

Determination of Cadmium Accumulation and Consequent Responses of Four Different Rice Varieties in Sri Lanka

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The heavy metal Cadmium (Cd) is known to be a widespread environmental contaminant in certain parts of the world. Thus, this study was conducted under controlled environmental conditions to identify a Cd tolerant rice variety with low Cd accumulation. The experiment was laid out in Complete Randomized Design with three replicates. Two traditional rice varieties (Pachchaperumal Ac940 and Goda Heenati Ac798) and two new improved rice varieties (Bg 250 and Bg 352) were grown in pots under different soil Cd levels (0.3, 1.5 and 4.5 mg kg⁻¹). The control was maintained without external Cd. The effect of soil Cd on rice plant was measured with respect to plant height, number of tillers, root length, root volume, shoot and root dry weight and flag leaf chlorophyll content. Amount of Cd accumulated in root, stem and leaves were measured using Atomic Absorption Spectrophotometer. For each variety, Accumulation Factor (AF), Bio concentration Factor (BCF) and Translocation Factor (TF) were calculated. At the highest soil Cd level, Pachchaperumal showed a significant increment in root dry weight compared to its control and all other parameters did not show any significant change except the reduction in number of tillers in Bg 250 compared to its control. ($p < 0.05$). The highest Cd accumulation on roots and stem were identified in Pachchaperumal and Goda Heenati, respectively ($p < 0.05$). No significant difference in Cd accumulation was detected in leaves. The lowest AF (0.72 ± 0.29) was found in Bg 352 and hence it can be identified as a Cd excluder ($AF < 1$). TF and BCF of Goda Heenati (0.24 ± 0.13 , 1.0 ± 0.3 , respectively) and Pachchaperumal (0.04 ± 0.02 , 1.0 ± 0.3 , respectively) revealed their potential to be used as a phyto stabilizer ($TF < 1$, $BCF > 1$). Moreover, Pachchaperumal can be identified as the least affected variety in terms of vegetative growth and hence appeared to be tolerant to above tested Cd levels.

Keywords: Atomic absorption spectrophotometer, Cadmium, Cd accumulation, Cd tolerance, Rice