for *S. granarius* adults 24h post-treatment: 55.6 µg/insect.
- Label-free quantitative proteomic analysis:



RESULTS

