

# **ABSTRACT**

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

Monoterpenes are plant secondary metabolites, which are used as flavourings or aromas in the food industry due to their smell and flavour. They also play an irreplaceable role in the cosmetic and pharmaceutical industry. Monoterpenes are substances with a wide spectrum of biological activities. They exert, for example, antimicrobial, anti-inflammatory, antioxidant, hypotensive, and analgesic effects. In addition to the positive effects of these substances, some cases of their toxic effects in various organs were also observed, mostly in the liver. Monoterpenes also affect the activity and expression of antioxidant enzymes. The aim of this thesis was to determine the effect of five selected bicyclic monoterpenes, (+)-camphor, (-)-camphor, (-)-fenchone, camphene, and (-)- $\alpha$ -thujone, on the activity and expression of antioxidant enzymes. Of those enzymes, glutathione-S-transferase (GST), glutathione peroxidase (GPx), glutathione reductase (GR), superoxide dismutase (SOD), and catalase (CAT) were studied. At first, the effect of monoterpenes at a 100  $\mu$ M concentration on the activity of antioxidant enzymes in subcellular fractions obtained from the human liver was evaluated. The catalytic activities of enzymes were assessed by spectrophotometric methods. Among studied monoterpenes, (-)- $\alpha$ -thujone showed the greatest effect on the activity. The effect of this monoterpene on the GST activity and mRNA expression of eight main isoforms of antioxidant enzymes (GSTA1, GSTP1, GPx1, GPx2, GPx4, GR, CAT, SOD) was further monitored in precision-cut liver slices. Liver slices were incubated with (-)- $\alpha$ -thujone at a concentration of 10  $\mu$ M and 50  $\mu$ M for 24 hours. The (-)- $\alpha$ -thujone 10 and 50  $\mu$ M significantly increased GST activity in one liver sample. It further increased mRNA expression of GSTA1 (50  $\mu$ M), GSTP1, and GPx2 (10  $\mu$ M) also in one liver sample. In the effect of monoterpenes on the activity and mRNA expression of individual antioxidant enzymes, differences were observed between individual liver samples.