



2014 Technical Workshop

22-25 March

Universidad La Salle Noroeste  
Cd. Obregón, Mexico

**Poster Index**

## Coordination and Infrastructure to Ensure Rust Resistance

- 1 **CIMMYT-KARI-DRRW partnership in East Africa: Working together to beat the threat of stem rust Ug99**, *S. Bhavani et al.*
- 2 **The OSAU – CIMMYT shuttle breeding program: Results and prospects**, *V.P. Shamanin et al.*
- 3 **Importance of yellow rust trap nurseries evaluation under rainfed environments of Central Mexico**, *M.F. Rodríguez-García et al.*
- 4 **Revitalization of the CDRI Murree laboratory and its results for 2012-13**, *J.I. Mirza et al.*
- 5 **Guidelines for development of comprehensive national policies for integrated management of the wheat rusts**, *F. Dusunceli et al.*
- 6 **Contingency plan for management of wheat rusts in Morocco**, *A. Ramdani et al.*

## Monitoring the Rust Pathogens

- 7 **Mitigation of the global threat of wheat stripe rust in Algeria**, *A. Benbelkacem*
- 8 **Virulence and diversity of the stripe rust pathogen in Egypt, 2009 to 2013**, *A.A. Shahin et al.*
- 9 **Race analysis of wheat rust pathogens in Pakistan**, *J.I. Mirza et al.*
- 10 **Virulence spectra and strategic management of wheat rusts in the Indian subcontinent**, *S.C. Bhardwaj et al.*
- 11 **Pathotype diversity in *Puccinia triticina* on wheat in Nepal in 2010-2012**, *S. Baidya et al.*
- 12 **New races of *Puccinia striiformis* f. sp. *tritici* in Syria**, *M. Kassem et al.*
- 13 **Wheat stripe rust surveys in CWANA and a Regional Cereal Rust Research Center at Izmir, Turkey**, *K. Nazari*
- 14 **Cereal rust monitoring in Georgia**, *K. Natsarishvili et al.*
- 15 **Occurrence of wheat stripe and stem rust in Germany and consequences for breeders and growers**, *K. Flath et al.*
- 16 **Insights into the epidemiology of wheat stripe rust in Australia since the introduction of the 'WA pathotype' in 2002**, *A.M. Daly et al.*
- 17 **Physiological specialization in *Puccinia graminis tritici* on wheat in Argentina during 2012**, *P. Campos and J. López*
- 18 **Induced resistance to stripe (yellow) rust using chemical inducers**, *E.M. Al-Maarroof et al.*

## Barberry Surveillance

- 19 **Stem rust in the presence of barberry**, *A. Berlin*
- 20 **Surveying stem rust and barberry in South America**, *T. Fetch et al.*

*\*Lead author is a graduate student.*

- 21 **Development of a web-based geospatial database for sharing historic United States barberry eradication records**, *T.D. Murray and L. Kennaway*
- 22 **Detection and phylogenetic relationships of *Puccinia emaculata* and *Uromyces graminicola* affecting switchgrass (*Panicum virgatum*) in New York (USA) using rDNA sequence information**, *S.C. Kenaley and G.C. Bergstrom*

### **New Tools for Rust Resistance Breeding**

- 23 **Validation of SNP chromosome locations via diverse molecular markers in three wheat mapping populations**, *S. Liu et al.*
- 24 **Application of the Ug99 SNP assay on herbarium stem rust specimens**, *B. Visser et al.*
- 25 **Identification of markers linked to stem rust resistance in wheat landraces by bulked segregant analysis**, *E.M. Babiker et al.*
- 26 **Applying genomic selection to CIMMYT spring wheat for end-use quality**, *S.D. Battenfield et al.\**
- 27 **Optimization of barley stripe mosaic virus for virus induced gene silencing in wheat**, *S.M. Clark et al.*

### **Understanding Mechanisms of Resistance**

- 28 ***PNPi*, *Puccinia NPR1* interactor, a rust effector that suppresses NPR1-mediated resistance by competing with TGA2**, *X. Wang et al.\**
- 29 **A comparative transcriptome analysis to dissect host-pathogen interactions**, *W.T. Zhang et al.*
- 30 **Quantification of fungal colonization in wheat lines with adult plant stem rust resistance**, *H.D. Castelyn et al.\**
- 31 **Understanding durable rust resistance in barley**, *R.F. Park et al.*
- 32 ***Lr34* is the key to durable leaf rust resistance in the Canadian cv. Pasqua**, *B.D. McCallum and J. Thomas*

### **Genetic Resources for Rust Resistance**

- 33 **Mapping and validation of two QTL conferring stripe rust resistance in hexaploid wheat**, *N. Cobo et al.\**
- 34 **Mining of new rust resistance genes from progenitor species of wheat**, *P. Chhuneja et al.\**
- 35 **Genome wide association mapping for stripe rust resistance in Pacific Northwest winter wheat**, *Y. Naruoka et al.*
- 36 ***Yr57*: A new locus for stripe rust resistance in wheat**, *M.S. Randhawa et al.\**
- 37 **Effective rye-derived resistance gene *Lr45* is combined with *Triticum timopheevii*-derived gene *Sr36* in Indian bread wheat cultivars**, *M. Sivasamy et al.*

\*Lead author is a graduate student.

- 38 **Identification and mapping of novel QTLs for leaf rust resistance derived from a tetraploid wheat *T. dicoccum* accession, F. Desiderio et al.**
- 39 **Evaluation and stability analysis of near-isogenic wheat lines carrying single genes for leaf rust resistance, W. M. El-Orabey**
- 40 **An effective and apparently new source of adult plant resistance to leaf rust in bread wheat, A.N. Mishra et al.**
- 41 **Mapping of leaf rust resistance and non-glaucousness genes from *Aegilops tauschii* on chromosome 2DS, M. Saluja et al.**
- 42 **European winter wheat cv. Rialto: A source of resistance to leaf rust, B.G. Temesgen\***
- 43 ***SrND643*: a new gene effective against the *Pgt* race Ug99 group, B.R. Basnet et al.**
- 44 **Mapping putatively novel Ug99-effective APR QTLs in a biparental spring wheat population using 9K and *de novo* SNPs, P. Bajgain et al.\***
- 45 **Mapping adult plant resistance to *Pgt* race Ug99 in Ecuadorian wheat cv. Morocho Blanco, J. Briggs et al.\***
- 46 **Identification and genetic mapping of a putatively novel Ug99 stem rust resistance gene in hexaploid wheat, L. Gao et al.**
- 47 **A search for new resistance to *Pgt* race TTKSK in wheat-intergeneric hybrids and their derivatives, J. C. Kielsmeier-Cook et al.\***
- 48 **Fine-mapping *SrCad* on wheat chromosome 6DS, C. Hiebert et al.**
- 49 **Field responses of wheat lines with resistance to African *Pgt* race PTKST introgressed from *Aegilops sharonensis*, Z.A. Pretorius et al.**
- 50 **Control of highly diverse *Puccinia graminis* f. sp. *secalis* pathotypes using novel resistances from rye genetic resources, T. Miedaner et al.**
- 51 **Stem rust resistance in 'Jagger' winter wheat, M.K. Turner et al.\***
- 52 **Reactions of some Turkish *Aegilops* and *Triticum* materials to *Puccinia graminis* f. sp. *tritici* race PKTTC, K. Akan et al.**
- 53 **Development of D genome specific genetic linkage map and mapping of disease resistance genes, S. Kaur et al.**
- 54 **Multi-location analysis by linkage mapping and genome wide association: A tale of three populations, two diseases, major genes, minor genes, and genetic background, M.D. Vazquez et al.\***
- 55 **Can the 7DL-7Ag translocation become a substitute for the 1BL.1RS translocation?, V.K. Vikas et al.**
- 56 **Seeds of Discovery (SeeD): Generating new resources for mobilizing novel genetic variation into breeding programs, S. Singh et al.**

## Rust Resistance in Durum Wheats

- 57 **Phenotypic variation in leaf rust response in Mexican durum wheat landraces collected in Oaxaca, J. Huerta-Espino et al.**

\*Lead author is a graduate student.

- 58 **Mapping of stripe rust resistance gene *Yr56* in durum wheat cultivar Wollaroi**, *U. Bansal and H. Bariana*
- 59 **Leaf rust reactions of a *Triticum durum* germplasm collection**, *M. Aoun et al.\**
- 60 **Searching for resistance to rusts in durum wheat genetic resources**, *A. Bari et al.*
- 61 **Responses of some Turkish durum wheat genotypes to stem rust and stripe rust**, *K. Akan et al.*
- 62 **New sources of resistance to stem rust and leaf rust in durum wheat in India**, *T.L. Prakasha et al.*

## The World of Rust Resistance Breeding

- 63 **A century of bread wheat production in Kenya: Past genetic gains and anticipation of future gains in the backdrop of adverse production environments**, *G. Macharia et al.*
- 64 **Evaluation of Kenyan and introduced wheat germplasm for seedling and adult plant resistance to *Puccinia graminis f. sp. tritici* race Ug99**, *Z. Kosgey et al.\**
- 65 **The importance of wheat stripe rust in Ethiopia: Historical perspective, current status, and future directions**, *B. Abeyo et al.*
- 66 **Agronomic performance of promising bread wheat varieties in Rwanda**, *I. Habarurema et al.*
- 67 **Preliminary evaluation of Ethiopian emmer land races to wheat rusts and Septoria leaf blotch in southeastern Ethiopia**, *B. Hundie*
- 68 **Breeding for resistance to stem rust in South Africa**, *T.G. Terefe et al.*
- 69 **Screening for rust resistance and grain quality in CIMMYT advanced lines under Moroccan conditions**, *K. Rhib et al.*
- 70 **Effectiveness of *Yr* genes under high inoculum pressure: *Yr15* was the most effective one under Moroccan conditions during the 2012-2013 cropping season**, *A. Ramdani et al.*
- 71 **The leaf rust situation and resistance in wheat cultivars deployed in northwestern Pakistan**, *S.J.A. Shah and M. Ibrahim*
- 72 **Understanding genetic bases of wheat varieties in Pakistan: A prerequisite for combating wheat rusts**, *K.D. Joshi et al.*
- 73 **Genetic diversity analysis of pre- and post-green revolution wheat varieties of Pakistan based on RAPDs**, *N. Qureshi et al.*
- 74 **Seedling stem rust responses of Pakistani wheat varieties**, *Y. Rauf et al.*
- 75 **Genetic diversity for adult plant resistance to leaf rust in bread wheat**, *A.N. Mishra et al.*
- 76 **Status of stripe rust resistance in popular wheat cultivars in India**, *M.S. Saharan et al.*
- 77 **Status of rust resistance genes in wheat cultivars of central and peninsular India**, *J. Kumar, J et al.*
- 78 **Developing wheat varieties resistant to *Pgt* race Ug99**, *R. Chatrath et al.*
- 79 **Development of rust resistant wheat varieties for food security in Bangladesh**, *M.J. Uddin et al.*
- 80 **Status of wheat rust management in Bangladesh**, *P.K. Malaker et al.*

\*Lead author is a graduate student.

- 81 Screening of imported barley accessions and selection of suitable lines for the high hills of Nepal, K.M. Basnet and R.B. Khadka**
- 82 Combating stripe rust in the hills of Nepal through resistance gene deployment, S. Sharma et al.**
- 83 Evaluation of the Nepalese wheat gene pool for drought and stripe rust responses, R.B. Amgai et al.**
- 84 Development of stem rust resistant germplasm using conventional and molecular methods, A. Kokhmetova et al.**
- 85 Assessment of a wheat collection for resistance to stem rust, R. Dumbadze and Z. Sikharulidze\***
- 86 Cold tolerance, local rust, and Ug99 reactions of some wheat genotypes from the Eastern Anatolia Agricultural Research Institute, Erzurum, Turkey, U. Kuçükozdemir et al.**
- 87 Assessment of seedling resistances to leaf rust, stem rust and stripe rust in Turkish wheat cultivars, B. Gocmen Taskin et al.**
- 88 Resistance of some international bread wheat material to yellow rust in Central Anatolia, K. Akan et al.**
- 89 Reactions of Iranian wheat lines to Pgt race TTKSK in 2013, F. Afshari et al.**
- 90 Association analyses of leaf rust and stripe rust resistances in a panel of eastern U.S. winter wheat lines, K.R. Merrill et al.\***
- 91 Evaluation of winter wheat in the northern Great Plains for resistance to leaf rust, A. Kertho et al.\***
- 92 Rust resistance in western Canadian winter wheat, R.J. Graf et al.**

### **Seed Delivery and Adoption**

- 93 A gender-response study of farmer preferences of bread wheat traits in Nepal, V. San Juan\***
- 94 Establishing food and nutritional security in the Eastern Gangetic plains of India through biofortified rust resistant wheat varieties, C. Tiwari et al.**

\*Lead author is a graduate student.

## **Phenotypic variation in leaf rust response in Mexican durum wheat landraces collected in Oaxaca**

J. Huerta-Espino<sup>1</sup>, S.A. Herrera-Foessel<sup>2</sup>, C.X. Lan<sup>2</sup>, R.P. Singh<sup>2</sup> and T. Payne<sup>2</sup>

<sup>1</sup>Campo Experimental Valle de México INIFAP, Apdo. Postal 10, 56230 Chapingo, Edo de México, México; <sup>2</sup>International Maize and Wheat Improvement Center (CIMMYT), Apdo. Postal 6-641, 06600 Mexico D.F., Mexico

**E-mail: [j.huerta@cgiar.org](mailto:j.huerta@cgiar.org)**

Introduced to Mexico by the Spaniards around the beginning of 16<sup>th</sup> century both bread wheat and durum were cultivated mainly in the central plateau under rainfed conditions. Over 10,000 Mexican landraces were collected during 1992 to 1994, and curated and preserved at CIMMYT and INIFAP germplasm banks. Some collections were identified as durum. Our aim was to identify new diversity for resistance to race BBGBNG of the leaf rust fungus, and its derivatives, because of the susceptibility of over 90% of semidwarf durum varieties and improved durum germplasm to this race group that was introduced into Mexico in 2001. We evaluated 307 durum landraces collected in Oaxaca at the seedling stage in a greenhouse with races BBBBNG, BBBBNJ, BBGBNC, BCGBNC, BBGBPC and CBGBPC, and in field trials with races BBGBNC and BBGBPC. About 10% of accessions displayed hypersensitive responses at the seedling stage and the remaining 90% were susceptible. Over 60% of seedling susceptible accessions displayed different levels of adult plant response in field trials with final disease severities ranging from immunity to 30% and most lines displaying compatible host reactions. This group is considered to be more valuable as potentially new sources of adult plant or slow rusting resistance. Although accessions displaying 40 to 50% rust severities may not have immediate value in breeding, genotypes with higher levels of resistance can be developed by intercrossing them provided they possess diverse slow rusting resistance genes. All accessions were tall and classified as late to very late, a typical characteristic of durum landraces. Mapping of slow rusting resistance in selected accessions is underway.

## Mapping of stripe rust resistance gene *Yr56* in durum wheat cultivar Wollaroi

U. Bansal and H. Bariana

University of Sydney, Plant Breeding Institute, Cobbitty, Private Bag 4011, Narellan, NSW 2567, Australia

**E-mail: [Urmil.bansal@sydney.edu.au](mailto:Urmil.bansal@sydney.edu.au)**

Stripe rust resistant Australian durum cv. Wollaroi AUS91465 was crossed with the susceptible genotype Bansi. A Wollaroi/Bansi F8 RIL population was tested for variation in stripe rust response under field conditions for three years and a DArT map was generated. Composite interval mapping (CIM) detected three consistent quantitative trait loci (QTL) in chromosomes 2A, 3B and 5B. These QTL, named *QYr.sun-2A*, *QYr.sun-3B* and *QYr.sun-5B*, explained on average 9.3, 26.7 and 8.7 % of the variation in stripe rust response, respectively. Wollaroi produced infection type (IT) 23N at the 4<sup>th</sup> leaf stage under greenhouse conditions. The RIL population was tested at the 4<sup>th</sup> leaf stage with *Pst* pathotype 150 E16A+. Monogenic segregation for stripe rust response was observed. The resistance gene was temporarily named *YrWol*. Phenotypic data were converted into genotypes and incorporated in the Wollaroi/Bansi genetic map. *YrWol* was flanked by DArT markers *wpt4197* (distally) and *wpt9104* (proximally) in chromosome 2AS. In a revised CIM analysis *QYr.sun-2A* peaked at *YrWol*. DArT clones were converted to sequence tagged site (STS) markers which were named *sun167* (*wpt4197*) and *sun168* (*wpt9104*). Lines carrying *YrWol/QYr.sun-2A* singly produced 40 to 50% severities. Since no other stripe rust resistance gene was located in chromosome 2AS, *YrWol* was formally named *Yr56*.



**Leaf rust reactions of a *Triticum durum* germplasm collection**M. Aoun<sup>1</sup>, E. Elias<sup>2</sup>, S. Chao<sup>3</sup>, S. Xu<sup>4</sup> and M. Acevedo<sup>1</sup>

<sup>1</sup>Department of Plant Pathology, North Dakota State University, P.O. Box 6050, Fargo, ND 58108, USA; <sup>2</sup>Department of Plant Sciences, North Dakota State University, Fargo, ND 58108, USA; <sup>3</sup>USDA-ARS Biosciences Research Laboratory, Fargo, ND 58102, USA; <sup>4</sup>USDA-ARS Northern Crop Science Laboratory, Fargo, ND 58102, USA

**E-mail: mariem.aoun@my.ndsu.edu**

Leaf rust is increasingly becoming a significant disease of durum since the detection of *Pt* race BBG/BN in Mexico in 2001. Many durum cultivars are susceptible to this race. A similar race, BBGQ, is present in California and its potential to spread to the major durum-producing areas of the U.S. northern Great Plains is a major concern. The objective of this project is to identify effective sources of resistance that can be utilized in durum to reduce the risk of yield losses due to leaf rust. A total of 497 durum accessions from the USDA-ARS National Small Grain Collection were evaluated for reaction to race BBGQ at the seedling stage. A subset of these accessions was evaluated at the adult plant stage at two locations in Mexico. Both, association mapping and biparental populations are being used to map resistance loci. The collection was screened for the presence of *Lr14a*, *Lr46*, and *Lr23* using molecular markers. Thirty two (6.4%) genotypes from 22 countries were resistant to BBGQ at the seedling stage; 19 of these were resistant at the adult stage in Mexico. Association mapping based on reaction to race BBGQ and 5,490 SNP markers revealed loci on chromosomes 2AS and 2BL that were significantly associated with resistance. For further validation 16 biparental hybrid populations were developed. Eleven of the resistant parents used in developing these populations were also resistant in Mexico. Marker screening revealed that *Lr14a* was present in only two resistant accessions from Argentina (PI 324928 and PI 383915); *Lr23* was postulated in 36% of accessions, and *Lr46* was not detected.

## Searching for resistance to rusts in durum wheat genetic resources

A. Bari<sup>1</sup>, K. Nazari<sup>1</sup>, M. Nachit<sup>1</sup>, A. Amri<sup>1</sup>, K. Street<sup>1</sup>, A. Yahyaoui<sup>2</sup> and D. Endresen<sup>3</sup>

<sup>1</sup>International Centre for Agricultural Research in the Dry Areas, ICARDA, PO Box 6299 Rabat-Instituts, Rabat, Morocco; <sup>2</sup>International Maize and Wheat Improvement Center (CIMMYT), México-Veracruz El Batán, Texcoco CP 56237, Edo. de México. Mexico; <sup>3</sup>GBIF Norway, Natural History Museum, University of Oslo, Norway

**Email: [a.bari@cgiar.org](mailto:a.bari@cgiar.org)**

Early identification of valuable traits in wheat genetic resources, such as resistance to rusts, is of equal importance to the process of transferring these traits into improved cultivars. However, the lack of comprehensive evaluation of genetic resources has been an ongoing barrier to their efficient use in wheat improvement. The objective of this study is to address the hindered evaluation of genetic resources *vis a vis* sources of disease and insect resistance, but particularly to rusts, in durum wheat genetic resources. The approach is to search for patterns of relationship between a particular trait and geo-physical and climatic data of the areas from which those traits were originally sampled. If a dependency can be detected it can be used to target more intensive evaluation of accessions that otherwise might be overlooked. The study discusses the approach and the results in relation to identification of accessions available in the genebanks as well as the areas with the highest probability of yielding accessions with potential resistance to one or more of the rusts.

## **Responses of some Turkish durum wheat genotypes to stem rust and stripe rust**

K. Akan, Z. Mert, L. Çetin, A. Salantur, S. Yazar, E. Dönmez, B. Özdemir and M.E. Alyamaç

The Central Research Institute for Field Crops, Sehit Cem Ersever Cd. No. 9-11, Yenimahalle, Ankara, Turkey

**E-mail: [kadir\\_akan@hotmail.com](mailto:kadir_akan@hotmail.com)**

Wheat is the staple crop of agriculture in Turkey, the second largest pasta manufacturer in the world after Italy. Stem rust and stripe (yellow) rust are the most important diseases limiting wheat production in Turkey. Eighty Turkish durum wheat genotypes developed by the Central Research Institute for Field Crops (CRIFC) and currently in advanced yield trials were evaluated for adult plant response to local *Pgt* and *Pst* races. Evaluations were carried out at the facilities of CRIFC at İkizce and Yenimahalle in Ankara in 2012. Although weather conditions after inoculation were not favorable, disease development was enhanced with irrigation. Stem rust and stripe rust responses on each entry were scored twice using the modified Cobb scale when the susceptible check Little Club had reached 80S severity. Coefficients of infections (CI) were calculated and values below 20 were considered to be resistant. Forty one (51%) genotypes were resistant to stem rust (avirulent on seedlings with *Sr24*, *Sr26*, *Sr27* and *Sr31*) and 61 (81%) were resistant to stripe rust (virulent on seedlings of Lee, Heines Kolben, Heines Peko, Kalyansona, Sonalika, Federation\*4/ Kavkaz and Avocet S); and 32 (40%) genotypes were resistant to both stem rust and stripe rust. This work enabled the identification of candidate lines resistant to stem rust and stripe rust.

*This study was financed and supported by General Directorate of Agricultural Research and Policy of the Ministry of Food, Agriculture and Livestock of Turkey (Project no: TAGEM/TA/12/03/01/001)*

## **New sources of resistance to stem rust and leaf rust in durum wheat in India**

T.L. Prakasha, A. Divya, S.V. Sai Prasad, J.B. Singh, V.G. Dubey, K. Kaushal and A.N. Mishra

Indian Agricultural Research Institute, Regional Station, Indore 45200, India

**E-mail: prakash7385@gmail.com**

Stem rust and leaf rust are the major biotic stresses affecting durum wheat in India. Field responses of durum genotypes in advanced varietal trials in inoculated multi-location field nurseries during 2006-2013 were determined in order to identify sources of resistance. Genotypes showing maximum co-efficients of infection of 10.0 for a minimum two years were classified as 'resistant'. Four genotypes, HI 8682, HI 8722, HI 8731 and HI 8739, were resistant to mixtures of important *Pgt* pathotypes. In isolated single pathotype nurseries all four genotypes were resistant to the most prevalent bread wheat-virulent pathotype 40A (62G29), whereas HI 8731 and HI 8739 was resistant only to 117-6 (37G19), the most common one on durum in India. Stem rust resistance genes *Sr11+* (HI 8682), *Sr2+* (HI 8722), *Sr2+9e+13+* (HI 8739) were postulated in these genotypes. HI 8663 showed resistance to many *Pt* pathotypes, including 77-5 (121R63-1) and 104-2 (21R55), the most prevalent ones. *Lr23+* was postulated in this genotype. It is evident that these genotypes carry genes additional to those listed above. These unknown resistance genes could serve as sources of stable resistance in durum.