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Growth, Gas Exchange and Ion Uptake of *Tamarindus indica* Seedlings under Salt Stress

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Abstract

In many parts of Sudan the degradation of agricultural land is becoming a more and more severe problem. One of the main factors is soil salinity. Tamarind (*Tamarindus indica*) is a native tree species within the savannah belt of Sudan. The tree is very well known and its fruits are intensively used by the rural population. Previous investigations indicate that tamarind is more or less salt tolerant.

To investigate the response of *T. indica* seedlings to salt stress an experiment was conducted in the greenhouse of the Department of Fruit Science in Berlin. Four-week old seedlings were grown in sand culture and treated with different salt solutions. Treatments were prepared by adding 0, 20, 40, 60 and 80 mM NaCl to the nutrient solution. 50 seedlings were put under stress for a time of 20 weeks under controlled environmental conditions (n = 10).

Plant growth was affected by the salt treatments. In the 40 mM NaCl variant, the reduction of fresh and dry weight was less than 50% after the 20 weeks in comparison to control plants. Foliar injuries (necrosis) did not appear within all salt treatments. Only leaf yellowing were frequently observed in the 60 and 80 mM treatments. However, with increasing salinity levels, leaf moisture content increased, indicating a salt-induced leaf succulence. Increased NaCl salinity decreased the photosynthetic rate as a function of time. After 20 weeks, plants treated with 20, 40, 60 or 80 mM NaCl exhibited a 34%, 50%, 75% and 91% drop in photosynthesis rate compared to the control. The decrease in photosynthesis was probably due to a diminished stomatal conductance and a degradation of chlorophyll content. Chlorophyll content of leaves at higher salinity levels was lower than at lower salinity levels. Raising NaCl levels in the irrigation solution increased Na⁺ and Cl⁻ concentrations in the plant tissue. Leaf Cl⁻ concentration was much higher than Na⁺ concentration.

The results have shown that *Tamarindus indica* seedlings tolerated a salinity level of 40 mM NaCl. This indicates that in the seedlings stage tamarind is a fairly salt tolerant tree species compared to other fruit trees.

Keywords: Physiology, salinity, tamarind, *Tamarindus indica*