Transnational Access Report

1. General Information

Project Acronym (ID):	MAIZE_ABI_STRESS
Project Title	Morpho-physiological responses of maize inbred lines to limited water and nitrogen supply during mid-growth stages
Name of Group Leader	Dr. Dejan Dodig
Name of organization	Maize Research Institute ZemunPolje

2. Duration of access

Begin of the project: 24.09.2015	End of the project: 23.11.2015

4. Project summary (max. 250 words)

Twenty maize inbred lines (15 tolerant and five susceptible to drought stress) have been chosen for the experiment. These genotypes were previosly tested for grain yield under drought stress field conditions at reproductive growth stage and classified as tolerant or susceptible. After entering the V6 growth stage (collar of 6th leaf visible) plants were entered the high-throughput imaging system for one week acclimatization and then subjected to single and combined water and nitrogen stress (four weeks). In addition to image-based traits available at IPK-APPP, the following traits were scored manually: leaf number, leaf chlorophyll content, leaf rolling, leaf relative water content and fresh and dry biomass. Water use efficiency (by dividing dry biomass at the end of the experiment by the total amount of water added during four weeks) and N use efficiency (by dividing dry biomass at the end of the experiment by the total amount of N added during four weeks) will be also calculated. Our specific objectives were to analyze the single and combined effects of water supply and nitrogen availability on maize growth and development, as well to identify inbreds in which water- and N-use efficiency is well combined. It is also of special interest to complement shoot phenotype developmental characteristics at vegetative stage inferred by IPK automated facilities with our previous field measurments at reproductive stage (grain yield) and marker scores. It is expected that results will be implemented in maize breeding programs and help in creation of drought tolerant maize hybrids.

6. Main achievements (max. 250 words)

The project implementation allowed automated phenotyping characterization of twenty maize inbred lines, previously screened in the field conditions, using a LemnaTec platform. The LemnaTec system enabled visual imaging and gathered data on a number of traits (such as plant geometric traits and color-related properties), as well as fluorescence and NIR-related parameters. Using controlled greenhouse and IPK-APPN system conditions we were able to screen our material in a more precise (controlling water and nitrogen supply, and time of stress occurrence) and dynamic (every day imaging) way compared to field where conditions are more variable (time and spatial variation) and sampling is usually destructive (allowing only one measurement). The phenotypic analysis was also performed by direct visual (leaf counting and leaf rolling) or device (chlorophyll content by SPAD meter) screening of the plants. The preliminary results evidenced a relationship between imposed stresses and performance of the analyzed maize inbred lines. The ranking of stress impact on the plants (averaged across all genotypes) according to leaf developments and chlorophyll content was as follows: water + nitrogen stress > water stress > nitrogen stress > no stress. The manually collected data (including leaf relative water content as indicator of plant water status) is also useful for comparing with digital derived counterpart trait. Collected data may yield valuable information on the relationship between drought tolerance in maize at earlier (vegetative) stage of development and drought tolerance at later (reproductive) stage.