

## Abstract (EN)

Communication mediated by chemical compounds (semiochemicals) is the most important way of information transfer in insects, especially in the social species. Gas chromatographic methods (one-dimensional, two-dimensional comprehensive, and preparative arrangement) coupled with mass spectrometric and/or electroantennographic detector were used for volatile or semivolatile semiochemicals analysis in various insect species.

In this Thesis, biosynthesis of the bumblebee male sex pheromone in species *Bombus terrestris*, *B. lucorum*, and *B. lapidarius* was studied using putative biosynthetic precursors (sodium acetate, fatty acids) labeled with  $^2\text{H}$  and  $^{14}\text{C}$ . For the purpose of labeled volatile metabolites analysis, a method of separation and detection of isotopically labeled compounds in two-dimensional comprehensive gas chromatography was studied ( $^2\text{H}$ ,  $^{13}\text{C}$ ). An "inverse isotope effects" was confirmed for compounds labeled with both isotopes in all examined types of columns. Concerning the biological samples, analysis of *in vitro* incubated tissues with labeled sodium acetate showed that pheromone components are synthesized *de novo* in the labial gland in *B. terrestris* and *B. lucorum*. Nevertheless, experiments of *in vivo* incubation of deuterated fatty acids confirmed biotransformation of the precursors into main pheromone components in *B. lucorum* and *B. lapidarius*. These results supported the hypothesis that fatty acids, stored in fat body as triacylglycerols, are precursors for the aliphatic pheromonal components biosynthesis.

Changes of pheromone production during life were studied in *B. terrestris* and *B. lucorum*. Significant differences were found between these two species. Pheromone production reaches a maximum between the day 5 and 10 of life in *B. terrestris* males and then rapidly decreases. In the case of *B. lucorum*, the maximum is achieved on the day 3 and stays constant over the rest of life. The gas chromatographic results were confirmed by an ultrastructural study of the pheromone gland tissue.

A new exocrine gland located in legs of bumblebee males, queens, and workers was discovered in *B. terrestris* species. Components of the glandular secretion were analyzed by means of comprehensive two-dimensional gas chromatography coupled with mass detection. The secretion consists mostly of linear hydrocarbons and wax esters with aliphatic or terpenic alcohols. Differences in the secretion composition among castes were found. Furthermore, dynamics of the secretion production was studied in males. Its function in mating behavior was suggested, but this has not been confirmed by behavioral experiments. Thus, the biological function remains unclear.

Volatile components of a defensive secretion of the European stink bug *Graphosoma lineatum* were studied. A method combining the headspace solid-phase microextraction (SPME) sampling procedure and comprehensive two-dimensional gas chromatography

coupled with mass detector as well as preparative gas chromatography was used for chemical analyses. There were 57 compounds identified, 39 of them have not been described in the *G. lineatum* secretion before.