

# **Assessment of Manganese Contamination and Human Health Risk from Rice Cultivated in South Korea**

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Manganese is an essential trace element necessary for human health. However, excessive intake through food can lead to a variety of neurological issues such as mental disturbances and motor coordination problems. This study evaluates the manganese contamination and its potential health risks in rice, a staple food in South Korea, cultivated in areas contaminated with manganese. The sampling was conducted in September, during the harvest period, where paddy fields were divided into four zones (Area 1-4) based on their proximity to contamination sources. The crops were divided into roots, shoots, and grains before being dried. Wet digestion methods were applied in processing the crops, and the manganese concentration was analyzed using Inductively Coupled Plasma (Optima 7000 DV, Perkin Elmer) at the integrated analytical center for earth and environmental sciences. The Estimated Daily Intake (EDI) was calculated using the manganese concentrations from the sampled crops, and the Hazard Quotient (HQ) was determined based on the EPA's oral reference doses for metals in mg/kg/day. The manganese concentrations in roots and shoots were the highest in region 1 (root: 1240, shoot: 860 mg/kg) and decreased toward region 4 (root: 219, shoot: 615 mg/kg) with grains averaging a concentration of 127 mg/kg. The calculated EDI was 18.97 mg/day/person, with an HQ value of 2.06, indicating a potential risk to human health as it exceeds 1. This study quantitatively assesses the manganese contamination in rice and indicates significant human health risks associated with rice containing high levels of manganese. The findings underscore the need for enhanced management of manganese contamination in rice agricultural environments and raise awareness about the risks of manganese intake through rice consumption.