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

## **Synthetic Hexaploid Wheat: Yesterday, Today, and Tomorrow**

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### **ABSTRACT**

In recent years, wheat yield per hectare appears to have reached a plateau, leading to concerns for future food security with an increasing world population. Since its invention, synthetic hexaploid wheat (SHW) has been shown to be an effective genetic resource for transferring agronomically important genes from wild relatives to common wheat. It provides new sources for yield potential, drought tolerance, disease resistance, and nutrient-use efficiency when bred conventionally with modern wheat varieties. SHW is becoming more and more important for modern wheat breeding. Here, we review the current status of SHW generation, study, and application, with a particular focus on its contribution to wheat breeding. We also briefly introduce the most recent progress in our understanding of the molecular mechanisms for growth vigor in SHW. Advances in new technologies have made the complete wheat reference genome available, which offers a promising future for the study and applications of SHW in wheat improvement that are essential to meet global food demand.

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