Science Societies

Genetic connections between wheat preharvest sprouting and late maturity alpha-amylase

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Sarah Peery, coauthor on a new study published in the journal Crop Science, collects wheat for late-maturity alpha amylase testing at the soft dough stage of grain development. Photo courtesy of Camille M. Steber, USDA-ARS.

High amounts of alpha-amylase degrade starch content in wheat, causing fallen cakes, sticky bread, and mushy noodles. If the grain contains high enough amounts of the enzyme, wheat farmers are usually forced to sell their crop as animal feed, losing money. The alpha-amylase problem is caused by **(1)** untimely rain triggering the germination of mature grain (preharvest sprouting, PHS) or immature grain (vivipary) on the mother plant, or **(2)** a cold shock during late grain development causing "late maturity alpha-amylase" (LMA).

Scott Carle, first author on the study, scores the degree of preharvest sprouting on a 1-to-10 scale after four days of misting in the greenhouse. Photo courtesy of Camille M. Steber, USDA-ARS.

Selecting resistant varieties can reduce risk from weather, but this requires much time and labor. Discovering molecular markers for each trait (PHS, vivipary, or LMA) could cut down on breeding costs, especially if the marker is associated with tolerance to multiple causes of heightened alpha-amylase.

Researchers mapped 16 chromosome locations associated with PHS resistance and compared PHS to vivipary and LMA data. High correlations suggested a genetic connection between these traits. Five of the PHS markers were so strongly associated with LMA that the researchers could select for resistance to both problems. This "two-for-one" deal can speed up breeding for resistant wheat varieties.

Dig deeper

Carle, S. W., Peery, S. R., Garland-Campbell, K. A., Pumphrey, M. O., & Steber, C. M. (2025). Association mapping of preharvest sprouting tolerance in spring wheat reveals genetic connections to late maturity alpha-amylase and vivipary. *Crop Science*, *65*, e70169. https://doi.org/10.1002/csc2.70169

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Back to issue

Back to home