1.5 Sustaining wheat yields under drought and heat stress and recovery

Wheat and Climate Change

TIGR2ESS research teams based in India and UK focused on sustaining wheat yield under climate extremes, identifying wheat genotypes that are tolerant of heat and drought. The identified genes and metabolites specific to the tolerant genotype revealed specific metabolic pathways, genes and traits that can now be targeted for breeding and for in-depth analysis.

The Challenge: Heat and Drought Resilience in Wheat

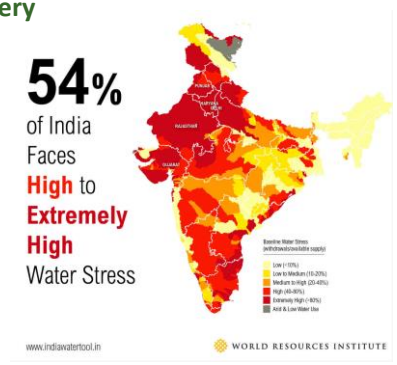
Wheat forms 20% of human calorie consumption and it is a highly valued commodity in India with a value of ₹1.29 trillion India (£12.5 billion) and £2.5 billion in the UK (2019). Predicted effects of climate change on the production of wheat are significant, with forecasts of up to a 23% production gap in India by 2050. To address this deficit in wheat supplies, it is crucial that knowledge and tools become rapidly available for resilience-breeding programmes.

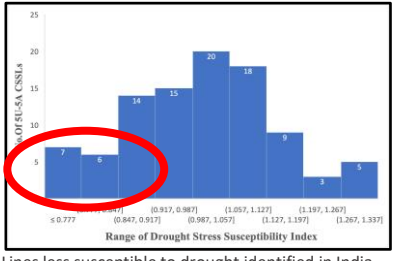
Wheat genotypes were assembled and shared between partners and screened (i) under field conditions during multiple seasons by PAU (ii) during vegetative heat stress at Rothamsted Research, (iii) under drought conditions at NIAB. A wheat diverse panel were additionally monitored for performance using the field-system phenotyping platform developed by partners at ICRISAT.

Phenotyping studies identified stress-tolerant line which produced larger yields compared to current commercial varieties under both stress and non-stressed conditions. Additionally, analysis of the identified heat tolerant genotypes revealed novel mechanisms of tolerance which will be targeted for future studies. Wheat lines with increased drought tolerance are currently being introduced into breeding programs and will be made available internationally.

The Future

Drought is episodic, with more than one period of little rainfall followed by irrigation. Crop recovery and achieving productive yields after extended periods of drought is as important as pure crop tolerance to these conditions. TIGR²ESS interdisciplinary collaborations continue to focus on trait combination for better resilience to multiple climate factors and episodic drought conditions. The research will ensure future sustainable production of wheat crops across global climatic regions.





Lines less susceptible to drought identified in India

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