

Effect of diethyl sulphate and sodium azide on tolerance of ex vitro banana to salt stress

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Abstract : Banana is a cash crop sensitive to the salinity and problem increases by water shortage especially in arid and semi-arid regions and this can severely limit plant growth and productivity. The aim of current study was to develop mutants of banana Grande Nain cv. tolerant to salinity stress. In vitro shoots of banana Grande Nain cv. were treated with different concentrations of diethyl sulphate (DES) and sodium azide (NaN_3) during the multiplication stage (in the third subculture) and then with NaCl in the rooting stage. After then, the transplanted banana was more stressed by adding the sea water to the irrigation water every time for 6 months. Three factors were investigated in this study, mutagen type, concentrations plus duration and salinity levels. The recorded vegetative growth parameters after six months in acclimatization stage showed that DES had less negative impact on the vegetative growth parameters than NaN_3 . In addition, the low concentration of DES and NaN_3 gave healthy ex vitro plants of 22.88 and 21.60 cm as plant height/plant, 5.78 and 7.00 as number of leaves/plant, 24.62 and 21.80 cm² as leaf area, 5.22 and 6.89 as number of roots/plant, and 7.31 and 2.98 cm as pseudostem circumference respectively at all duration periods. However, using the high concentration of DES (400 μM) and NaN_3 (8 μM) produced the most viable plants at 10 min. Concerning the effect of salinity levels in the greenhouse, all measured growth parameters decreased by increasing salinity levels. There was a great variance regarding the double interactions between the three studied factors, but the triple interaction among the three factors indicated that DES at 100 and 200 μM for 10, 20 or 30 min as well as at 400 μM for 10 or 20 min with all studied salinity levels produced the best results when compared with the other treatments. Also, a fingerprinting based on ISSR was used to detect any genetic variation occurred in the stressed plants. Using different mutagens under different salinity levels, on the other hand, led to induce a great effects in terms of ions accumulation (K^+ and Na^+) and proline contents. According to PCR-ISSR and SDS-PAGE test results; there were genetic variations in the stressed plants as a result to use DES mutagen. This study could be a base to use diluted sea water in irrigating banana plants produced from in vitro culture and treated with DES mutagens.

Key words: Banana cv. Grande Nain, diethyl sulphate, DES, Sodium azide, NaN_3 , mutagens, salinity, vegetative growth, ISSR.
