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Ecophysiological Responses of *Chenopodium quinoa* to NaCl Salinity

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Abstract

Quinoa (*Chenopodium quinoa* Willd), which is also called 'mother grain', is an important food crop in the Andes of South America and has been cultivated there for over 5000 years.

Its seeds have an exceptionally well balanced amino acid profile and they are high in vitamins and minerals. Even the NASA considered it as a potential crop for their Controlled Ecological Life Support System and the demand, especially in the United States of America is rising.

Quinoa shows resistance to adverse abiotic factors like drought and cold. However there is still not much known about its ability to cope with saline soils although the family Chenopodiaceae contains several halophytic species like *Atriplex nummularia* or *Chenopodium maritimum*.

The aim of the present study was to investigate the adjustment of this plant during the increment of the soil salinity. Plants were grown in a quick check system and final NaCl concentrations were 100 mM NaCl (0,6 %)and 300 mM NaCl (1,8 %).

Growth, water relations, CO_2/H_2O gas-exchange, ion- and protein composition were measured to study the major contraints of NaCl salinity.

100 mM NaCl lead to a transient increase of the growth. The growth reduction at higher salinities depended much on the period of time over which the plants have grown under these conditions. The data are consistent with the concept of two - phase growth response to salinity. In the first phase CO_2/H_2O gas-exchange decreased due to water stress or osmotic phase.

In the second phase at high salinity, salt was accumulated in transpiring leaves for osmotic adjustment (includer mechanism). Simultaneously the CO_2-concentrations in the intercellulars decreased and high light intensities lead to oxidative stress. This was shown by the rising concentration of detoxifying enzymes in the high salinity treatment.

As a consequence of our study we recommend to extend the use of *C. quinoa* to deserted and saline regions (semi-arid), where the water quality (medium salinity) and availability hinder the growth of other conventional crops.

Keywords: *Chenopodium quinoa*, drought, NaCl, osmotic adjustment, oxidative stress, proteomics, salinity, two-phase growth response

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