

The presence of pharmaceuticals in wastewater, which are not eliminated in sewage treatment plant process and thus get easily into rivers and aquatic environment in general, constitutes a severe problem to the whole society. The research into the removal of pharmaceuticals from the environment began about twenty years ago. Phytoremediation represents one of the most promising wastewater treatment methods. It is based on the ability of plants to remove xenobiotics from their environment and sequester them, build them into their tissues or degrade them. Many plant species have been tested as potential phytoremediation agents including maize (*Zea mays* L.) and sunflower (*Helianthus annuus* L.). These two plant species were also used for phytoremediation experiments described in this project. The sunflower BELEM variety and the maize G1 variety were cultivated in sterile media containing carbamazepine or its metabolite 10,11-epoxycarbamazepine. The same experiments were carried out with ibuprofen and acetaminophen for comparison. The antiepileptic drug carbamazepine belongs to the group of compounds, which are, due to their high stability, poorly degraded in the environment. Its metabolite 10,11-epoxycarbamazepine was synthesized by epoxidation of the double bond of carbamazepine using *m*-chlorperoxybenzoic acid in chloroform. The removal of all xenobiotics mentioned was observed, showing that carbamazepine was sequestered rather poorly by both plants, while 10,11-epoxycarbamazepine was removed efficiently by maize only. In contrast, ibuprofen and acetaminophen were removed by both plants effectively. The presence of xenobiotics except ibuprofen did not have any significant impact on the growth of plants. The enzymatic activity of NADP-ME, PEPC, PPDK and peroxidases in both bound and soluble fraction in extracts from plant roots and leaves was measured, which indicated the degree of the stress response of plants to the presence of xenobiotics in media. The largest increase of the activity of NADP-ME, PEPC and PPDK was observed in plants cultivated in media with 10,11-epoxycarbamazepine. The activity of NADP-ME and PEPC was increased in roots of maize more than in leaves. This fact could be attributed to an increased requirement of intermediates for various biosynthetic processes. A significant increase of peroxidase activity in bound fraction was observed in both leaves and roots of sunflower. The largest increase of the enzymatic activity of peroxidases in soluble fraction was observed in plants cultivated in media with carbamazepine and 10,11-epoxycarbamazepine. It is obvious that the way the plant metabolism is influenced by xenobiotics in media and its extent strongly depends on the plant species used and its way of CO₂ fixation.