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The influence of veterinary drugs on the metabolic processes of pea (*Pisum sativum* L.) and yellow lupin (*Lupinus luteus* L.) seedlings

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SUMMARY

Excessive use of antibiotics in human and veterinary medicine has resulted in contamination of the environment with these substances. Antibiotics are poorly metabolised in animal organisms, and consequently they enter the environment in faeces and urine as unmodified compounds or their active metabolites. Field fertilization with manure is one of the main sources of soil contamination with antibiotics. Plants can take pharmaceuticals up from soil and accumulate them.

The effect of antibiotics on plants, in particular crops, has not been extensively studied yet. Therefore, the objective of this thesis was to demonstrate the influences of selected veterinary antibiotics on metabolic processes in garden pea and yellow lupin. The experiments confirmed the uptake of antibiotics by plants from soil. The decrease of soluble carbohydrate contents in plants was shown to be a good indicator of antibiotic induced stress in plants. Nevertheless, analyses of soluble carbohydrates in plants cannot be used as a measure of soil contamination with antibiotics, as it may be strongly modified by the plant physiological status. The analysed antibiotics induced oxidative stress in plants, which resulted in excessive production of reactive oxygen species (ROS). Increased ROS production in cells stimulated activity of the enzymes of the antioxidative stress (guaiacol peroxidase and catalase). The enzymes studied were good markers of oxidative stress in antibiotic affected plants. Total protein measurements indicated the changes in root proteins. It was demonstrated that the studied antibiotics increased the levels of protein controlling cellular metabolism, and the proteins involved in the processes of adaptation, protection and detoxication. The analyses carried out demonstrate the occurrence of many various metabolic reactions in plants grown in antibiotic contaminated soil.

The development of an effective method of tetracycline removal from water solutions may contribute to the control of environment contamination with this antibiotic. To this end, three methods of contaminated water treatment were considered: UV-C, ozonation and treatment with iron chelates. Two of these methods proved effective (ozonation and treatment with iron (III) citrate) and induced a rapid breakdown of tetracycline.