The Wheat-CAP Project. Applying Genomics To Wheat Breeding


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US wheat breeders face increasing demands for improvements in quality, yield, and disease and insect resistance to remain competitive in domestic and international markets. A consortium of public wheat breeders from 25 states, all four USDA-ARS Small Grain Genotyping Labs and the GrainGenes database was formed to incorporate genomic tools into wheat breeding. The Wheat Coordinated Agricultural Project (Wheat-CAP) started its activities in 2006. The research component includes the construction of 17 mapping populations using microsatellite and SNP markers to discover and map new QTLs for pest resistance, agronomic and quality traits. Breeders selected the parental lines and traits according to regional needs and recommendations from growers and industry. Screening of the parental lines with 908 microsatellites and 236 SNP markers revealed an average of 330 polymorphisms per population. The applied component focuses on Marker Assisted Selection (MAS) strategies in public wheat breeding programs. The collaboration with the USDA-ARS high-throughput genotyping laboratories resulted in more than 100,000 DNA markers analyzed during 2006. The consortium also carried out education and outreach activities including courses, undergraduate and graduate student training, presentations to growers and industry representatives, field days, educational trips and workshops, collaboration with teaching organizations, development of a MAS website (maswheat.ucdavis.edu), and organization of a National Symposium on MAS. These activities supported by USDA-CSREES are essential to incorporate new biotechnological tools and establish a network of public wheat breeding programs to train the next generation of breeders and improve agricultural competitiveness.