ABSTRACT

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Title of diploma thesis: Effect of selected monocyclic monoterpenes on the activity and expression of antioxidant enzymes in human liver

Monocyclic monoterpenes belong to plant secondary metabolites, which are characterized by their aroma and possess a wide range of use. They attract pollinators and are involved in plant communication as well as in the cosmetic and food industries. They are ingredients of spices, beverages, and food. In some of them, anti-cancer activity has been proven, however, we should keep in mind that some of them exert toxic properties in various organs of the organism, mainly in the liver. The aim of this thesis was to find out what effect have (+)-carvone, (-)-carvone, (+)-isomenthone, (-)-isopulegol, and piperitone on the activity and mRNA expression of antioxidant enzymes in human liver. The liver tissues obtained from patients of both sexes and 50-80 years old were used as biological material. At first, the effect of the selected monoterpenes (100 μM) on the activity of the enzymes glutathione reductase (GR), glutathione peroxidase (GPx), catalase (CAT), and glutathione S-transferase (GST) in subcellular fractions obtained from human liver tissue of six volunteers was evaluated. In this part of the experiment, monoterpenes influenced the catalytic activity of cytosolic GST the most; the most significant effect was shown by the monoterpene piperitone which was therefore selected for the next part of the study. Subsequently, the effect of piperitone (10 μM and 50 μM) on the catalytic activity and mRNA expression of antioxidant enzymes was examined using human precision-cut liver slices (PCLS) obtained from three volunteers. In PCLS, GSTP1 and GPx1 mRNA were most significantly induced by piperitone (10 μM) while piperitone (50 μM) induced GSTA1. Piperitone (50 μM) also considerably decreased the GPx2 mRNA levels. The activity of GST in human PCLS was increased in two liver samples by piperitone (50 μM). The other tested concentration (10 μM) caused a significant increase in the GST activity in one liver sample and a significant decrease in another one.