PROJECT TITLE

Drought effects on roots developmental aspects in spring barley population differentiated in the sdw1/denso locus

CONSORTIUM

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SUMMARY OF THE REPORT

Drought is one of the main abiotic factor limiting plants productivity and the recognition of dynamic traits of root system under constrained conditions is a great of importance. The aim of the study was to characterize growth dynamic and architecture of spring barley roots and their modifications induced by temporal water scarcity. Imagining platform was provided by ALSIA Metapontum Agrobios Research Center (Italy). Plant material consisted of 100 recombinant inbred lines (RILs, F_{12}) of spring barley developed through hybrids: European cv. Maresi and Syrian breeding line CamB1 with increased resistance to drought. Besides, cv. Bowman and its near isogenic lines (NILs) BW827 (*sdw1.a*) and BW828 (*sdw1.d*) were included as reference genotypes for discovering the effect of *sdw1/denso* locus on roots phenotype of barley semi-dwarf plants. Five seeds for each genotype were sown into a plexiglass space out at 120° in triplicate. The plexiglas tubes was 8 cm in diameter, 50 cm in length and contain 2.5 L of substrate (50:50 mixture of peat and river sand). Before filling the tube with the soil substrate a permeable sheath was placed against the inner tube wall, seeds were placed between the tube wall and the seath. Altogether 315 rhizotubes were used in the expermient. Water shortage was applied to young seedlings (21 days after sowing) and maintained for 14 days. Soil moisture was controlled by automated weighing system on the platform, and water was supplemented manually if needed to keep the full field capacity (FC) and not exceed 40% FC in well-watered and stress conditions, respectively. Imaging started before stress application and was continued during the water shortage and after re-watering (44 days in total). Each tube was imaged sequentially employing a special near infrared (NIR) sensor for root activity (Fig.1) and RGB camera (Fig. 2). This allowed to evaluate i.a. total root biomass, dynamic of root growth, and root biomass distribution. Imagined data were collected continuously and recorded in one snapshot per run through the scanalyzer3D, producing several hundred data points per tube and run. In the final step plants were harvested and total green biomass were measured – enabling the calculation of shoot/root ratio. The image analysis pipeline using LemnaGrid and LemnaMiner software was reported in detail by Marko et al. (2018). Provided studies will be integrated with the dataset obtained previously in our projects (e.g. SNP genotyping). This will give a complex knowledge about spring barley response to water shortage at the whole plant level. Moreover, the effects of the semi-dwarf *sdw1/denso* locus on roots triats under water shortage was investigated for the first time. Promisingly, genotypes selected in the project by imagining-based screening, which were characterized by favorable root traits can be used as genetic resources for modern cultivars development with improved resistance to drought in the future.

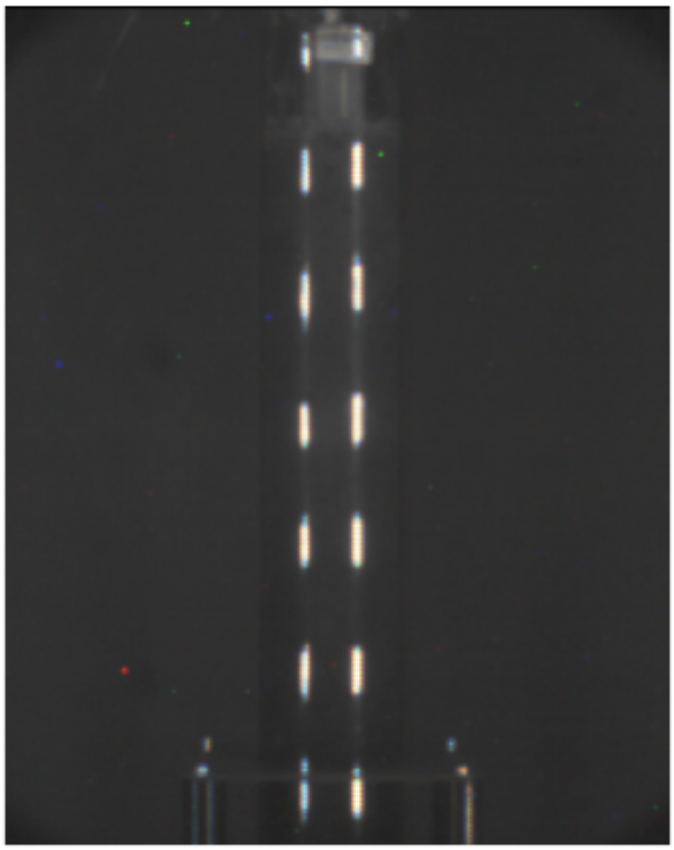

Fig. 1. Image of soil in the Plexiglass tube using NIR sensor for soil water content determination

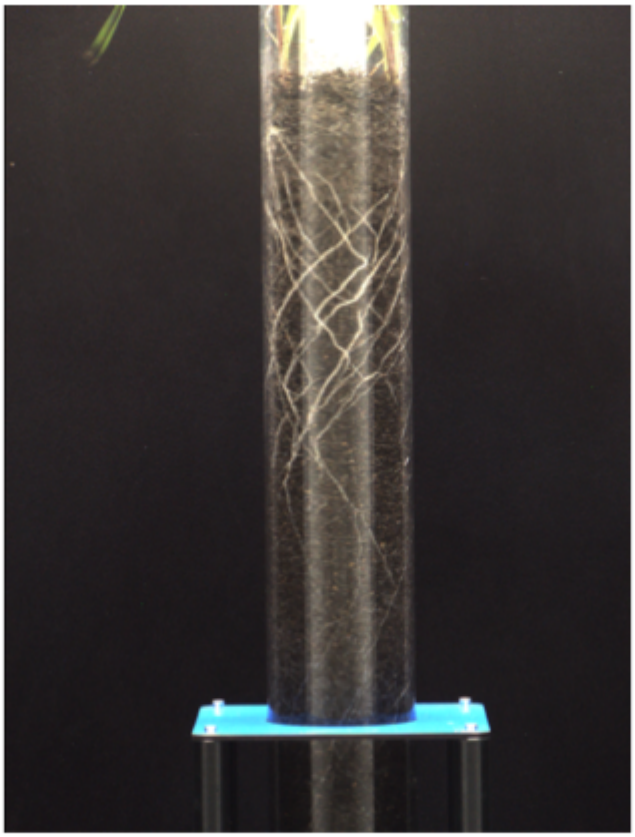

Fig. 2. Image of root biomass visible in the Plexiglas tube at the end of the experiment