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Effects of excess iron (Fe) on seed germination and early-seedling growth of five selected low land rice (*Oryza sativa* L.) varieties

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Fe content varies (470 – 1200 mg/kg) in the soil of the low-country wet zone (LCWZ) of Sri Lanka. Generally, rice plants grow in the presence of 60-300 ppm of Fe levels in soil. Therefore, iron (Fe) toxicity in the soil is one of the major constraints for rice production in the LCWZ. Thus, selection of rice varieties with tolerance to Fe toxicity is considered as a viable solution. However, most of the recommended rice varieties for LCWZ have not been systematically tested against Fe toxicity. In the present study, five recommended rice varieties for LCWZ were tested for the level of Fe tolerance at the germination and the early-seedling stages. Seeds and five-day-old seedlings of five varieties (Ld408, Ld371, Ld 368, Ld365 and Ld355) were exposed to different levels of Fe^{2+} namely 150 ppm (Control), 450 ppm, 650 ppm, 850 ppm, 1050 ppm and 1250 ppm at pH 5.5 for seven days respectively. The experiment was carried out in a modified flow and drain hydroponic system. There was a Fe^{2+} concentration-dependent significant ($P<0.05$) reduction in seed germination of the tested varieties compared to the control experiment. However, varieties Ld408, Ld371 and Ld365 showed more than 80% seed germination rates even at the highest Fe^{2+} concentration (1250 ppm). Therefore, results infer the comparatively higher tolerance in seed germination of Ld408, Ld371 and Ld365 in the presence of high level of Fe^{2+}. Four varieties except Ld368 showed significant increase in the number of roots in all the treatments compared to that in the control experiment. This indicates the presence of root initiation mechanism in those varieties even at the presence of Fe^{2+} in the growth media. The lowest leaf bronzing score (LBS) was reported in Ld408 under all the treatments indicating the presence of shoot tolerance mechanism under excess Fe^{2+}. The overall results infer the varietal-specific negative impact of excess Fe^{2+} on seed germination and seedling growth of rice. Among the tested varieties, Ld408 showed a higher tolerance to excess Fe^{2+} compared to the other four varieties evaluated in the study.

Key words: *Fe toxicity, seed germination, early-seedling, tolerant, low-country wet zone*

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