

Evaluation of Salt Tolerance in Sorghum (*Sorghum bicolor* L.) Mutant Population

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Sorghum (*Sorghum bicolor* L.) is a promising biomass crop with a high lignocellulose content. This study aimed to select high salt-tolerance sorghum lines for cultivation on reclaimed land. Using 7-day seedlings of the sorghum population consisted of 71 radiation-derived mutants (M₂ to M₆) and 33 genetic resources, survival rate (SR), plant height (PH), root length (RL), fresh weight (FW), and chlorophyll content (CC) were measured for two weeks after 102 mM (0.6%) NaCl treatment. Furthermore, the characteristics of the sorghum population were confirmed using correlation analysis, PCA (principal component analysis), and the FCE (fuzzy comprehensive evaluation) method. Under 102 mM NaCl conditions, SR ranged from 4.9 (IS645-200-6) to 82.4% (KLS079125-200-1), with an average of 49.9%. PH varied from 7.5 (Mesusu-100-2) to 33.2 cm (DINE-A-MITE-100-2-10), with an average of 20.4 cm. RL ranged from 1.0 (IS645-200-1) to 17.0 cm (30-100-2), with an average of 7.7 cm. FW varied from 0.1 (IS645-200-6) to 4.5 g/plant (DINE-A-MITE-100-2-10), with an average of 2.1 g/plant. CC ranged from 0.9 (DINE-A-MITE-100-2-2) to 3.1 mg/g (IS12937), with an average of 1.7 mg/g. An overall positive correlation, with SR and FW ($r = 0.86$, $P < 0.01$), and FW and CC ($r = 0.79$, $P < 0.01$), was shown by correlation analysis. Among the five traits, two principal components were extracted by PCA analysis. PC1 was significantly associated with FW, while PC2 was highly involved with RL. To evaluate the salt tolerance level of the sorghum population when an FCE based on trait data was performed, MFV (membership function value) was 0.68. As a result of compiling the MFV of each line, eight lines with MFV > 0.68 were selected. Ultimately, the radiation-derived mutant lines, DINE-A-MITE-100-2-10 and DINE-A-MITE-100-2-12 were selected as salt-tolerant sorghum lines. The results are expected to inform salt-tolerant sorghum breeding programs, and the high salt-tolerance sorghum lines might be advantageous for cultivation on reclaimed land.

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