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HIGH-THROUGHPUT PHENOTYPING OF VEGETATIVE GROWTH AND WATER USE EFFICIENCY OF DURUM WHEAT NEAR ISOGENIC LINES FOR *QYLD.IDW-3B*, A MAJOR QTL FOR YIELD *PER SE*

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The study of the genetic basis of grain yield is one of the major challenges of the scientific community because of both its complex genetic control and the strong interaction with environment and management practices. Furthermore, such interactions may affect yield during the entire life cycle of the plant. It is therefore crucial to consider yield as the result of multiple simpler traits and thus study their genetic control separately. In this study, we used the phenotyping platform PhenoArch in order to identify growth and water use related traits that may explain the segregation for yield and plant height observed at *Qyld.idw-3B,* a major QTL for yield *per se* Graziani et al. 2010). Four pairs of durum wheat near-isogenic lines (NILs) for *Qyld.idw-3B* were grown at three levels of drought stress: no stress (soil water potential > -1 bar), mild stress (soil water potential of -5/-8 bar) and severe stress (soil water potential ≈ -13 bar). The stress was applied at the beginning of stem elongation until the end of the experiment (late milk stage, Zadok 77) on eight replicates per genotype per treatment. We recorded two main types of phenotypic data: (i) canopy images and (ii) weight measurements: every night, digital RGB images were collected. From these images we estimated several growth related phenotypes like biomass, leaf expansion and plant height; every plant was weighted to estimate the evapotranspiration at least once per day. Combining these data, it was possible to evaluate key physiological parameters like water use efficiency (WUE) and leaf transpiration. The QTL did not affect vegetative growth and water use of plants during the early vegetative stages while showing strong differences between NIL pairs during the reproductive and early ripening stages. This explains the segregation for final plant height previously observed by Graziani et al (2010). These results may provide useful information for further phenotypic as well as physiological and genetic characterization of the effects of *Qyld.idw-3B* with a main focus on mid to late stem elongation and reproductive/maturity stages.