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ABSTRACT

Heat stress is one of the bottlenecks for global wheat production. The in-depth investigation of wheat genotypes based on canopy temperature depression, SPAD, and dry matter allocation attributes could assist in understanding the reasons for yield sensitivity under terminal heat stress condition. Four relatively heat-tolerant genotypes, namely AS-10636, BD-594, BD-674, and BARI Gom-33 (BG-33), and two heat-sensitive genotypes (BD-675 and Pavon-76), were grown under two temperature conditions, viz., "control" (optimum sowing on 30th November) and "heat stress" (late sowing on 30th December) to evaluate their yield performance as affected by varied temperatures. During the grain-filling period, late-sown heat-stressed wheat genotypes received about 4.7 ºC greater mean air temperature than the control conditions, and a 4% decrease in the grain yield was recorded for every 1 ºC rise in temperature. Heat stress significantly reduced the number of days required for heading and anthesis compared to the control. The upper exposed peduncle length increased under late-sown heat-stressed conditions, with a greater significant impact on the susceptible BD-675 genotype. Canopy temperature depression (CTD) was reduced to about 65% in susceptible genotypes and 40% in tolerant genotypes under heat stress, implying the tolerant genotypes could keep their leaves cooler than susceptible ones under high temperatures. The SPAD value was also severely decreased in the susceptible genotype Pavon-76 compared to the tolerant ones under heat stress. While dry matter distribution in the culm, flag leaf, husk, and grain decreased under heat stress conditions compared to the control, the tolerant genotypes maintained higher grain dry weight by prioritizing dry matter allocation to the grain, principally by reducing it in the culm. Our results concluded that genotypes that can tolerate terminal heat stress by maintaining better CTD, SPAD, and dry matter partitioning potential to grain, along with a relatively greater grain filling duration, can sustain a higher grain yield under heat stress conditions. Moreover, the proper dissection of underlying biochemical and molecular mechanisms associated with yield sustainability in tolerant genotypes is encouraged before adopting them for upcoming breeding programs.

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