

Nilgiri Wheat News

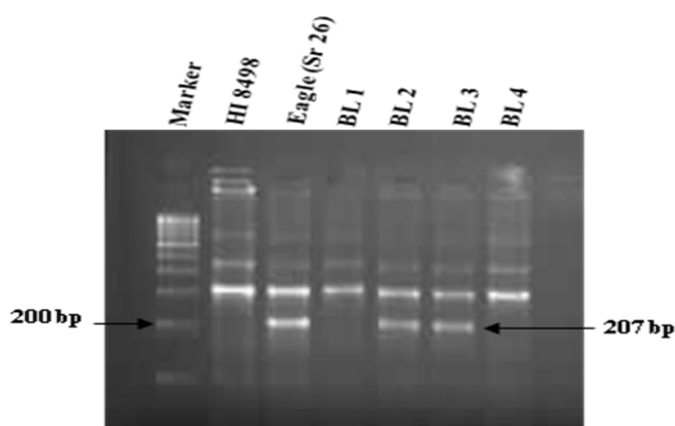
(January – April, 2011)

IARI, Regional Station, Wellington

Vol 3 (1)

Introgression of novel alien genes into popular Indian Durum cultivars – A new initiative

Dr. Vikas, V.K., Scientist (Plant Breeding)



Banding pattern of marker *Sr 26#43* on agarose gel

In India, durum wheat (*Triticum durum*) occupies second place after bread wheat in production and area of cultivation. It is cultivated primarily in Central, Peninsular and Western Plain zones of India. As in Bread wheat (*Triticum aestivum*), durum wheat is also affected by three rust pathogens viz., stem, leaf and yellow rust. Incorporation of major / minor rust resistance genes is found to be an effective strategy to control the rust in bread wheat in India and worldwide. Currently majority of these rust resistance genes are effectively exploited only in the *Triticum aestivum* background and not in the durum background. Hence an attempt was made at I.A.R.I. - Regional Station, Wellington to transfer the alien stem rust

resistance gene into durum background employing conventional Back Cross (BC) and Marker Aided Selection (MAS) approach. The effective stem rust resistance gene *Sr 26* which was transferred from the long arm of a group 6 *Agropyron elongatum* chromosome to wheat chromosome 6AL (Knott, 1968) is used. Gene *Sr 26* is one among the few major genes effective against the Ug 99 lineage. Initial crosses were performed in Rabi 2009 and the F_1 's were critically evaluated. Leaf samples were collected from BC_1F_1 lines three weeks after sowing and genomic DNA was extracted from leaf samples according to Cetyl tri methyl ammonium bromide (CTAB) based procedure with minor modifications. Polymerase chain reaction (PCR) was performed using AFLP marker for *Sr 26#43* (Mago *et al.*, 2005). The PCR products were electrophoresed at 3% agarose gel for about one hour, visualised under UV light and photographed. Among the four BC_1F_1 lines evaluated for the presence or absence of *Sr 26* gene, two lines (BL2 & BL3) showed polymorphism at 207 bp, whereas the other two lines (BL1 & BL4) did not show polymorphism for *Sr 26* gene. It is now in the BC_1F_1 stage, further critical evaluation of the backcross lines is required to know whether alien chromosome in durum background have yield or quality defects.

References

Knott, D.R. (1968). Can. J. Genet. Cytol. 10 : 695-696.

Mago *et al.* (2005). Theor. Appl. Genet. 111 : 496-504.

Breeding for multiple resistance in wheat using wild species/relatives

Dr. P. Jayaprakash, Sr. Scientist (Plant Breeding)



In any wheat breeding program the goal is developing varieties with stable and high yield over wide range of environmental conditions alongwith resistance to all the rusts. Variability in primary gene pool has nearly been exhausted in the case of diseases' resistance which necessitates the transfer of genes from wild species of secondary and tertiary gene pool. In the past, such transfer has contributed genes of leaf and stem resistance to cultivated hexploid wheat. An attempt was made at IARI, R.S., Wellington, to transfer *Thinopyron ponticum* derived linked genes *Lr19 + Sr25*, *Triticum timopheevi* derived linked genes *Sr36 + Pm6* both present in Australian cultivar 'Cook' and *Ae. squarrosa* derived leaf rust gene *Lr 32* in different combination in the background of popular bread wheat HD 2402 and HS 240. The multiple disease resistant wheat lines HW 4013 (HS 240 carrying *Lr32*) and HW 4205 (HD 2402 carrying *Lr19 + Sr25* and *Sr36+ Pm6*) were constituted at BC2F2 stage. The line HW 4205 is resistant to the leaf rust, stem rust and powdery mildew which is attributed to

the presence of resistance genes *Lr19 + Sr25* and *Sr36 + Pm6* and these genes together confers high degree of resistance at Wellington although a virulent race has been reported from peninsular zone. The recurrent parent



HD 2402 is already conferring resistance to yellow rust. The gene *Lr32* offers high degree of resistance to leaf rust in the variety HW 4013 which in addition has stem rust gene *Sr31* and stripe rust resistance gene *Yr9*. These constituted varieties are being tested under common variety trial of IARI. The multiple disease resistant wheat lines HW 4013 carries *Lr 32* , *Sr31* and *Yr 9* (Donor: Thatcher, Recurrent parent: HS 240). The line HW 4205 is resistant to leaf rust, stem rust and powdery mildew which is attributed to the presence of resistance genes *Lr19 + Sr25* and *Sr36+ Pm6* (Donor: Cook, Recurrent parent: HD 2402)

Strengthening genetic base of rust resistance in Indian Wheat germplasm

Dr. M. Sivasamy, Sr. Scientist (Plant Breeding)

Superior back cross derivatives of 20 popular cultivars carrying *Lr45*, *Lr45+Sr31*, *Lr45+Lr19+Sr25* , *Lr35*, *Lr39*, *Lr47* along with *Yr10* and stem rust genes *Sr2*, *Sr14*, *Sr22*, *Sr24*, *Sr25*, *Sr26*, *Sr27*, *Sr29*, *Sr30*, *Sr33*, *Sr35*, *Sr36*, *Sr44* have been advanced to BC3F4 stage. Populations having been introgressed with *Lr35*, *Lr39*, *Lr47* along with *Yr10* advanced to BC3F5.

Populations availed after introgression of targeted stem rust genes (*Sr2*, *Sr14*, *Sr22*, *Sr24*, *Sr25*, *Sr26*, *Sr27*, *Sr29*, *Sr30*, *Sr33*, *Sr35*, *Sr36*, *Sr44*) in order to pyramiding them in at least 20 popular cultivars advanced to BC3F3 stage (pre-emptive breeding for Ug 99 race resistance). BC3 generation of populations bred for durable resistance involving APR genes *Lr34*, *Lr46*, *Lr67*, *Sr2*, *Sr22* etc. raised successfully. Also raised BC1 of F1 population carrying new rust resistance genes *Lr44*, *Lr32*, *Lr19*, *Lr53*, *Lr57* etc. Work on molecular marker development and validation for Lr 45 is in progress. World known head scab resistant stock Sumai – 3 has been crossed with popular Indian wheat cultivars. F1 will be harvested in April, 2011. As many as 20 offsprings of cultivated x wild relatives F1 cross were evaluated for the traits of yield and rust resistance. As many as 60 popular Indian wheat cultivars have been subjected to genetic analysis of necrotic (Ne genes) behavior.

A new pathotype of *Puccinia striiformis tritici* recorded at Wellington

Dr. J. Kumar, Principal Scientist (Wheat Pathology)

Wellington area in Nilgiri hills of Tamil Nadu is traditionally known to harbour pathotype I (38S102) of wheat yellow rust pathogen since mid seventies. No further evolution of this pathogen could be noticed even after diverse germplasm sources having major resistance genes were planted here by various wheat breeders of the country and were available throughout the year (continued host – pathogen contact) for serving as mutational ground for pathogen to throw new variants. Why mutation for new variation in *P.striiformis* has been so poor in Nilgiris is a matter of further investigation. But incidently, during the

rabi season of crop year 2010-11, a variant has been monitored in several field samples showing wider virulence than pathotype I (38S102) with a remarkable feature that alongwith several resistant genes it can infect *Yr 9*, a gene present in most of the present day Indian wheat cultivars. Samples have also been sent to DWR, Regional Station, Flowerdale for further confirmation of the novel variation observed in *P. striiformis* at Wellington.

All India Coordinated Wheat and Barley Improvement Project activities

Dr. J. Kumar, Zonal Coordinator –AICW&BIP, South Hill Zone

Scored host – pathogen interactions for black, brown, yellow rusts and powdery mildews in the entries of IVT and AVT trials of AICW&BIP (2010-11), CVT (2010-11), PDSN programme of IARI(2010-11) and plant pathological nurseries of AICW&BIP (2010-11). In the capacity of coordinating centre for South Hill Zone, AICW&BIP trials of south hill zone were monitored at Paiyur (Tamil Nadu) and Mandya (Karnataka) alongwith a team of scientists from Directorate of Wheat Research, Karnal (DWR Team : Dr. D. Mohan, Principal Scientist – Wheat Breeding, Dr. A.K. Singh, Principal Scientist – Wheat Protection and Dr. Pradeep Sharma, Sr. Scientist – Biotechnology). At both the locations trial conduct was found satisfactory.

Seed Indents

Dr. M. Sivasamy, Sr. Scientist (Plant Breeding)

Three tones breeder seed each of popular wheat cultivars such as HD 2833, COW (W) 1, COW2 and HW 5207 is targeted and seed multiplication has been undertaken at IARI, Regional Station, Wellington. Seeds have been harvested successfully.

Distinguished Visitors:

January 9, 2011:

- Dr. Max J. Pfeffor, Sr. Associate Dean, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, USA
- Dr. Ronnie Coffman, Cornell University Vice Chair, BGRI, Director, DRRW
- Dr. Peter Hobbs, Cornell University, Ithaca, NY
- Jessica Rutkoshi, Ph.D. student, Ithaca, NY

February 14, 2011:

- Etienne Duveiller, Assoc. Director (Wheat), CIMMYT
- Julio Huerta, CIMMYT, Mexico
- Sybil Herrera Foessel, CIMMYT, Mexico
- Sukhwinder Singh, CIMMYT, Mexico
- Velu Govindan, CIMMYT, Mexico

February 22, 2011

- Dr. Harbans Bariana, University of Sydney, Australia

News:

- ❖ Dr. S. Nagarajan (earlier, PD – Wheat, Director, IARI, Chairman, PPVFRA) has graced the station by joining as INSA senior Scientist to undertake an assignment on epidemiology of stem rust race Ug 99 in the global context.

Retirement/Joining

- Dr. R. Asir (T 7/8) retired elegantly after having put more than 30 years of dedicated service at the station. Pray for his good health and happy retired life.
- Mrs. Uma Srinivasan (Sr. Clerk.) has been transferred from IARI,

headquarters and joined the station in February, 2011.

Call for summer nursery indent

Dear Users of Summer Nursery,

1. Seed materials of wheat, barley and triticale (main emphasis) and other crops of your centre must reach Regional Station, IARI, Wellington latest by 20th May, 2011.
2. Specific requirements for handling your research materials as off – season crop and guest house requirement should be intimated to Dr.P.Jayapraksh (Cell:09842506455), Sr. Scientist at this station.
3. Summer nursery facility to organisations other than ICAR institutes, SAUs and other Govt. sponsored institutes will be made available on payment basis.
4. Seed parcel must be accompanied by a proper forwarding letter with all details (disease scoring, harvesting etc.) and addressed to or handed over to:

The Head, IARI Regional Station, Wellington, The Nilgiris (Tamil Nadu) – 643231