

## **Effect of molasses-based wastewater irrigation on the rice yield and heavy metals uptake by *Oryza sativa*: A field study**

### **Abstract**

The molasses-based effluent discharge contains significant amount of nutrients (e.g. Fe, Mg, K), which has potential use as an organic fertilizer to fit into the waste-to-wealth plan. Apart from that, the presence of toxic heavy metals content should not be underestimated as it could somehow end up in the rice grains and into the food chains. Thus, in this present work, the concentrations of Al, Cr, Cu and Ni in paddy crops from three different plots irrigated with the molasses-based effluent from an ethanol distillery; Control Plot, Plot 1 (repeatedly irrigated) and Plot 2 (irrigated for the first time) were investigated. All the heavy metals were found to be within the limits indicated by the Food and Agriculture Organization (FAO) for the reuse of wastewater for cultivation, Standard B in the Fifth Schedule, Environmental Quality (Industrial Effluent) Regulations 2009, and the Malaysia Ground Water Quality Standard (MGWQS) for Agricultural 2019 by the Department of Environment Malaysia. The results postulated that the rice yield in Plot 2 was higher compared to the other plots. The study also revealed that the concentrations of the heavy metals in the paddy plants decreased when mobilized from the roots to the rice grains for all sampling plots ( $p < 0.05$ ). The bioconcentration factor (BCF) for Cu and Ni showed the highest values of 2.01 and 4.89, respectively in Plot 1. As the heavy metals concentration in wastewater were within the allowed limit, metals present in the paddy plant parts could be mobilized from the metals readily present in the soil. These results indicated that the molasses-based distillery's effluent could be a source of plant nutrients as the rice yields improved and have potential to be used for paddy irrigation, as long as it is contained from leaching into water reservoirs. © 2023 Author(s).