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Effects of NaCl-induced Salinity on Seedlings Growth of *Ziziphus spina-christi* Willd.: A Wild Fruit Tree Species

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Abstract

Ziziphus spina-christi is a fruit tree that grows wild in arid and semi-arid areas of Pakistan and Sudan. The fruits, leaves, bark and the wood are intensively used by the rural population. Increasing soil salinity is one of the major abiotic factors threatening plant production in these regions. Planting of indigenous trees such as *Z. spina-christi* could therefore play an important role to productively use barren land.

A pot experiment under controlled environmental conditions was conducted to determine the response of *Z. spina-christi* to salt stress. Six weeks old seedlings were initially subjected to 0, 20, 40 and 80 mM NaCl (added to a Hoagland solution). After four weeks salt treatments were doubled (0, 40, 80 and 160 mM) to detect increase the level of stress.

Salinity levels of 80 and 160 mM resulted in a reduction of more than 50% in plant height, leaf number, leaf chlorophyll content, total leaf area and dry matter as compared to the control. Leaf tissues accumulated 81- and 21-fold higher Na⁺ and Cl⁻ concentration as compared to the control at 160 mM, respectively. Excessive accumulation of salt ions in leaf tissues resulted in a remarkable foliar deterioration (chlorosis and necrosis) and 20% seedlings mortality due to ion toxicity. Enhanced salinity increased leaf water contents by 14, 16 and 17% at 40, 80 and 160 mM, respectively. At the same time, the K⁺/Na⁺ ratio was barely affected by the different salt levels indicating an effective adaptation to tolerate low or moderate NaCl salinity.

Overall, our results allow to classify *Z. spina-christi* seedlings as moderate salt tolerant.

Keywords: Afforestation, NaCl salinity, neglected fruit species, seedling growth