

'TOXICOLOGICAL EVALUATION OF FUNGICIDES ON COMMON CARP'

SUMMARY

Fungicides are an important group of plant protection, constituting a second class of pesticides in terms of quantities sold preparations. As they are used in large amounts in agriculture, the evaluation of their toxic effects is of major concern to environmental safety. Fungicides may enter the aquatic environment via drops drift and runoff. Fungicides are usually non-toxic or mild toxic to mammals; however they can produce toxic effects in aquatic organisms, including fish. The aim of the present study was to investigate the toxic effect of chosen fungicides to common carp.

The experiments were conducted on individuals of common carp (*Cyprinus carpio* Linnaeus, 1758), with a mean weight of 60 ± 10 g in aquaria condition. Fish were divided into 3 equinumerous experimental groups and the control group. Fish were exposed for 14 days on mancozeb, prochloraz and tebuconazole in following concentrations: 1 mg l⁻¹, 1 mg l⁻¹ and 2,5 mg l⁻¹, respectively. After that, fish were transferred to water without fungicides for 30 days of recovery period. Samples of tissue were collected from fish after 3 days (gill), 14 days of exposure (gill, liver and posterior kidney) and the end of recovery period (gill, liver and posterior kidney). Peripheral blood of treated fish was collected many times during exposure and also at the end of recovery period. Following biomarkers of metabolism were measured: glucose, triglycerides, total proteins, activities of and aspartate aminotransferase (AST) alanine aminotransferase (ALT). As well as hematological parameters such as the total number of erythrocytes (RBC), total number of leukocytes (WBC), hematocrit value (Hct), total hemoglobin concentration (Hb), mean corpuscular hemoglobin (MCH), mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC) and leukograms were determined at once. Microscopy study of blood cell were also performed. Results were analyzed at the level of significance $\alpha = 0.05$ using STATISTICA 10 program.

Exposure to fungicides affected physiological parameters of common carp; however it was a temporary state. The main changes were determined in glucose and triglycerides

fluctuations as well as RBC, WBC, Hct and Hb alternations. Results of AST and ALT activities and liver histopathology showed that chosen fungicides are not acting strictly hepatotoxic. In hepatocytes of treated fish there were observed disruptions of RER and mitochondria structure. Based on the results of gill lesions, it has been determined destruction of the gill epithelium and the lamellae structure. The most adverse effect of fungicides were the hypertrophy, disruption of pavement cells microridges and capillary dilatation. At kidney the prominent effect was an enlargement of renal epithelial, dysfunction of hematopoietic structure and destruction of hematopoietic cells.

The fish exposure to tested fungicides seems to cause temporary changes on common carp physiology, regardless of the kind of fungicides. The effects of pesticides on changes and the time of their persistence in metabolic or hematological parameters alternations and pathomorphology seem to depend on the type of fungicide.