



Deutscher Tropentag, October 11-13, 2005, Hohenheim

“The Global Food & Product Chain—  
Dynamics, Innovations, Conflicts, Strategies”

## Influence of the N-Fertilisation on the Drought Tolerance of *Chenopodium quinoa* Willd.

ALBERTO DOMÍNGUEZ ESCODA<sup>1</sup>, LUIS BALAGUER NÚÑEZ<sup>2</sup>, HANS-WERNER KOYRO<sup>1</sup>

<sup>1</sup>Justus-Liebig-University Giessen, Institute for Plant Ecology, Germany

<sup>2</sup>Universidad Complutense de Madrid, Department of Plant Biology I, Spain

### Abstract

*Chenopodium quinoa* is an old crop from the Inca civilisation. Its seeds have a huge nutritional value and have the potential to become a “supergrain”. Due to the low nutrient requirements of quinoa, it is able to grow to higher altitudes, in scanty and stony habitats.

One aim of this study was to understand how it can manage to develop at nitrogen-poor soils. Nitrogen, one of the most important nutrients, presents limited availability, especially in arid and semi-arid regions of many parts of the world, where water and nutrient supply will be in future (or are already) the major growth limiting constraints. There is an essential need to find new crops that are able to sustain periods of low precipitation in oligotrophic soils.

Quinoa is known to be drought tolerant. We studied adaptative strategies to a combined deficiency of water and nitrogen to determine its potential to grow under these conditions. Plants were grown at three nitrogen levels (1, 6 and 26 mM). After two weeks the cultures were split into these treatments, control and drought. Drought stress was applied by decreasing constant (highly controlled) and slowly the content of soil water (from 25 % to 5 %).

The nitrogen supply correlates as expected with the biomass production. Additionally, morphological and osmotic changes were related to a decreasing soil water potential. However, water use efficiency and net photosynthesis were at the same time affected by drought stress, especially in plants with bigger leaf surfaces and growth rates (high-N-treatments). Stomatal resistance increased generally at all drought conditions.

It has been shown that the “Corn of the Andes” is highly drought tolerant even with low nitrogen situations. It is most suitable to grow in extreme environments, such as deserts and mountainous regions. Unfortunately, the potential of this useful alternative crop is by far not exploited.

**Keywords:** Crop, drought, fertiliser, nitrogen, quinoa, water stress