

BREAKTHROUGH

Resistance like you have never seen before



BREEDER'S BULLETS

NOT A DRAG

No other wheat variety currently grown in the southern Plains is known to carry gene *Wsm1*. The USDA-ARS variety, Mace, from Lincoln, NE was the first but has since fallen out of favor. Linkage drag for yield and quality traits can be the Achilles heel of *Wsm1* deployment. Linkage drag has not shown to be a serious detriment with Breakthrough, thus largely justifying its name.

MATTER OF DEGREES

The exact breakpoint is not known, but *Wsm1* is generally effective up to about 75 to 81°F. Avoid planting too early when temperatures are high to reduce the amount of virus titer in the plant going into spring.

NOT THE FIRST

In 2011, OSU pulled the plug at the last minute on OK05312, a high-yielding Endurance derivative with exceptional curl mite resistance from gene *Cmc4*. Protection against the insect vector carried over to excellent protection against wheat streak mosaic. We held back in the interest of protecting this valuable gene against biotype shifts in curl mite populations that might render it ineffective. Future varieties from OSU will likely feature the combination of *Wsm1* and *Cmc4* via OK05312.

Dr. Brett Carver,

Oklahoma State Wheat Breeder

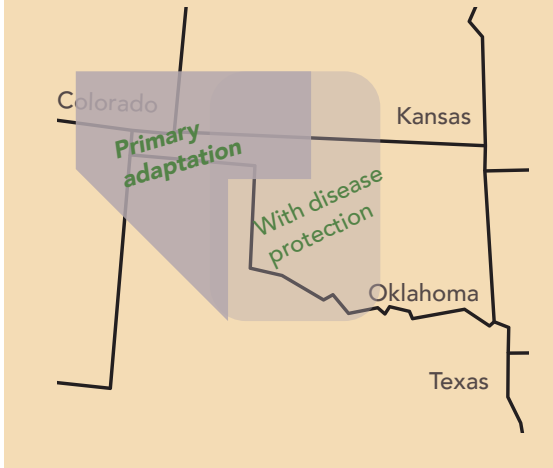
GOING VIRAL

This is the breakthrough Oklahoma farmers have been waiting for, an adapted variety for the Oklahoma panhandle with highly effective resistance to the most yield-ravaging viruses in the High Plains – Wheat streak mosaic and Triticum mosaic (*WSM/TM*). Breakthrough is the only variety adapted to Oklahoma with a gene called *Wsm1*, developed from a three-way collaboration among OSU, Kansas State University, and Colorado State University. Crucial to its development was finding competitive yield and quality combined with the virus resistance. Breakthrough is like Iba in those characteristics, but far better than Iba in *WSM/TM* protection.

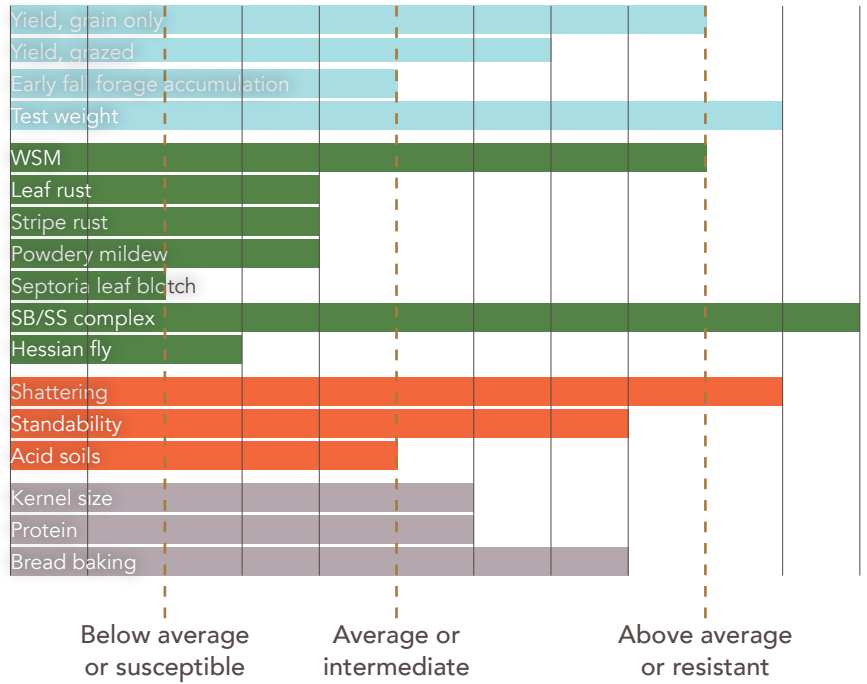
END-USE QUALITY

Overall Quality	Acceptable
Dough Properties	Good mix strength
Baking Quality	Good volume, below average absorption
Milling Quality	Very good test weight, below-average kernel weight

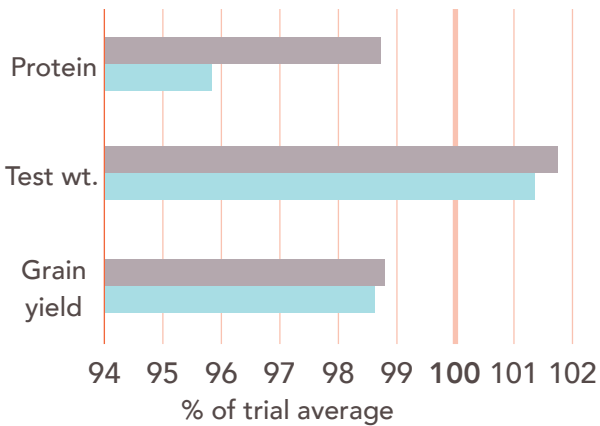
ADAPTATION MAP



BAR EXAM



BREAKTHROUGH VS. IBA



Breakthrough Iba

Source: okstate.wheat.edu, 14 OSU variety trials, 2019-2022, High Plains

Bottom Line: In High Plains environments, Breakthrough averaged the same grain yield and test weight as Iba, but with resistance to WSM/TM and higher protein.

RESPONSE TO WSM/TM COMPLEX, 2021 MEAD, NE

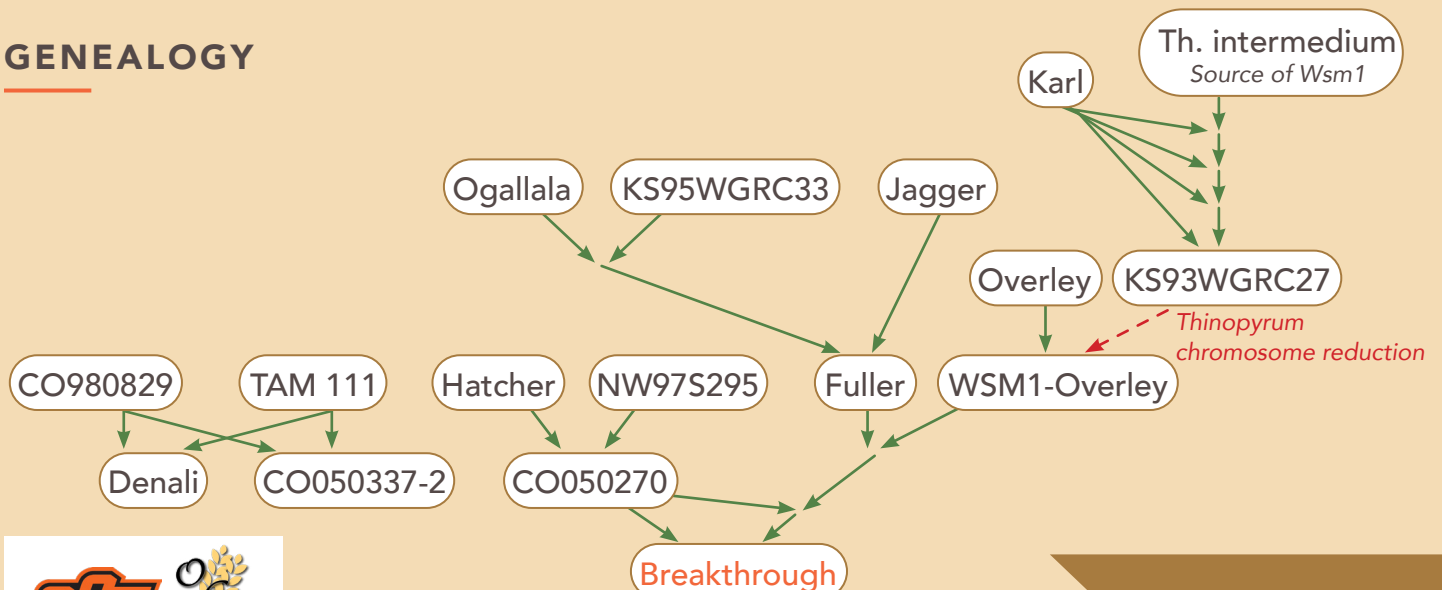
Variety	WSM/TM Classification	Plant yellowing ^a	Leaf chlorophyll index ^b	Plant vigor ^c
		1-5		%
Breakthrough	Resistant	1.5	41	78
Canvas	Intermed.	3.0	32	28
Doublestop CL+	Intermed.	3.0	28	30
OK Corral	Mod. susceptible	3.5	27	25

^aYellowing: 1 = normal, 5 = dead; desired rating <2

^bLeaf chlorophyll: <30, severe chlorosis/necrosis; ≥40, healthy green color

^cVigor: 0 = dead, 100% = normal plant growth; desired rating > 75%

GENEALOGY



BREAKTHROUGH