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News Release

USDA Small Grains Genotyping Labs Help Breeders Develop & Release Improved Cultivars Faster

Ask most people what a “genotyping lab” is and why its work is important, and you’ll be rewarded with a blank stare. Ask a wheat or barley breeder the same question, and you’ll receive a succinct reply — and one delivered with conviction.

The USDA Agricultural Research Service (ARS) operates four regional small grains genotyping laboratories. Though their work is highly technical, the core mission of these labs boils down to four focus areas: developing new molecular marker technologies; implementing effective strategies for their application in the breeding of small grains; providing breeders with access to state-of-the-art molecular technologies; and finally, helping to maximize the efficiency of small grain breeding programs by speeding up the process of new cultivar release.

Plant breeders, both public and private, annually submit thousands of samples from their research programs to these labs. The labs then employ their sophisticated gene marker technology to analyze the samples for traits of interest and to interpret the generated data. This information, back in the hands of the breeders, is of great value as they focus on incorporating the desired trait(s) into their breeding populations much more quickly than they could have otherwise.

All four ARS small grains genotyping labs serve breeders who are working directly on resistance to Fusarium Head Blight (scab). The Raleigh, NC, lab primarily works with breeders in the soft red winter, soft white winter and hard red winter wheat market classes, plus barley and oat breeders. The lab at Fargo, ND, serves hard red spring, durum and hard red winter wheat breeders, as well as spring barley, primarily from Minnesota and the two Dakotas. The ARS lab in Manhattan, KS, mainly serves the genotyping needs of hard winter wheat breeders from Texas, Oklahoma, Kansas, Colorado, Nebraska, Montana and the Dakotas, while the Pullman, WA, lab works with Pacific Northwest breeders, including Idaho and Montana for purposes of Fusarium Head Blight (FHB).

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These ARS labs also conduct collaborative research with breeders and geneticists to identify QTL* for important traits, including FHB resistance; to develop markers for the QTL; and to transfer the QTL to locally adapted breeding lines using marker-assisted backcross and double-haploid technology to quickly improve wheat (or barley) resistance to FHB and other traits. They additionally train students and technical personnel from various institutes and breeding programs in high-throughput genotyping.

*(*QTL stands for “quantitative trait loci.” QTL are stretches of DNA that are linked to, or contain, the genes that underlie a particular quantitative trait, such as FHB resistance.)*

With demand for their services continually expanding — and with ARS operating budgets under increased pressure — the genotyping labs rely strongly upon support from stakeholder entities like the U.S. Wheat and Barley Scab Initiative (USWBSI).

Their work is very technical and specialized. It’s cutting-edge technology immersed within the complex world of DNA, chromosomes, genetic mapping and sequencing — a world that’s basic to plant and animal life, but simultaneously one that’s foreign to most laymen. But the core reason for these small grains genotyping labs’ existence — and the motivation behind all their endeavors — is pretty straightforward: It’s all about helping breeders find and utilize important traits — like stronger resistance to Fusarium Head Blight — more quickly than they could strictly through phenotypic evaluations. The ultimate result is the faster development and release of improved cultivars to the farmer.

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