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ITEMS FROM ETHIOPIA

CIMMYT–ETHIOPIA AND THE ETHIOPIAN INSTITUTE FOR AGRICULTURAL RESEARCH
Debre Zeit, Ethiopia

Bekele Abeyo (CIMMYT) and Firdissa Iticha, Kebede Tadesse, Ayele Badebo, and Asefa Yilma.

A number of international nurseries were planted at various sites in Ethiopia during the 2009–10 cropping season. Off-season the nurseries were planted only at Debre Zeit because of the availability of irrigation. A total of 7,214 wheat lines were evaluated for stem rust resistance, including 806 durum wheat lines from CIMMYT, 2,107 bread wheat lines, 3,295 durum wheat lines, 974 synthetics from ICARDA, and 32 bread wheat lines from the Russian Federation. The nurseries were planted on time, were well managed, and infector rows well distributed. Because the temperature was warmer than normal, the disease pressure was higher. Only CIMMYT nursery data are presented in Table 1. Most of the lines tested during this season were durum wheat. Of the 622 total lines tested, 297 (or 48%) were found to have 20% or less infection rates. The data were submitted to the respective coördinating breeders at CIMMYT–Mexico.

Table 1. International nurseries tested at Debre Zeit, Ethiopia, during the off-season in 2009–10.

	Number tested	≤ 20^% sten rust	Comment
Durum wheat			
CD10 MCDZ	208	146 (70%)	Many resistant lines
F6 SR	175	131 (75%)	Many resistant lines
CD10_BHADERDZZ	35	2 (6%)	
CD10_DDPDZ	204	18 (9%)	
TOTAL	622	18 (9%)	
Bread wheat			
4th SRRNSN BW	184	79 (43%)	Many resistant lines
TOTAL	806	376 (47%)	

The main 2010 season was characterized by wide spread yellow rust epidemics on the major cultivars Kubsa and Galama. These two cultivars have served for over 15 years and can not be blamed. Efforts were made to spray fungicides to minimize damage. In addition, the new CIMMYT cultiars Picaflor and Danphe, with good resistance/tolerance to yellow rust, were released to replace the susceptible, older cultivars this year. Different nurseries were obtained from in 2010, including 1,190 bread wheats, 1,297 durum wheats, and 202 triticales from CIMMYT; 4,185 bread wheats and 318 durum wheats from ICARDA; 243 bread wheats from Egypt; and 2,100 durum wheats from the USDA. These nurseries were planted at different sites. Kulumsa is an area for wheat where many lines can express their yield potential by tolerating the high rust development. Holetta, a hot-spot for Septoria, is an ideal site for screening for Septoria resistant lines. Many CIMMYT international nurseries were tested at Holetta for quarantine purposes and most of them were found susceptible to the existing strain of Septoria. In the future, Septoria screening only will be evaluated at Holetta. Melkasa is the quarantine site for the semi-arid environments of the country. Last year, plentful rainfall during the growing season lead to a high incidence of stem and yellow rust at Melkasa. Debre Zeit is the screening site for durum wheat to the three rusts. Only data on CIMMYT materials are reported here. About 77% of the total bread wheat nurseries tested at Kulumsa, Melkasa, and Debre Zeit were found to have 20% or less infection rates of either stem rust or yellow rust. This is good news for the national program, where yellow rust epidemics have wiped out the popular cultivars from production. Durum wheat and triticale nurseries were planted at Debre Zeit and Holetta. The disease pressure at Debre Zeit was relatively high. As a result, only 341 durum wheat lines (26%) of the total 1,297 lines evaluated were found to have lower than or equal to 20% severity or infection rate for the two rusts. Triticale was found to better tolerate Septo-

ria at Holetta. The lower number of materials maintained at Holetta is mainly due to Septoria. Most leaves were killed by the time the plants flowered causing shriveled grain with poor germination.

ITEMS FROM GERMANY

LEIBNIZ–INSTITUT FÜR PFLANZENGENETIK UND KULTURPFLANZENFORSCHUNG — IPK
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Association mapping in hexaploid wheat – The project GABI-Wheat.

GABI-Wheat is designed as an association mapping study in hexaploid wheat. The aim of the project is the identification of associations of molecular marker data with traits that are important for breeding new cultivars. Populations employed in association studies consist of (mostly) unrelated individuals from a broad population. In this project, the population comprises 358 elite, Western-European hexaploid winter wheat cultivars and 14 spring wheat cultivars. The wheats were cultivated on one location in 2009 and three locations in 2010 in France, and on two locations in 2009 and 2010 in Germany, utilizing an alpha-design. Field trials and phenotyping for yield, yield components, and baking quality traits were performed by industrial project partners. Genotyping was performed for a total of 800 microsatellite markers. Inoculation trials for *Fusarium culmorum*/*Fusarium graminearum*, *Septoria tritici*, and *Drechslera tritici-repentis* were performed by the Julius-Kühn-Institut (B. Rodemann) in 2009 and 2010 for each disease at two locations in Germany.

After correction for rare alleles (less than 3% frequency in the population), data from 781 loci, corresponding to 732 microsatellite marker and from 17 candidate genes chosen from the literature, are available for the 372 cultivars. From those microsatellites, 650 are mapped in the ITMI mapping population with an average distance of 7.6 cM. No apparent population structure was detected employing the STRUCTURE program and principal component analysis. Hence, a marker-based kinship matrix was used to reduce the number of false positive associations caused by spurious relationships between the cultivars. Linkage disequilibrium analysis showed small values for R^2 between unlinked markers as well as physically linked markers. The correlation between R^2 and physical marker distance also is weak. Mixed linear models are employed for the analysis of marker–trait associations. The Genstat and Tassel programs are currently used to evaluate the data. Preliminary results revealed significant associations for the first traits investigated so far.

Sustainable grain yield loci in bread wheat detected via an association mapping approach.

A core collection of 96 winter wheat genotypes from 21 different countries and five continents was considered for a genome-wide association mapping analysis. These genotypes were selected from a larger collection created at the Institute of Field and Vegetable Crops, Novi Sad, Serbia. The collection was phenotyped for grain yield in field plots in Novi Sad during six growing seasons between 1994 and 1999. Genotyping using DArT markers was performed by Triticarte Pty. Ltd. (Canberra, Australia). The calculation of testing for an association between markers and traits was done with the software programs TASSEL 2.01. and TASSEL 2.1 exploiting the general linear model and mixed linear model, respectively.

Only stable marker–trait associations (MTAs) significant in both models in three out of five years were considered. In total, 10 MTAs were identified on chromosomes 1AL, 3AL (two), 3BL, 4AL, 4BL, 5BL, 6BS, 7AS, and 7BL. Interestingly, there was coincidence with MTAs described in a study performed by CIMMYT using different sets