

Chemical intervention for enhancing growth and reducing grain arsenic accumulation in rice

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Abstract

Arsenic (As) is a ubiquitous environmental carcinogen that enters the human food chain mainly through rice grains. In the present study, we evaluated the potential of thiourea (TU; non-physiological reactive oxygen species scavenger) in mitigating the negative effects of arsenic (As) stress in indica rice variety IR64, with the overall aim to reduce grain As accumulation. At seedling stage, As+TU treatment induced the formation of more numerous and longer crown roots compared with As alone. The significant reduction in As accumulation was observed in As+TU treated seedling, which coincided with light-dependent suppression in the expression levels of aquaporins and photosynthesis-related genes in roots. The foliar-supplemented TU under As-stress maintained reducing redox conditions which decreased the rate of As accumulation to flag leaves and, eventually grain As by 0.53-fold compared with those of As treatment. The agronomic feasibility of TU was validated under naturally As contaminated sites of Nadia (West Bengal, India). The tiller numbers and crop productivity (kg seed/ha) of TU-sprayed plants were increased by 1.5- and 1.18-fold, respectively; while, grain As accumulation was reduced by 0.36-fold compared with those of water-sprayed control. Thus, this study established TU application as a sustainable solution for cultivating rice in As-contaminated field conditions.

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Table-1_Quantification of various agronomic parameters in pot trials.pdf available at <https://authorea.com/users/378442/articles/494938-chemical-intervention-for-enhancing-growth-and-reducing-grain-arsenic-accumulation-in-rice>