International Wheat Yield Partnership
Research to Deliver Wheat for the Future

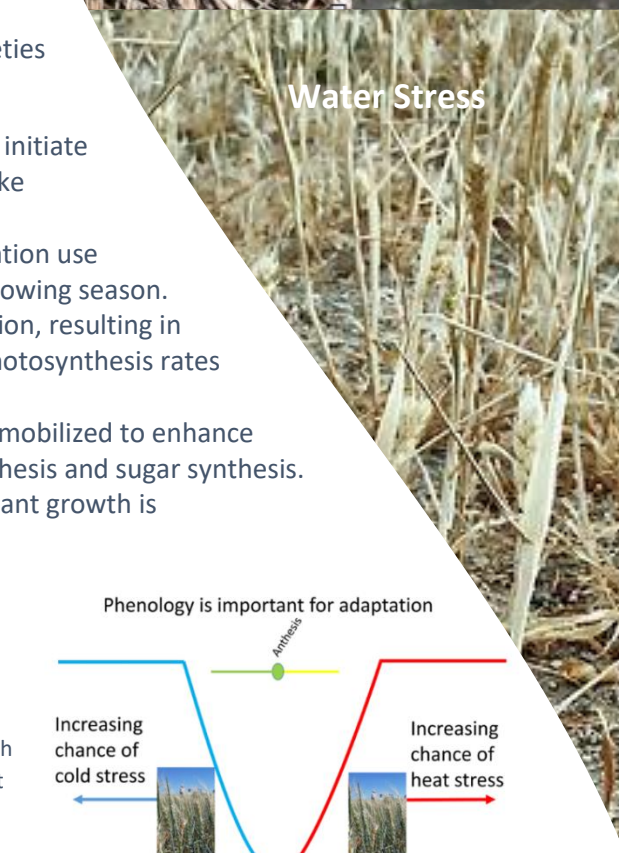
IWYP SCIENCE BRIEF

NUMBER 14 MAY 2021

IWYP Traits to Aid Mitigation of the Effects of Changing Climates

Several seminal research publications have attempted to predict the likely effects of climate change on overall wheat yields in different countries. Based on climate prediction models commonly in use today, the results predict that yields will significantly decrease in many places due to increased flooding, droughts and/or extreme temperatures, while other locations are predicted to experience higher yields, (e.g., northern Europe, northern China). A changing climate means that varieties grown productively will need to be different from those available today. Agronomic practices will also need to be adjusted.

The focus of The International Wheat Yield Partnership (IWYP) (https://iwyp.org) is to develop and disseminate wheat lines containing novel traits that are incorporated into future wheat varieties to increase their yield potential in different climatic conditions. Substantial evidence in the scientific literature suggests that the best performing wheats under optimal conditions are also generally better at withstanding environmental stresses associated with sub-optimal growing conditions, including those caused by changing climates. As IWYP develops trait improvements to enhance yield, it is also providing the genetic tools and assays required to adapt varieties to new and different climate conditions.



Specifically, many of IWYP's trait improvements use known genes and/or molecular genetic markers and chromosome segments that can re-tune varieties to meet the new conditions and sustain yields. These traits include:

- Combinations of novel and known genes to fine tune the growth cycle to initiate flowering at an optimal time, e.g., before higher temperatures inhibit spike development and grain production.
- Earlier biomass production due to enhanced photosynthesis and/or radiation use efficiency to enable plants to produce maximal biomass over a shorter growing season.
- Less waste of fixed carbon by costly metabolic processes such as respiration, resulting in increased radiation use efficiency and plant biomass production when photosynthesis rates are compromised.
- Improved rates of soluble sugar storage in wheat stems that can be fully mobilized to enhance grain yield when extreme environmental stresses reduce total photosynthesis and sugar synthesis.
- Higher harvest index values resulting in greater grain production when plant growth is compromised.
- Optimized spike development and lower rates of grain abortion to reduce yield losses due to higher temperature.
- Optimized root structure to utilize available water most efficiently at critical times during the growing season and reduce the impact of abiotic stress on grain production.

Figure 1. As climate changes, the crop growth cycle (phenology) and other attributes must be re-tuned to fit in with the temperature profiles.

For more information on IWYP and how our research may help mitigate the adverse effects of the climate crisis please visit: https://iwyp.org/research-program/ , https://iwyp.org/iwyp-science-briefs/, https://iwyp.org/annual-report/.