

PBCC
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JULY
2024

INCREDIBLE
FEATS OF

PLANT BREEDING

**WHEAT STEM
SAWFLY STYMIED**
by SOLID STEMMED WHEAT!!

Traditional Portuguese
wheat variety holds
the key to defeating
EXPANDING PEST

SEE INSIDE FOR DETAILS!

THE PROBLEM

Ravaging wheat fields across the Northern Great Plains for over a century (more than \$350 million annual losses), **the wheat stem sawfly (WSS)** is considered one of the greatest threats to wheat production in the US. Production losses are caused by WSS **larvae** feeding inside the stems, resulting in lower seed weight and end-use quality due to reduced water and nutrient transport. Near the end of the growing season, the devastating larvae migrate to the base of the wheat plant, where they cut the interior of the stem in preparation for overwintering. The weakened stem becomes highly susceptible to **lodging** (falling over), and total yield losses can be as high as 80%. In recent years, the geographical range of WSS has expanded due to changing climate conditions, with impacts to wheat growing regions of Montana, North Dakota, Wyoming, Nebraska, and Colorado.

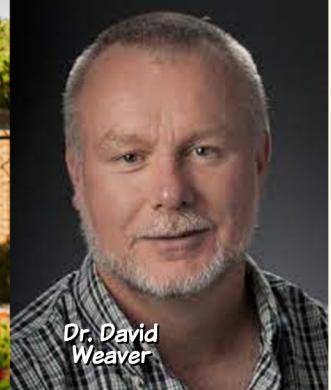
THE SCIENCE

In the early 1900's, in search of resistance to WSS, wheat breeders screened thousands of wheat **landraces** (traditional varieties) and discovered a **solid stem trait** in a Portuguese landrace, S-615, that provides partial resistance to WSS-induced lodging. Since then, the solid stem trait has been used by breeding programs in the Northern Great Plains to develop **WSS-resistant varieties**. Typically, however, the solid-stemmed varieties developed in this way were lower yielding compared to hollow stem varieties, due to **linkage drag** (negative genetic association) with reduced productivity traits in landraces. Recently, however, the genetics underlying the solid stem trait have been dissected, with one specific region of the genome found to account for more than 60% of the variation in the trait. Where WSS is emerging as an economically damaging wheat pest, western US wheat breeders are now using **molecular breeding** to quickly and more precisely introduce the solid stem trait into high-performing WSS-resistant varieties adapted to their regions.

THE IMPACT

New solid stemmed varieties like 'Dagmar' and 'Bobcat' are lifelines to wheat growers facing WSS, a native species that is expanding into more and more wheat production regions across the country. The development of genetic markers for precisely **backcrossing** (introducing) the solid stem trait into susceptible varieties has been critical for wheat breeders working to develop WSS-resistant varieties adapted to the regions where WSS is emerging as an economically important pest. Research is ongoing to identify additional sources of WSS resistance to expand our genetic toolbox for developing high yielding, WSS-resistant varieties.

THE TEAM



Also contributing from the WSS breeding/entomology team:
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