MEETING REPORT

Genomics and wheat breeding*

A workshop on 'Application of Genomics in Wheat Breeding' was recently organized by the Generation Challenge Programme (GCP). The GCP itself is a multinational, multisectoral and multidisciplinary 'true' collaboration in the plant sciences, which was created in 2003 by CGIAR (the Consultative Group on International Agriculture Research), ARIs (Advanced Research Institutes) and NARS (National Agriculture Research System) as partners and is hosted by the International Maize and Wheat Improvement Centre (CIMMYT) located in Mexico. GCP's defined mission is 'to use plant genetic diversity, advanced genomic science and comparative biology to develop tools and technologies that help plant breeders in the developing world produce better crop varieties for resource-poor farmers'. It has been observed that although a number of projects on several crops have been funded and successfully completed in the past, wheat genomics research perhaps could not be adequately funded by the GCP. The workshop was organized to look into this aspect and provide suggestions to improve awareness about the GCP in developing countries and its involvement in the application of wheat genomics research, with an aim to bring about an improvement in wheat productivity for the resource-poor farmers.

The workshop began with a presentation by Philippe Monneveux (SubProgramme3 Leader), who gave an overview of the GCP and appraised the audience about the purpose of the GCP, emphasizing upon the importance of using genomics research for improvement of crops (including wheat) in the dryland areas. He reiterated that the GCP has five SubProgrammes called SP1–5, which deal with the following five GCP activities in that order: (i) SP1 for germplasm; (ii) SP2 for comparative genomics; (iii) SP3 for marker-assisted selection (MAS); (iv) SP4 for bioinformatics and data management, and (v) SP5 for capacity-building and training. He also described the achievements made under various SubProgrammes of the GCP and encouraged wheat workers to take part in wheat genomics research through GCP funding for improvement in wheat productivity in dryland areas. This was followed by three presentations, one each made by Susanne Dreisigacker on wheat germplasm projects and delivery, Peter Langridge on gene discovery/analysis and Scott Chapman on modelling and database work. It was shown that the GCP has already completed work on the assembly of reference germplasm for almost all crops, including wheat, and that gene discovery is a continuing process. The GCP has also developed a genotyping support service (GCP–GSS) to help wheat workers in the developing world to get the genotyping of their material done at the best genotyping facility available; proposals have been invited by the GCP for this purpose. The most conspicuous aspect of the presentations made at the workshop was the details of bioinformatics tools involving modelling, database development and utilization for virtual wheat breeding. It was shown that databases and software are available for a variety of purposes, which can be deployed for wheat genomics research leading to wheat improvement in dryland areas. Most wheat workers in the developing world are perhaps unaware of the availability of these tools.

Scott Chapman (CSIRO Plant Industry, Australia) is using GCP funds for developing applications in virtual wheat breeding in collaboration with The University of Queensland, the Chinese Academy of Agricultural Sciences and CIMMYT. The project builds software tools that combine molecular, physiological and genetic information to simulate how different wheat-breeding lines are generated and selected. This allows plant breeders to compare the results of conventional plant breeding with those from methods based on MAS, with a focus on efficient and fast selection of varieties suited to dry conditions.

The presentations were followed by a panel discussion chaired by Peter Langridge (University of Adelaide, Australia), who briefly outlined the purpose and structure of the panel discussion. Three panellists who made presentations about the GCP wheat programmes in their respective countries included Pushpendra Gupta from India, Ruilian Jing from China and Alexey Morgounov from Turkey. Gupta emphasized that the GCP annual budget is inadequate, and informed the audience that the GCP had a minimal impact on wheat biotechnology research in India. However, the Department of Biotechnology, Government of India supported network projects on molecular marker development and nutrient biofortification in wheat and other programmes under Indo-Swiss and Indo-Australian collaboration currently in progress in India. Some small GCP-supported projects on wheat are currently underway only at the Directorate of Wheat Research (DWR) (Karnal) or ARI (Pune). Perhaps the situation is no different in Turkey. The situation in China seems to be better, where some work on wheat breeding in dryland areas is already under progress with support of the GCP. It is thus apparent that the GCP wheat genomics programme is poorly funded in India, Turkey and several other countries in the Sub-Sahara region and in South-East Asia. According to Rajeev Varshney (SP2 Group Leader, ICRISAT; pers. commun.), the lack of GCP support for wheat research in India is mainly due to lack of interest shown by Indian wheat workers and the Indian Council of Agricultural Research (ICAR) in GCP activities.

In the open discussion that followed, several participants including B. Mishra and H. K. Chaudhary from India participated. In particular, B. Mishra (DWR, Karnal) briefly described the ongoing genomics research activities on wheat and other crops funded by ICAR. In conclusion, Peter Langridge summarized the outcome of the workshop and emphasized on the need for participation from the developing countries in GCP activities involving genomics research and its application in wheat breeding.

*A report on the workshop on 'Application of Genomics in Wheat Breeding' arranged during the 11th International Wheat Genetics Symposium organized in Brisbane, Australia (24–29 August 2008), by the Generation Challenge Programme of the Consultative Group on International Agricultural Research.

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