Transnational Access Report

1. General Information

Project Acronym (ID):	WHEAT_N_SHOOT
Project Title	Genotype-dependent interactive effects of nitrogen and water supply on wheat growth and productivity under greenhouse conditions
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2. Project summary (max. 250 words)

Water supply together with N availability is among the major abiotic factors that affect agricultural productivity of important crop species, including wheat, worldwide. Drought stress influences the normal physiology and growth of plants, which can be alleviated by better plant nutrition that activates physiological, biochemical and metabolic processes. On the other hand, under low soil nutrient concentrations plants have to increase water absorption to be able to take up the same amount of mineral nutrients for their metabolism than they would from soil with satisfactory fertility. As a consequence in conditions of water limitation, plants are unable to get optimal amounts of nutrients, which have negative effects on their growth and seed quality. Details of the complex interaction of these two important environmental factors are not yet understood in detail.

The objectives of the project were:

(i) To use the HAS-Shoot Stress Diagnostic System to analyze the combined effects of drought stress and nitrogen nutrition on wheat growth and development.
(ii) To find out in which extent N nutrition can alleviate adverse effects of drought stress in wheat.
(iii) To identify genotypes in which water-use efficiency and N-use efficiency are well combined.

3. Main achievements (max. 250 words)

A general feature of N limitation was a retardation of total shoot biomass. This effect was observed both under well watered and water-limited conditions. In well watered plants N limitation had a similar effect on biomass retardation as the decrease of field capacity from 60 to 20 %. Similar effect was observed in case of the seed parameters. Combination of drought stress and N limitation enhanced the effect of these stress factors relative to their separate applications. However, in case of Siete Cerros the N limitation under drought stressed conditions had only a small additional effect, which occurs also in case of seed production. Based on our N limitation generally enhances the adverse consequences of drought stress with the exception of Siete Cerros. Plant height was less sensitive to decreased water and N amount than biomass and seed production. The new cultivar NS Avangarda shows a good level of tolerance against water and N limitation. Water use efficiency was significantly decreased by N limitation in well watered conditions and also in drought stressed plants. This shows that under N-limitation wheat plants have decreased capacity to use soil water, which could be an important factor in the enhancement of the drought stress. Interestingly, in case of two cultivars (NS Avangarda and Siete Cerros) the water use efficiency at the level of seed production was not affected by N limitation under drought stress. These cultivars could be potential candidates for production under conditions when drought and N limitation are combined.