Poster 15. Molecular breeding in wheat: findings from an international survey.

Susanne Dreisigacker, Petr Kosina, Sukhwinder Singh, and Hans-Joachim Braun. Wheat molecular breeding, Global Wheat Program, International Maize and Wheat Improvement Center (CIMMYT), Apdo. Postal 6-641, 06600 Mexico, D.F., Mexico.

Molecular breeding for crop improvement has the target to create gene-to-phenotype knowledge for breeding objectives and to use this knowledge in product development and deployment. Molecular techniques can impact every stage of the breeding process from parental characterization and selection for cross prediction to introgression of known genes and population enhancement via allele enrichment or gene stacking. It is often reported that molecular breeding through gene transfer and marker-assisted selection has been successfully applied especially in the private sector and that its wider use especially in the public sector institutions in the developing world is still limited due to various bottlenecks. Tangible information on the application of molecular breeding tools in public sector wheat programs is however fragmented. During the preparation of the 21st ITMI in Mexico City in 2011, we distributed a survey to the participants and CIMMYT collaborators addressing this subject. The survey included questions regarding the magnitude of application of molecular markers in the respective breeding programs, the form of deployment and trait target, bottlenecks in the case molecular markers are not used, and questions regards logistic and molecular marker systems. A total of 220 responses form 58 countries were received. The outcome of the survey will be presented.

Poster 16. Imprints of selection in CIMMYT wheat lines targeted to irrigated and rain-fed environments.

Susanne Dreisigacker, Ravi P. Singh, Yann Manes, and Hans-Joachim Braun. Wheat molecular breeding, Global Wheat Program, International Maize and Wheat Improvement Center (CIMMYT), Apdo. Postal 6-641, 06600 Mexico, D.F., Mexico.

CIMMYT international yield trials sent to national collaborators globally and targeted to diverse growing environments have been analyzed, but genotypic characterization of this elite material has not been extensively carried out. Twenty-three Elite Spring Wheat Yield Trials (ESWYT) and 17 Semi-Arid Wheat Yield Trials (SAWYT) together with recent CIMMYT elite lines were therefore genotyped with DArT and partly GBS markers. The high-throughput genotyping platforms were able to assign the lines in both yield trials into various but mainly two germplasm groups according to their targeted environment reflecting the establishment of diverse germplasm pools due to breeding for improved adaptation. Constant genetic diversity was observed across the years of trial distribution. The average genetic distance was slightly higher in the ESWYT than in the SAWYT and significantly increased in both trials with a growing difference in distribution years, suggesting a systematic change in allele frequencies during the breeding process. Observed frequencies for each marker allele, and haplotypes with a four-marker, sliding window, were determined for each of the ESWYT and SAWYT to further identify regions in the genome under selection. Markers and haplotypes displaying a significant change in allele frequency across years were identified and interpreted as an indicator for constant selection. Markers identified were partly linked to traits under CIMMYT breeder's selection and point to key genomic regions for further investigation.

Poster 17. Deriving a hard red winter wheat prebreeding population suitable for marker-facilitated recurrent mass selection.

Bradley Bisek and Francois Marais. Department of Plant Sciences, North Dakota State University, Fargo, ND 58108, USA.

A new hard red winter wheat pedigree breeding program is being established at NDSU. As a result, there is an urgent need to develop improved breeding stock that can be used for making elite crosses. The most important demand is to develop breeding parents with high levels of cold-hardiness coupled with effective resistance against the major diseases, which include Fusarium head blight, leaf and stem rust, tan spot, and the *Septoria* complex. Backcrosses of resistance sources to a winter-hardy variety, such as Jerry, can only partially solve the problem as it restricts overall genetic variability. Recurrent selection is a population improvement strategy that is ideally suited to the development of improved germplasm as it maximizes opportunities for genetic recombination and gene pyramiding and allows for shorter genera-