Cover Stories:

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Yan, L., D. Fu, C. Li, A. Blechl, G. Tranquilli, M. Bonafede, A. Sanchez, M. Valarik, and J. Dubcovsky. 2006. The Wheat and Barley Vernalization Gene *VRN3* is an Orthologue of FT. ***Proc. Natl. Acad. Sci.*** 103: 19581-19586.

One of the critical differences that help wheat and barley adapt to different environments is the existence of winter and spring forms. Winter wheat and barley varieties are planted in the fall, but wait until the winter weather passes before flowering. This long-term exposure to low temperatures required to accelerate flowering is called the "vernalization requirement". In contrast, spring wheat and barley varieties do not have this vernalization requirement and can be planted in the spring. A team of scientists cloned the vernalization gene VRN3 responsible for these differences, which are essential for the adaptation of these species to different climates. This gene is similar to the Arabidopsis FLOWERING LOCUS T (FT) and its induction in the leaves results in a transmissible signal that promotes flowering. The researchers determined that wheat and barley plants carrying the dominant VRN3 alleles for early flowering have higher FT transcript levels than the plants carrying the recessive vrn3 alleles for late flowering. To confirm that they had identified the correct gene, the researchers transformed the winter wheat variety, Jagger, with the VRN3 allele from the spring variety, Hope. The genetically modified plants showed the early flowering characteristic of the spring wheat varieties, whereas the control non-transgenic plants failed to flower in the absence of vernalization. This result confirmed that the gene cloned by this research team was correct. The study also shows that variation in the wheat and barley FT genes is responsible for natural variation in vernalization requirement, providing additional sources of adaptive diversity to these economically important crops. The VRN3 mutation discovered in the wheat variety Hope can now be used to accelerate flowering time of other wheat varieties. In addition, the VRN3 molecular markers developed in this study will help breeders to detect the mutations present in their breeding lines and to study their effects on the adaptability of wheat and barley varieties to their particular environments.

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