

Comments on special issue on “Wheat Genetics and Breeding”

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Global wheat production is facing great challenges such as much higher frequency of extreme weather events, increasing occurrence of various pests and diseases, shortage of water and other resources and growing demand for more nutritional products, as indicated by the guest editors of this special issue. It is expected that development and integration of new technology into established breeding schemes, as well as international collaboration, can contribute significantly to wheat improvement. This special issue on wheat genetics and breeding presents a broad range of topics on the subject, such as wheat genomics, high throughput phenotyping platform for abiotic stress and yield estimation, breeding for resistance to Ug99 and scab, quality improvement, and history of wheat utilization in China. The authors are from International Maize and Wheat Improvement Center (CIMMYT) in Mexico as well as from Australia, China, Turkey and the USA. All articles in this issue indicate the great importance of utilizing new technology in the context of international collaboration.

We have seen the routine utilization of new technology, such as molecular marker assisted selection, in the breeding of cultivars with better quality and improved disease resistance, but less so in improving yield potential and enhancing resistance or tolerance to biotic stress, such as drought and heat, as indicated by the various authors in this special issue. Progress in wheat genome and transformation over the last 5 years has made it possible to rapidly fine map and clone as well as to understand the function of agronomical important genes greatly reducing costs incurred just a few years ago. However, it is important to realize that up to now less than 200 gene-specific markers are globally available in public breeding programs, so many more validated molecular markers as well as better genomic selection methods are urgently needed in breeding climate-resilient wheat. High throughput phenotyping platforms have been established in CIMMYT and other advanced institutions, and spectroradiometry techniques have provided unprecedented improvement in the efficiency of screening physiological traits that have been typically laborious and time-consuming. However, adoption of this technology in breeding programs targeting for cultivar release rather than breeding research will take time and concerted effort is needed to transfer these scientific findings into improved breeding practices and to find ways to delivery this technology affordably.

Wheat production is facing great challenges from climate change, and international collaboration is becoming increasingly important for all countries including China. Significant progress in wheat improvement has been achieved in China over the last 40 years, and the China-CIMMYT collaboration has been highly significant in strengthening of China’s research capacity during this period. For example, CIMMYT germplasm has successfully contributed to Chinese wheat, improving processing quality, yield potential and disease resistance. CIMMYT also provides the unique opportunity in training scientists and developing international network. Chinese wheat germplasm, such as Sumai 3, has also made significant contributions to global wheat improvement through CIMMYT’s network. However, greater support from China and the wider international donor community is needed to strengthen CIMMYT’s capacity in research and service. We also acknowledge the collaborations in wheat improvement with Australia, the UK and the USA, among many other countries. We are pleased to see that the Chinese Government gives high priority to international collaboration in agricultural research and development.

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