

Transnational Access Report

1. General Information

Project Acronym (ID):	PHEMELENS	
Project Title	Phenotypic and metabolic responses to drought and salinity of four lentil genotypes	
Name of Group Leader	Prof.ssa Muscolo Adele	
Name of organization	Mediterranea University of Reggio Calabria Italy	

2. Access to the Installation

IPK-MP and IPK-APPP

3. Project summary (max. 250 words)

The aim of this project was to identify morphological, physiological, and metabolic traits associated with drought and salinity stress tolerance in different cultivars of Lentil (4 genotypes). Our specific objectives were: 1. Selecting lentil genotypes better adapted to specific stresses; 2. Characterizing the plant material both at phenotypic and metabolic levels. Selecting cultivars with diverse physiological responses to stress provides an option to growers in different environment constraints. Combinations of growth chamber and laboratory-based approaches were needed to find a relationship between imposed stresses and plant performance. As stress tolerance mechanisms differ between seed and seedling growth stages, we evaluated the effects of both stresses on seed germination and seedling growth to identify the most sensitive growth stage of the different cultivars. The novel phenotyping system named small plant phenotyping module has been used as it is capable to deliver simultaneously quantitative information on germination, shoot development, and plant performances. The research was conducted using four different cultivars of lentils: Pantelleria and Ustica, native and cultivated in the homonymous small islands close to Sicily, (Southern Italy), Castelluccio di Norcia, a local population cultivated in Umbria region (Central Italy), and Eston, a Canadian commercial variety. Each lentil genotype was subjected to 3 conditions: Control (non-stressed seeds and seedlings), drought, and salinity (both at an iso-osmotic potential of -0.88 MPa). We investigated 2 growth stages (72 h germinating seeds and 3 week old seedlings).

4. Main achievements (max. 250 words)

The results evidenced a relationship between imposed stresses and performance of the lentil cultivars analyzed. The ranking of genotype resistance/susceptibility according to germination studies was as follows: NaCl resistant > susceptible: PAN > UST > CAST > Eston; PEG resistant > susceptible: CAST > UST > Eston > PAN. The data on seedlings from automated image analysis report, created with IAP -Research Group Image Analysis, IPK-Gatersleben, evidenced difference among the cultivars in respect to plant height, shoot area and fluorescence intensity. Shoot area decreased in presence of NaCl stress mainly in Castelluccio and Eston compared to Pantelleria e Ustica, Conversely, in PEG conditions, side area,

decreased much more in Eston and Pantelleria. Results obtained from fluorescence activity, showed differences in side phenols/chlorophyll ratio among the cultivars. The greater ratio was observed in Pantelleria under salinity conditions, and in Castalluccio under PEG conditions, and the chlorophyll intensity was greater in Castelluccio and Ustica in PEG, and in Pantelleria and Ustica in NaCl treatments. Leaf length and width confirmed the ranking of genotypes in presence of both abiotic stresses. Regarding the metabolomic data, differences in the amount of metabolites were observed both from the same cultivar in relation to the treatments and among the cultivars in presence of the same treatments. The differences were mainly quantitative than qualitative. These results may yield valuable information and appropriate indicators (metabolites) on the tolerance of lentil cultivars, suggesting that the environment where the different cultivars grow could be responsible for the different tolerance of the genotypes.