Kansas State University

Better Bread
How Researchers are Using Genomics to Predict Bread Quality and Accelerate Wheat Variety Development

With funding from USAID's Feed the Future Initiative, a team of breeders and geneticists at Kansas State University's Feed the Future Innovation Lab for Applied Wheat Genomics and the International Maize and Wheat Improvement Center (CIMMYT), are using DNA markers to predict important traits for bread wheat, such as dough strength and loaf volume.

Historically, the main focus of wheat breeding has been grain yield and the selection of varieties with the best performance and disease resistance. Quality traits, such as those used for bread, are usually evaluated at the end of the selection cycle due to high cost and the large quantity of grain needed for testing. Kansas Hard Red Winter wheat, for example, needs to have a stronger dough strength as it mostly goes to industrial bakers and needs to be able to withstand industrial processing. The typical wheat breeding cycle takes eight to 10 years—a lengthy amount of time to wait before being able to test for the quality of bread.

The team used wheat quality data generated in the test baking lab at CIMMYT and built algorithms using DNA marker information for predicting quality traits in new generations of wheat varieties. Using the prediction algorithms, they have been able to advance wheat quality screening by at least a year and predict over 10 times more candidate varieties than can be tested in the quality lab.

From all this data, decisions can be made on whether the wheat line is good enough to keep—but this question cannot be addressed until six to eight years into the breeding cycle.

Accurate processing and end-use quality prediction models, such as genomic selection, will allow breeding programs to target specific varieties before investing time and resources into varieties that will not pass the final test.

Researchers estimate that making these adjustments could increase the selection gains for quality two or three times above what is currently possible. The results also show that wheat breeding programs can use genomic selection for wheat quality, along with their traditional breeding pipeline, to more effectively and efficiently use resources throughout the whole breeding program.

Learn more: http://www.k-state.edu/media/newsreleases/jun16/betterbread63016.html

PHOTO: KANSAS STATE UNIVERSITY FEED THE FUTURE INNOVATION LAB FOR APPLIED WHEAT GENOMICS

For each breeding line, a quantity of wheat grain is milled and baked into a small experimental loaf, from which total volume is measured as one assessment of the performance of that line.