# Abstract of the PhD dissertation

**“Change in the chemical composition of volatile and medium volatile insects obtained by selected species of insects under the influence of fungi"**

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Insects and fungi are constantly fighting against each other in the natural environment. Studies of one organism influencing another, along with discoveries of insect defense barriers, and changes that can be caused by fungal infections, may contribute to development of pest control methods. That may also contribute to identifying and applying natural compounds produced by insects under the influence of fungal infection in medicine.

The main goal of this dissertation was to determine composition of volatile and medium-volatile organic compounds produced by selected insect species before and after fungal infection by using gas chromatography combined with mass spectrometry (GC-MS). The research material consisted of insects, which are mainly pests. They were: *Galleria mellonella, Zophobas morio, Tenebrio molitor, Periplaneta americana, Hylobius abietis* and *Calliphora vomitoria. Metarhizium flavoviride, Beauveria bassiana, Metarhizium robertsii* and *Cordyceps fumosorosea* are entomopathogenic fungi that have been used to infect insects, as in natural habitat they attack arthropods by penetrating into insect bodies, and more specifically into their living tissues. Thanks to these properties some of them have been approved for the production of bio-preparations used for protection of crops. That is why research carried out as a part of this dissertation expands knowledge not only in the field of chemistry, but also in the field of insect pathology.

In the first stage of the research insects and entomopathogenic fungi were bred. The main focus was placed on establishing the method and measuring the time of conducting fungal infection. Regarding insects' fat bodies, focus was placed on isolating the research material. Depending on the insect species different types of extractions were performed: solvent extraction (Folch method) and headspace microextraction (HS-SPME). Subsequently, qualitative and quantitative analysis were performed using the GC-MS technique.

The next stage of the research was based on the analysis of volatile and medium-volatile profiles of compounds, identified before and after infection, and on selecting a group of compounds with potential antifungal activity. This section of dissertation presents an analysis of the composition of isolated compounds from whole insects and from the fat body of selected species. Additionally, qualitative and quantitative summary of all identified compounds before and after the fungal infection was made. Characteristic compounds found in controlled and infected insects were analyzed and identified. Moreover, principal component analysis (PCA) of the identified compounds was performed on all tested insects before and after fungal infection.

The last stage of the research was identifying a group of compounds with potential antifungal activity, and selecting appropriate analysis parameters using the HS-SPME-GC/MS technique. For this purpose, 17 aldehydes produced by insects were selected. Extraction conditions were developed and validation parameters of this method were determined. Subsequently, tests to determine the minimum inhibitory concentration (MIC) against fungi for selected aldehydes were performed.

The conducted research complements the unknown information on the profiles of volatile and medium-volatile compounds produced by the above-mentioned insects before and after fungal infection. This constitutes an ideal preparation for understanding the defense mechanisms of insects.