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**SEASONAL AND SEX-SPECIFIC ACCUMULATION OF SOME TRACE ELEMENTS IN
GLOMERIS HEXASTICHA BRANDT, 1833 (MYRIAPODA: DIPLOPODA: GLOMERIDA)
ACROSS URBAN LOCALITIES**

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The upper layers of soil and leaf litter, habitats for detritivorous organisms like millipedes, are an important sink for different metal pollutants. While certain trace elements are essential micronutrients, they can still produce harmful effects if they accumulate (in organisms or their habitat) to toxic levels. The aim of this study was to assess accumulation of four metal trace elements (Fe, Mn, Cu, and Ni) in millipede *Glomeris hexasticha* Brandt, 1833, across the three localities in Belgrade (Banjica Forest, Hyde Park and Makiš Forest) during two seasons (spring and autumn of 2023). We collected 30 animals per sex from each locality in spring, and 60 animals in autumn, except for males from Makiš population, where 22 animals were found. Adults were separated by sex and kept in plastic boxes in laboratory for a month on the soil and leaf litter from the collection site. For sample preparation, animals were frozen for an hour in the freezer, rinsed with tap and distilled water, and air dried. Following the immersion in liquid nitrogen, the animals were ground in ceramic mortars and the resulting paste was left to air dry to powder. The concentrations of trace metals in whole body, leaf litter, and soil were determined by atomic absorption spectrophotometry (Shimadzu AA 7000). Several parameters were analyzed: bioaccumulation factor (BAF), soil vs. leaf litter contribution, relative contributions of metals in tissue, and tissue vs. environment. To assess the relationships between analyzed metal concentrations in soil, leaf litter, and millipede tissues across seasons and sexes, Spearman's rank-order correlations were calculated. The BAF values showed a consistent accumulation of Cu and regulation of Mn across all localities, during both seasons and for both sexes. Other metals displayed variable BAF values, indicating differing physiological requirements rather than a uniform accumulation or regulation strategy. The uptake of Cu, Fe and Mn from soil was predominant in autumn across all localities when compared to leaf litter. Iron was the dominant analyzed metal found in tissues for both sexes, with females showing elevated levels in autumn. In spring, findings indicate that females accumulate less Fe, Mn, and Ni than what is present in the soil and leaf litter across all localities, suggesting a regulatory mechanism. Both sexes tend to accumulate Cu, potentially concentrating it within their tissues. Strong negative correlations were identified between Cu and Fe levels in soil and leaf litter, indicating that as the concentration of metals in the soil rises, the concentration in leaf litter declines. A strong positive correlation was also

noted for Cu between leaf litter and male tissue concentrations. Our findings confirm that metal deposition in millipedes is affected by environmental pollution, with these arthropods exhibiting mechanisms for accumulation and regulation that vary according to seasonal changes and physiological demands.

Keywords: bioindicator, biomonitoring, millipedes, soil pollution, trace metals.

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