

**ROOT MORPHOLOGICAL AND ANATOMICAL RESPONSES IN SELECTED RICE
(ORYZA SATIVA L.) VARIETIES AGAINST EXCESS IRON (Fe²⁺)**

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Roots are the primary sensors of toxicity; their responses to excess Fe²⁺ can be used as biomarkers in the selection of Fe²⁺ toxicity tolerance rice varieties. Therefore, this study aimed to analyze root morphological and anatomical responses of selected rice varieties to excess Fe²⁺. Two selected rice varieties from a preliminary study as tolerant (Ld408) and susceptible (Ld365) to excess Fe²⁺ were examined for morphological and anatomical responses. Seven-day old seedlings of both varieties were exposed to different levels of Fe²⁺ [150 mg l⁻¹ (control), 450 mg l⁻¹, 650 mg l⁻¹, 850 mg l⁻¹, 1,050 mg l⁻¹ and 1,250 mg l⁻¹] at pH 5.5 for seven days. The experiment was carried out in a modified flood and drain hydroponic system according to the randomized block design (RBD). The number of roots and length of the roots per plant were recorded, and the fully developed air channels in the root cortex were counted in the cross sections of the roots under the high power of the trinocular compound microscope. Data were analyzed by two-way ANOVA followed by Tukey's posthoc test using statistical software MINITAB 17. Ld365 showed a significant (p<0.050) reduction in the number of air channels in the tested Fe²⁺ levels higher than 650 mg l⁻¹. In contrast to Ld365, Ld408 showed Fe²⁺ level-dependent significant increase (p<0.050) in the number of fully developed air channels in the root cortex. This indicates a high root oxidation power in tolerant plants in order to form an iron plaque as a defence mechanism against excess Fe²⁺ uptake. Both varieties showed a significant (p<0.050) increase in root number with Fe²⁺ stress. Comparatively, a higher number of roots was exhibited by Ld408 in all treatments compared to Ld365, suggesting a higher oxidation power of roots in Ld408. However, Ld365 reported a significant (p<0.050) reduction in root length compared to Ld408 against Fe²⁺ toxicity indicating a reduction of root growth in Ld365 under excess Fe²⁺. Overall results inferred that morphological and anatomical responses of rice roots are variety-specific in response to Fe²⁺ stress.

Keywords: Anatomical responses, Fe²⁺ toxicity, Morphological responses, Ld365, Ld408