Proceedings of the 3rd World Congress on Civil, Structural, and Environmental Engineering (CSEE'18)
Budapest, Hungary – April 8 - 10, 2018
Paper No. AWSPT 124
DOI: 10.11159/awspt18.124

A Preliminary Study on Heavy Metal Contamination in Rice Fields from Turkish Thrace Region

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Extended Abstract

Rice is the staple food for 40% of the world's population and is grown in over 100 countries today. Rice cultivation is not only important for providing food resource for humans but also for including rich biodiversity. The rice ecosystems host many plants and animals. These ecosystems are exposed different farming practices like using pesticides, fertilizers, agrochemicals and irrigation water quality. The different applications cause heavy metals contamination in rice fields and threat risk to rice crops and biodiversity.

The objective of this study was to investigate the heavy metals (Cd, Cu, Ni, Mn) in rice fields from sediment and water, in Turkey. The Meriç-Ergene River Basin (MERB) which is located on Turkish Thrace at northwestern of Turkey was chosen as study area due to hosting important paddy fields providing rice needs of Turkish people. MERB has consisted of 43.4 % of the total area under rice. Water and sediment samples were taken from 4 localities which based on the 4 different water regimes; irrigation from artesian locality A), Meriç River (locality M), Ergene River (locality E), mixed water by Meriç-Ergene Rivers (locality ME). In the area, rice is cultivated and harvesting during an annual cropping season: March–October. The sampling was done in May (spring sampling) and September (autumn sampling) 2016.

The sediment samples were cleaned to remove residuals of stones, roots and the other impurities and dried at room temperature. 1 g dried sediment samples were dispersed in 3ml distilled water and extracted by acid mixture (5 ml HNO_3:2 ml HCL). Then, the solution was filtered with filter paper. The filtered samples were placed into the polyethylene bottles and kept in 4 ºC until heavy metal analyses were done. Before heavy metal analyses, 1 ml $HClO_4$ was added. Concentrations of Cd, Cu, Ni, Mn in the extractants were determined by atomic absorption spectrophotometry. For the water analyses, the acid mixture (5 ml HNO_3:2 ml HCL) and 8 ml distilled water were added in 10 ml water samples. Then, the solution was filtered with filter paper. Before heavy metal analyses, 1 ml $HClO_4$ was added. Concentrations of Cd, Cu, Ni, Mn in the extractants were determined by atomic absorption spectrophotometry. The results were evaluated by statistically using Bray-Curtis similarity index.

As a result, Mn and Cu were found higher than Ni and Cd at the spring sampling for sediment, but for water Mn was the least. At the autumn sampling for sediment Mn was found the highest, but for water Mn and Ni were found lower level than Cu and Cd. At the all localities, sediment included Mn in the highest level. According to the Bray-Curtis index results, localities E (Ergene River which is located in industrial areas) and A (artesian water from underground) were found to have the most similar each other according to their heavy metal contents. This similarity can be explained by the underground waters in the area may contaminated from surface water resources which located in the industrial or agricultural areas.