

## **Changes in the neuroendocrine system of beetles induced by natural products - towards development of new tools for insect population control**

The search for effective tools to control insect pest populations is one of the most intensively developing fields of research. Each year, insects generate huge economic losses. Annually, they destroy one fifth of the world's total crop production and kill millions of people by insect-borne diseases. On the other hand insects are considered as an alternative or new source of nutrients for human consumption and animal feed. Currently, the most common way to control insect populations is to use synthetic pesticides, although they have a negative impact on the environment. The negative effects of synthetic insecticides result from their insufficient selectivity, accumulation in the environment and food chains, long durability, disruption of the ecosystem balance and high socio-economic costs (water pollution, food contamination, poisoning), as well as the development of resistance in pest species. The Integrated Pest Management System (IPM) covers various plant protection strategies, with an emphasis on various biological control systems, such as the use of plant-derived substances, crop rotation, and mechanical pest removal. **The proposed project involves examining the mode of action of new substances of natural origin that can be used in the IPM strategy. On the other hand, insects increasingly became a source of fodders for pets and farm animals thus factors increasing effectivity of breeding insects used for food and feed are also of interest.** In the project, we are looking for new agents to control insect population from two natural sources: insects and plants. We would like to use endogenous insect molecules from the nervous system - neuropeptides and secondary plant metabolites - glycoalkaloids to alter the functioning of one of the most important regulatory systems in the animal's body, which is the neuroendocrine system. We will use large-scale analyses (omics techniques) such as transcriptomics - RNA analysis and peptidomics - peptide analysis, gene silencing method (RNA interference technique) and combine it with various microscopic methods (confocal and electron microscopy) to assess the effect of endogenous insect neuropeptides (CAPA peptide, sulfakinin, short neuropeptide F) and plant secondary metabolites glycoalkaloids, from the Solanaceae family (solanine, tomatin, chaconine) on the functioning of the insect's neuroendocrine system. We will compare the effects of these substances with a commercially available insecticide.

**Project results will determine the mode of action of natural substances derived from insects and plants, which can then be used to develop new environmentally friendly bioinsecticides or agents which will help breeding feed insects.**