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ITEMS FROM UNITED KINGDOM

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Genetic biodiversity for stripe and stem rust resistance in African wheat genotypes.

Turnbull Chama, Ruth MacCormack, Zakkie Pretorius, Ruth Wanyera, Susanna Dreisigacker, Cornel Bender, Debbie Snyman, Denise Liebenberg, Lesley A. Boyd, and Renée Prins.

This new program, launched in February 2008, involves the genetic and phenotypic characterisation of over 500 African wheat genotypes for resistance to the new virulent stem rust, *P. graminis* Ug99-derived strains, and to stripe rust, *P. striiformis*. Stem rust resistance will be assessed in field trials in Njoro, Kenya, the first trial taking place in March 2009, and by seedling tests. This collection also will be assessed for stripe rust resistance in South Africa and the UK. The population is being assessed for molecular diversity using SSR and AFLP markers. This program is a collaboration between Dr. Lesley A. Boyd at the JIC, Norwich, UK; Prof. Zakkie Pretorius and Dr. Renée Prins of the University of the Free State, Bloemfontein, RSA; Dr. Ruth Wanyera, KARI, Njoro, Kenya; and Dr. Susanna Dreisigacker, CIMMYT, Mexico. The student working on this project is Mr. Turnbull Chama. This work is supported by UK, BBSRC/DfID funding under the Sustainable Agriculture Research for International Development (SARID) initiative.

Fine mapping of durable resistance to stripe rust in the South African wheat cultivar Kariega.

Gloudi Agenbag, Ruth MacCormack, Zakkie Pretorius, Debbie Snyman, Denise Liebenberg, Lesley A. Boyd, and Renée Prins.

The objective of this study is to use an EST marker strategy to fine map previously identified QTL for effective adult-plant resistance to stripe rust in the cultivar Kariega. Two major QTL have been identified, *QYr.sgi-7D* and *QYr.sgi-2B.1*, as well as minor QTL, which included *QYr.sgi-4A* and *QYr.sgi-2B.2*. All evidence indicates that the 7D QTL is the *Lr34/Yr18* complex. To date, one EST-derived marker has mapped to each of the 2BS intervals, and one marker has mapped to 4AL in the target QTL interval. These ESTs provide anchors for further EST-derived marker development within the QTL intervals. This program is a collaboration between Dr. Lesley A. Boyd at the JIC, Norwich, UK and Profs. Zak-

kie Pretorius and Dr. Renée Prins of the University of the Free State, Bloemfontein, RSA. The student working on this project is Miss Gloudi Agenbag. This work is supported by UK, BBSRC/DfID funding under the Sustainable Agriculture Research for International Development (SARID) initiative.

Genetic mapping of adult-plant stripe rust resistance within the European wheat cultivar Cappelle Desprez.

Gloudi Agenbag, Zakkie Pretorius, Debbie Snyman, Denise Liebenberg, Lesley A. Boyd, and Renée Prins.

Cultivar Cappelle Desprez was grown in Western Europe throughout the 1960s and 1970s, being a known source of durable adult-plant resistance (APR) to stripe rust. The stripe rust resistance in Cappelle Desprez has remained effective under South African conditions since 2001, and programs are underway to select for this APR in a cross to the South African cultivar Palmiet. Zakkie Pretorius is currently developing an RIL population derived from this cross that will be used to genetically map the resistance QTL for stripe rust resistance in Cappelle Desprez. This program is a collaboration between Dr. Lesley A. Boyd at the JIC, Norwich, UK and Profs. Zakkie Pretorius and Dr. Renée Prins of the University of the Free State, Bloemfontein, RSA. The student working on this project is Miss Gloudi Agenbag. This work is supported by UK, BBSRC/DfID funding under the Sustainable Agriculture Research for International Development (SARID) initiative.

Biological and transcriptional defence responses of wheat to nonadapted and adapted species of the blast fungus Magnaporthe.

Hale A. Tufan, Graham R.D. McGrann, Andreas Magusin, Jean-Benoit Morel, Lucie Miché, and Lesley A. Boyd.

The *Magnaporthe* species complex infects over 50 Graminaeceous plant species, and rice blast, caused by *Magnaporthe oryzae*, is one of the most economically important diseases worldwide. *M. oryzae* tends to colonise cultivated grasses, whereas *M. grisea* attacks wild grass species. Recently in Brazil, *M. oryzae* has become a problem to local wheat production and could potentially become a threat to global wheat production. We have investigated the resistance present in the wheat cultivar Renan against species of *Magnaporthe* that are either adapted or nonadapted to wheat. Confocal microscopy demonstrated that the early defence response against both adapted and nonadapted species involves the production of a diffuse autofluorescent HALO structure around the site of attempted fungal penetration. A high proportion of HALOs were associated with penetration events over time in response to the nonadapted *M. grisea*, with very few infection attempts being able to progress beyond the HALO stage. In contrast, the adapted *M. oryzae* was frequently able to infect past the HALO stage and develop further into the leaf. In these cases whole cell autofluorescence was often observed, indicative of a hypersensitive response to prevent further pathogen colonisation.

Microarray analysis of the transcriptome 24 hours post inoculation indicated that wheat undergoes extensive transcriptional reprogramming during interactions with both adapted and nonadapted species. Comparison between the differentially expressed transcripts responding to the adapted and nonadapted *Magnaporthe* species revealed both conservation and diversification in the type of transcripts that were regulated, suggesting some common mechanisms in the defence response against adapted and nonadapted *Magnaporthe* species, while highlighting potential differences that may result in the observed biological phenotypes. Functional genomic approaches are currently being used to examine the roles of candidate transcripts in innate immunity of wheat against different species of the blast fungus. This program was part of a collaboration with Drs. Jean-Benoit Morel and Lucie Miché at UMR BGPI INRA/CIRAD, Montpellier, France, and was funded by a CGIAR, Generation Challenge project, Cereal Immunity.

Publications.

Melichar JPE, Berry S, Newell C, MacCormack R, and Boyd LA. 2008. QTL identification and microphenotype characterisation of the developmentally regulated yellow rust resistance in the UK wheat cultivar Guardian. Theor Appl Genet 117: 391-399.