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Review

Developing Wheat for Improved Yield and Adaptation under a Changing Climate: Optimization of a Few Key Genes

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**Research**  
**Crop Genetics and Breeding—Review**

**Developing Wheat for Improved Yield and Adaptation under a Changing Climate: Optimization of a Few Key Genes**

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**ABSTRACT**

Wheat grown under rain-fed conditions is often affected by drought worldwide. Future projections from a climate simulation model predict that the combined effects of increasing temperature and changing rainfall patterns will aggravate this drought scenario and may significantly reduce wheat yields unless appropriate varieties are adopted. Wheat is adapted to a wide range of environments due to the diversity in its phenology genes. Wheat phenology offers the opportunity to fight against drought by modifying crop developmental phases according to water availability in target environments. This review summarizes recent advances in wheat phenology research, including vernalization (*Vrn*), photoperiod (*Ppd*), and also dwarfing (*Rht*) genes. The alleles, haplotypes, and copy number variation identified for *Vrn* and *Ppd* genes respond differently in different climatic conditions, and thus could alter not only the development phases but also the yield. Compared with the model plant *Arabidopsis*, more phenology genes have not yet been identified in wheat; quantifying their effects in target environments would benefit the breeding of wheat for improved drought tolerance. Hence, there is scope to maximize yields in water-limited environments by deploying appropriate phenology gene combinations along with *Rht* genes and other important physiological traits that are associated with drought resistance.

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