PROJECT TITLE

Association of roots with grain yield under variable moisture availability in winter and spring wheat

CONSORTIUM

P 1	Alexey Morgunov		
P 2	Ibrahim Ozturk		
P 3	Sergey Shepelev		

SUMMARY OF THE REPORT

Wheat is a major food crop in the region of Central and West Asia. There are two regions of crop cultivation are in the region: winter wheat belt from Turkey to Iran and Central Asia and spring wheat in Northern Kazakhstan and Western Siberia. In both regions drought represents a major challenge to yield stability. There are two on-going experiments in both regions to identify the role of roots in drought tolerance. Winter wheat experiment in Konya (Turkey) with 50 genotypes grown in 2017-2018 and 2018-2019 seasons under irrigated and rainfed conditions side by side. Root traits (length, area, diameter, number of tips and forks) were phenotyped after flowering in June, 2018 and agronomic traits were collected. It is repeated in 2019. Spring wheat experiment was conducted in Omsk (Russia) in 2017 and 2018 with 50 genotypes representing local material, US germplasm and primary hexaploid synthetics. The same root parameters and agronomic traits as in winter wheat were recorded. In addition KASP markers for important adaptation genes (*Vrn*, *Rht*, *Ppd*, published QTLs for grain yield, kernel weight, roots, etc) have been determined. The project conducted precision roots phenotyping of winter and spring wheat panels at Aeroponics Facility, Universite Catholique de Louvain, Belgium. The phenotyping installation has been designed to estimate the rate of formation, the rate of growth and the initial growing angle of the various root types. These variables are the main parameters of root system architecture andable to capture the variation of the drivers of root system in the absence of mechanical impedance and water deficit. At the time of report preparation not all the data, generated during phenotyping, has been processed yet. Special software is being used to process the images and extract the root traits which can be used to describe the root system development. For this reason, we used the data for the roots and shoots weight as well as the assumptions on data to be obtained after the images processing.The main project achievements are: A) Two young researchers from Turkey and Russia were trained on aeroponics precision root phenotyping. B) For the roots and shoots weight (both fresh and dry) spring wheat generally was more superior comparing to winter wheat. C) For spring wheat early Russian varieties and early CIMMYT synthetics had higher roots and shoot weight compared to other groups. Japanese synthetics has the lowest roots and shoots weight. D) For spring wheat we identified positive significant correlation between the dry roots weights evaluated in Aeroponics Experiment and grain yield in the field demonstrating usefulness of plants phenotyping in early stages. E) Further analysis and relationships will be conducted once the images are processes to develop root traits. F) The visit to EPPN facility at Universite Catholique de Louvain, Belgium allowed to establish cooperation which may develop in future collaborative projects and studies.