Improved Root Growth in Salt-Tolerant Alfalfa (*Medicago Sativa* L.) Selections

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Abstract

Alfalfa (*Medicago sativa* L.) is an important forage legume crop worldwide that is relatively susceptible to soil salinity. Improved cultivars with high biomass production on saline soil will profit many land managers. This study reports biomass production of three experimental alfalfa half-sib families, HS-A, HS-B and HS-C that were developed in a greenhouse selection for survival under high saline conditions. Six-week-old seedlings were subjected to salinity treatment by dipping roots in a NaCl-nutrient solution starting at an electrical conductivity (EC) of 3.0 dS m^{-1}. The treatment was continued for four weeks with an incremental increase of 3.0 dS m^{-1} per week of the salt solution, reaching 12.0 dS m^{-1} in the fourth week. HS-A and HS-B showed greater shoot dry biomass production, 47% and 63%, respectively, compared to their parental lines under salinity, while HS-C showed no difference in dry weight accumulation from its parental lines. Root dry weight, however, was greater in all three half-sib families, showing a 30%, 47% and 50% increases for HS-A, HS-B and HS-C, respectively, compared to their parental lines. Root/shoot dry weight ratio was not affected by salinity treatment in parental lines but increased in all the salt-tolerant half-sib families. Salinity treatment resulted in browning of the roots regardless of genetic backgrounds. The selected half-sib families, however, showed larger and more branched root systems compared to their parental lines after salt treatment. These results indicate that root growth of the selected half-sib families is less sensitive to salinity stress and suggest that an increase in root/shoot ratio may be important for overall salinity tolerance of these plants.