UNIVERSITI TEKNOLOGI MARA

MORPHOLOGICAL CHARACTERIZATION OF WATER STRESS AND ISSR GENETIC DIVERSITY ASSESSMENT OF SELECTED IONIC RADIATION INDUCED MUTANT *Oryza sativa* LINES

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ABSTRACT

The effects of ionic radiation on MR219 Malaysian rice variety were assessed by characterising morphological variances under different water stress treatments. Three third mutant generation (M3) ionic mutant rice lines ML-3, ML-10 and ML-30 were tested under lowest (T1), moderate (T2), and highest water stress treatment (T3). Results indicated ML-30 performed significantly higher in terms of 100 grain weight and grain weight per plant in all three water stress treatments, while had similar performances compared to other rice lines in terms of flag leaf length, leaf length, number of leaves per plant, panicle length, number of panicles per plant and plant height. ML-30 was observed to performed significantly lower in terms of flag leaf width under the severest water stress treatment (T3). Genetic diversity assessment was conducted using MR219, MR219-4, Mardi Aerobic Rice (MRIA), ML-3, ML-10 and ML-30 by using 11 Inter-Simple Sequence Repeats (ISSR) primers. The average polymorphism produced by the 11 ISSR primers was 53.66%, which indicated high informativeness. Clustering analysis indicated that the mutant rice lines were differentiated genetically compared to their parental rice variety MR219, as evident by the construction of group A which consisted by only MR219 and group B which was occupied by other mutant rice lines. ML-30 and MRIA were clustered together in cluster II with high similarity (0.808), while MR219-4 was differentiated from the ML-3 and ML-30 with low similarity value of 0.707. ML-30 had potential to perform positively under water stress conditions, evident by the significantly higher 100-grain weights and grain weight per plant under all water stress treatments, and similar clustering with the aerobic rice variety MRIA. In conclusion, ionic radiation was proven to be effective in producing drought tolerant mutant lines. Ionic radiation also had an unexpected reaction that may produce susceptibility to water submergence in ML-30 line. The recommendations include increasing the number of ISSR primers, incorporate other genetic marker systems, and include biochemical analyses.

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