DERMINATION OF CADMIUM ACCUMULATION AND CONSEQUENT RESPONSES OF FOUR DIFFERENT RICE VARIETIES IN SRI LANKA

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ABSTARCT

Cadmium is a heavy metal which is identified as widespread environmental contaminant. Three experiments were conducted to determine the effect of Cadmium on rice. For each experiment, two traditional rice varieties (Pachchaperumal Ac 940 and Goda Heenati Ac 798) and two new improved rice varieties were tested (Bg 250 and Bg 352) under different Cadmium levels (0.3, 1.5, 4.5) mg kg^{-1} as form of $CdCl_2.2½ H_2O$ and control was maintained with absence of external Cadmium. As the first experiment, Germination test was done to determine the effect of Cadmium on seed germination. According to germination test results, germination percentage, germination energy and speed of germination were calculated. Moreover, Radicle length and plumule length were analyzed. As the second experiment, seedling growth performance was evaluated. At the end of the 14^{th} day, seedling height, root length and dry weight of seedlings were measured. Third experiment was a pot experiment in which the effect of soil Cadmium on rice plant was measured with respect to plant height, number of tillers, flag leaf chlorophyll content, root length, root volume, shoot dry weight and root dry weight. The initial Cadmium content of soil was 0.121 mg kg^{-1}. The amount of accumulated Cadmium on root, stem and leaves were measured with Atomic Absorption Spectrophotometer (AAS). Accumulation Factor (AF), Translocation factor (TF) and Bio Concentration Factor (BCF) were analyzed. At the highest soil Cd level, Pachchaperumal showed a significant increment in root dry weight by 108% 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 ($p < 0.05$). Highest Cd accumulation on roots and stem were identified in Pachchaperumal and Goda Heenati, respectively. 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 Pachchperumal (0.04 ± 0.02, 1.0 ± 0.3, respectively) revealed their potential to be used as a phyto stabilizer ($TF < 1$, $BCF > 1$). Moreover, Pachchperumal 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: Cadmium, Atomic Absorption Spectrophotometer, Germination, Cd Accumulation