Wheat phenological development and growth studies as affected by drought and late season high temperature stress under arid environment


Abstract:

This study evaluates the potential for adaptability and tolerance of wheat genotypes (G) to an arid environment. We examined the influence of drought stress (DS) (100, 75, and 50% field capacity), planting times (PT) (16-November, 01-December, 16-December and 01-January), and G (Yocoro Rojo, FKAU-10, Faisalabad-08, and Galaxy L-7096) on phenological development, growth indices, grain yield, and water use efficiency of drip-irrigated wheat. Development measured at five phenological growth stages (GS) (tillering, jointing, booting, heading, and maturity) and growth indices 30, 45, 60, and 75 days after sowing (DAS) were also correlated with final grain yield. Tillering occurred earlier in DS plots, to a maximum of 31 days. Days to complete 50% heading and physiological crop maturity were the most susceptible GS that denoted 31-72% reduction in number of days to complete these GS at severe DS. Wheat G grown with severe DS had the shortest grain filling duration. Genotype Fsd-08 presented greater adaptability to studied arid climate and recorded 31, 35, and 38% longer grain filling period as compared with rest of the G at 100-50% field capacity respectively. December sowing mitigated the drought and delayed planting effects by producing superior growth and yield (2162 kg ha(-1)) at severe DS. Genotypes Fsd-08 and L-7096 attained the minimum plant height (36 cm) and the shortest growth cycle (76 days) for January planting with 50% field capacity. At severe DS leaf area index, dry matter accumulation, crop growth rate and net assimilation rate were decreased by 67, 57, 34, and 38% as compared to non stressed plots. Genotypes Fsd-08 and F-10 were the superior ones and secured 14-17% higher grain yield than genotype YR for severely stressed plots. The correlation between crop growth indices and grain yield depicted the highest value (0.58-0.71) at 60-75 DAS. So the major contribution of these growth indices toward grain yield was at the start of reproductive phase. It's clear that booting and grain filling are the most sensitive GS that are severely affected by both drought and delay in planting.

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