

Automated phenotyping for abiotic stress tolerance in lentil

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Lentil yield in low rainfall areas is limited due to several abiotic stresses. High-throughput phenotyping techniques could speed-up breeding varieties tolerant to abiotic stresses. Three phenotyping assays for water stress, boron toxicity and salt stress have been developed at the Plant Phenomics Victoria's high-throughput plant phenotyping facility located at Horsham. Three different set of lentil genotypes were used for each assay, with three watering regimes, four boron levels, and four salt (NaCl) levels. Plants were imaged - top view and three side views (0, 120 and 240°) - three times per week. Destructive harvesting was conducted during the vegetative growth stage. High correlations were observed between the projected plant area derived from visible images and manually harvested fresh and dry biomass. Significant varietal responses were also observed for each abiotic stress treatment. For water stress, PBA Ace showed higher projected area compared to PBA Jumbo2 and Northfield. For boron stress, ILL2024 had a higher projected area than PBA Flash and PBA Blitz. For salinity stress, CIPAL1504 showed a higher projected area than ILL2024 and Nugget. The phenotyping protocols established efficient identification of genotypes tolerant to abiotic stresses and will be useful to accelerate crop breeding efforts in the improvement of lentil.