

Major Yield Gains Across Diverse Trial Sites

The goal of IWYP since its founding in 2014 has been to translate plant technologies to wheat yield gains; with a stated goal of 50% more yield by 2034. The IWYP Spring Wheat Hub at CIMMYT combines traits and markers conferring improved yield, discovered by IWYP researchers and from other leads. The Hub's Predictive Pre-Breeding (PPB) pipeline is designed to optimize expression of photosynthetic or 'source' traits and match these with the expression of complementary fertility-related or 'sink' traits. The pipeline has delivered a new generation of PT (Physiological Trait) lines that provide unique and diverse sources of yield potential and climate resilience to wheat breeders at CIMMYT and globally via the International Wheat Improvement Network (IWIN).

Supporting evidence has come from an international experiment in collaboration with the 'Heat & Drought Wheat Improvement Consortium' (HeDWIC) and national program partners in many countries. The experiment identified differential adaptation of lines to a range of weather scenarios from optimal to heat and drought stressed environments; some genetic bases of GxE have been identified and gene/haplotype discovery will follow.

Furthermore, the diversity panel used in the experiment included 58 IWYP PPB (PT) lines and 80 diverse CIMMYT advanced Bread Wheat lines. Considering average performance across the 22 sites, the best performing IWYP PPB (PT) line expressed 17% more yield than Borlaug F100 -the baseline CIMMYT check variety- (see Figure), and 10% more yield than the best CIMMYT Bread Wheat line, independently corroborating accelerated yield gains using the Hub's PPB approach.

Especially noteworthy are IWYP PPB (PT) lines expressing outstanding yields in Egypt and Pakistan (see Figure). At one site in Egypt the best IWYP PPB (PT) line produced 17% more grain yield than the best CIMMYT Bread Wheat check, while at another site in Pakistan the best IWYP PPB (PT) line expressed 16% more yield than the best CIMMYT Bread Wheat check at the site (corroborated by order statistics). Among these sites the best IWYP PPB (PT) line expressed at least 35% more yield than the check Borlaug. Given these results, breeders in Egypt and Pakistan have developed new varieties from particularly high performing IWYP PPB (PT) lines.

Clearly substantial progress in yield improvement has been achieved since IWYP was founded in 2014. The strategy of trait stacking and integration of novel genetic diversity has resulted in a significant positive impact on breeding programs and environments around the world that IWYP serves. We expect to continue making positive gains in the future.

Misir 7 & 9. Two new Egyptian wheat varieties developed from IWYP PPB (PT) lines in 2022 & 2023 respectively.

Misir 7

Misir 9

