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DOES OXIDIZING POWER OF ROOTS AFFECT THE IRON TOXICITY TOLERANCE OF RICE?

Y. U. C. Wijerathna[1], W. S. Dandeniya[1], Y. J. P. K. Mithrasena[2]

[1]Department of Soil Science, Faculty of Agriculture, University of Peradeniya
[2]Regional Rice Research and Development Center, Bombuwela

Iron toxicity decreases the average rice yield in the low country wet zone of Sri Lanka from its potential of 10 t ha^{-1} to 2.5 t ha^{-1}. Management of iron toxic soils will not be successful until a clear understanding of the mechanisms to tolerate iron toxicity is gained. A study was conducted with the aim of determining the effect of the oxidizing power of roots on iron toxicity tolerance by rice.

Three varieties of rice with varying iron toxicity tolerance were used in an experiment conducted at the Regional Rice Research and Developing Centre, Bombuwela. The varieties were Bw 267-3 (tolerant), Bw 272-6b (susceptible) and Bw 363 (moderately tolerant). Rice seedlings were grown in a nursery maintaining aseptic conditions. To test the iron toxicity tolerance by rice varieties 21 day-old seedlings were transplanted in sand culture maintained at saturated condition and enriched with three iron treatments; 0, 75 and 300 ppm of Fe^{2+} supplied as $FeSO_4.7H_2O$ in four replicates. Plants were irrigated with standard IRRI solution with the respective iron treatment twice a week until 40 days after germination (DAG). At 40 DAG plants were uprooted and oven dry weights, shoot Fe, P and K contents were measured. Potential rhizosphere oxidizing power of three rice varieties was assessed following the method suggested by Trolldenier (1987). Analysis of variance was done to determine the significance of treatment effects and LSD was used for mean separation.

At 40 DAG, the biomass production decreased by nearly 50% with increasing iron levels from 0 to 300 ppm in all three varieties. Bw 272-6b showed iron toxicity symptoms and higher tissue Fe^{2+} contents than the tolerant varieties but Fe^{2+} levels were not significantly different ($p<0.05$). There was a significant interaction between variety and iron treatment on nutrient uptake by rice ($p<0.05$). Oxidizing power of roots as indicated by the width of the clearing zone was significantly different among varieties. Tolerant Bw 267-3, had the highest oxidation potential (5.3±0.9 cm) followed by moderately tolerant Bw 363 (3.7±0.9 cm) and susceptible Bw 272-6b (2.5±0.6 cm). Hence, there is a positive relationship between oxidizing power of roots and iron toxicity tolerance.

Even though the results from the present work suggest the use of oxidizing power of roots as a potential parameter for *in* vitro screening of a large number of rice varieties for iron toxicity tolerance, further studies with a larger germplasm with varying iron toxicity tolerance is recommended.