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https://wheatgenetics.k-state.edu, www.ksu.edu/wgrc, and https://wgrc.k-state.edu

Mining wheat's wild side for global food security.

The Wheat Genetics lab is receiving nearly $1 million from the U.S. Department of Agriculture's National Institute of Food and Agriculture, through its Agriculture and Food Research Initiative, for two projects to improve the genetic diversity of wheat. Centuries of focused breeding to increase yields and performance stability has reduced genetic diversity in most modern wheat cultivars. As the human population increases and climates become more variable, the lack of genetic diversity in modern wheat has the potential to compromise global food security. The grants to mine wheat wild relatives for genes that increase disease resistance, stress tolerance, and yield potential. Two reservoirs of untapped genetic diversityare *Aegilops speltoides* and the wild emmer *T. turgidum* subsp. *dicoccoides*. These new projects, supported through the National Institute of Food and Agriculture, will build on decades of work and genetic resources assembled in the Wheat Genetics Resource Center. Current industry partnerships in the NSF Industry-University Cooperative Research Center, have further strengthened the value of the germplasm collection. K-State can directly connect the work on wild wheat with companies and breeders delivering the new germplasm to farmers.

The first project is a collaboration between K-State, 2Blades Foundation, the University of Minnesota, and the John Innes Center. The extensive Wheat Genetics Resource Center collection of wild emmer will be leveraged to resequence the emmer genome and identify genes providing resistance to stripe, leaf, and stem rust, three diseases that cause nearly $3 x 10^6 in damage to global wheat crops annually. The second collaboration brings K-State Plant Pathology researchers together with the University of Haifa, Israel, to unlock genetic diversity in *Ae. speltoides*, a distant wild relative of wheat with huge diversity. This work will better characterize the collection of *Ae. speltoides* and use this information to identify genetic segments transferred into wheat with the aim of making better genetic markers for wheat breeders to use. These projects really complement the ongoing work of the WGRC to provide robust genetic resources to breeders and see this novel genetic diversity transferred to breeding companies and delivered to farmers.

Registration of Hessian fly-resistant germplasm KS18WGRC65 carrying H26 in hard red winter wheat Overley background.

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Hessian fly causes severe damage to wheat worldwide. Several resistance genes have been identified in wheat and wild relatives; however, HF populations are under strong selection pressure and evolve rapidly to overcome resistance. To ensure the availability of resistance sources, HF-resistant germplasm KS18WGRC65 (TA5110, Reg. no. GP-1042, PI 688251) was developed by Wheat Genetics Resource Center at Kansas State University as a breeding stock that carries resistance gene *H26* from *Ae. tauschii*. KS18WGRC65 is a cytogenetically stable, homozygous, $BC_3F_{3:6}$ line derived from the cross between *Ae. tauschii* accession KU2147 and hard red winter wheat recurrent parent Overley. KS18WGRC65 exhibited no penalty for yield or other agronomic characters, making it a suitable source of HF resistance for wheat breeding.