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# Heavy metal characteristics in Kočani Field soil-plant system (Republic of Macedonia)

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Contamination of soils with heavy metals is globally widespread and induces a long-term risk to ecosystem health. This research focuses on the heavy metal contamination, transfer values and health risk assessment in the Kočani Field soil-plant system (Republic of Macedonia). To identify the heavy metal concentrations in Kočani soils and crops (rice and maize) the geochemical analysis were performed by inductive coupled plasma mass spectrometer (ICP-MS), thereupon the transfer factor (TF) and estimated daily intake amount (EDIA) values in Kočani crops were calculated. Heavy metal contamination status of Kočani soils was also assessed by using sequential extraction procedure and by several environmental indexes: geoaccumulation index, contamination factor and contamination degree.

The detected total concentrations of As, Cu, Cd, Pb and Zn in soil samples were highly above the threshold values considered to be phytotoxically excessive for the surface soils. The results of the applied indexes confirmed a very high contamination status for Kočani soils. According to the sum of the water soluble (1) and exchangeable (2) fractions for Ag, As, Cd, Cu, Mo, Ni, Pb, Sb and Zn measured in the soils, the mobility and bioavailability potential of the heavy metals studied declined in the following order: Cd > Mo > Sb > Zn > Cu > As > Pb > Ni > Ag. The highest As, Cd, Mo, Pb and Zn values were determined in the rice samples grown in the paddy fields near the Zletovska River. The highest Pb and Mo concentrations measured in the maize samples were from the maize fields near the Zletovska River and Ciflik city. High transfer factor values for Mo, Zn, Cd and Cu revealed a strong accumulation of Mo, Zn and Cd by rice and Mo and Zn by maize crops. The results of the estimated dialy intake showed that the regular consumption of rice and maize crops containing the highest Cd, Mo, Pb and Zn concentrations could pose a serious threat to human health, because the daily intake of Cd, Mo, Pb and Zn for crops grown in the fields around the Zletovska River exceeded the recommended provisional tolerable daily intake values.

Taking into account the results, the area around Zletovska River is considered as the most anthropogenically impacted part of Kočani Field.