

Using Leaf Bronzing Score to Assess Iron Toxicity Tolerance in Lowland Rice**Siriwardana K.G.D.I.¹, Weerasinghe W.D.P.¹, Chandrasekara K.K.D.¹,
Rupasinghe M.G.N.¹, Palliyaguru N.P.K.¹, Priyantha G.D.A.¹, Wijesinghe M.R.²**¹*Regional Rice Research and Development Centre, Bombuwela, Sri Lanka*²*Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka***mayuri@sci.cmb.ac.lk***Abstract**

Iron toxicity is recognized as one of the most widespread soil constraints for rice production, particularly in the Low Country Wet Zone (LCWZ) of Sri Lanka. Underwater logged conditions, soluble iron present in the soil solution is absorbed by paddy roots and is accumulated in the leaves, resulting in poor plant growth, lowering of tillers and severe yield reductions. These characteristics are often accompanied by apparent leaf discoloration or bronzing. The aim of this study was to assess the use of the Leaf Bronzing Score (LBS) to assess its suitability as an indicator of Fe toxicity tolerance/susceptibility. The suitability of LBS of the rice varieties were monitored against the grain yields of each tested variety. This simple and practical approach will result in identifying promising rice varieties that could be used in breeding programs aimed at improving iron toxicity tolerance. The experiment was carried out in the *Maha* seasons of 2017/2018, at the research field of the Regional Rice Research and Development Center (RRRDC), Bombuwala, located in the LCWZ. The selected location consisted of sandy loam which had a relatively high level of total Fe (589.0 ± 16.51 ppm) and acidity ($\text{pH}: 4.47 \pm 0.20$). Three rice varieties of unknown iron tolerance, and a further two varieties of known tolerance/susceptible traits, were used as test entries. Varieties were arranged in the field in a Randomised Complete Block Design (RCBD), with three replicates. The Leaf Bronzing Scores (LBS) were determined at different stages of growth while the grain yields were determined at maturity. Observations revealed that there were significant differences in the LBS values between the tested varieties across the different stages of growth. The varieties Kahata Wee and Bw267-3 were the most tolerant as indicated by the lowest LBS value (LBS-1), followed by Bw372 and Bw360. The highest LBS value was recorded in Bw272-6b (LBS-7), indicating its susceptible nature. The grain yield of the five varieties also differed significantly (one-way Anova: $F=18843.034$, $p<0.05$). Three rice varieties (Kahata Wee, Bw372, Bw360) consistently recorded higher yields than the other two. The highest grain yield (9.9145 t/ha) was recorded in Kahata Wee, followed by Bw372 (5.1086 t/ha) and Bw360 (4.0462 t/ha). The lowest grain yield of 1.9968 t/ha was recorded in Bw267-3. The trends further showed that the LBS values were negatively correlated with grain yield (Regression Analysis: $R^2=14\%$, $F=2.112$, $p<0.05$). This observation indicates that the Leaf Bronzing Score could be used as a simple trait to detect iron toxicity tolerance in rice varieties.

Keywords: Iron toxicity, Leaf bronzing score, Grain yield, Low country wet zone