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WHOLE PLANT PHENOTYPING TO SELECT CLIMATE-READY DURUM WHEAT GENETIC RESOURCES

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Durum wheat is an important crop for agriculture and the economy of Mediterranean countries where more than half of the crop is cultivated. The upcoming climate change, and especially the shortage of water in the Mediterranean area is going to strongly affect wheat production and quality. While genomic tools are in place for adapting major crop species to environmental stresses, fast selection and quantification of phenotypic traits or components remains challenging. Traditional phenotyping is a labor intensive and time consuming procedure based mainly on destructive methods that greatly limit its application. The use of phenotyping automated platforms may overcome these limitations, collecting large data sets high-throughput and non-destructively. In this study, high-throughput phenotyping was used to characterize a selection of 40 durum wheat landraces held by CNR-IBBR institute. Shoot and root wheat morphology were investigated to dissect mechanisms underlying wheat resistance and resilience to drought. In a first experiment, image in different spectral ranges was used to examine the dynamic phenotypic response to reduced water availability, in association with stress indicators (plant biomass and biovolume, water use efficiency and the plant stress index). The root system architecture of each landrace was also investigated to select those more useful for plants drought adptation. Root phenotyping was carried out using the GROWSCREEN-Page platform at the IBG-2, Forschungszentrum Julich GmbH, Germany, which allows the acquisition of time series of the developing root system, and quantification of short-term variations. Most traits showed a large variation within the genotypes. In general, root length traits contributed more than shape and branching related traits on the overall variability of the root system architecture among genotypes. This approach allowed to select, on the basis of the whole plant phenotypic traits, a set of durum wheat landraces, potentially more adaptable to the upcoming climate change.