Molecular marker assisted selection for leaf rust resistance in wheat (Triticum aestivum L.)

Scholor

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A Randomly amplified polymorphic DNA (RAPD) marker $S73_{719}$ tagged to gene *Lr19* was found to be linked to the gene *Lr24.* RAPD marker got amplified in ten NIL pairs for the gene *Lr19* and *Lr24* revealing that both NILs of a pair possessed same gene. RAPD marker further get amplified in other *Lr24* carrying lines and did not get amplified in *Lr19*carrying lines when validated on International wheat material, suggesting that the marker was linked to the gene *Lr24* and there is redundancy or misidentity in the Indian wheat germplasm stock. Similarly, three RAPD markers ($S49_{1100}$, $S421_{640}$ and $S464_{721}$) identified earlier as linked to *Lr32* amplified the critical marker bands identically in eight of the ten NIL pairs carrying the gene *Lr32* and *Lr28* as well as in the *Lr28* donor parent. The critical bands were not amplified in the *Lr32* donor parent suggesting that the RAPD markers actually tagged the gene *Lr28*.

Leaf rust resistance genes *Lr9* and *Lr24* were tagged with RAPD markers. Segregating F_2 populations from cross between resistance parent carrying the target gene and the susceptible parent HD2329 were screened in the phytotron against a virulent pathotype 77-5 of leaf rust. The gene *Lr9* was tagged with three RAPD markers and the gene *Lr24*was tagged with six tightly linked RAPD markers.

One RAPD marker linked to the gene *Lr9*, four RAPD markers linked to the gene *Lr24* and one RAPD marker linked to the gene *Lr28* were converted to Sequence characterized amplified region (SCAR) markers. These SCAR markers were validated for specificity to the target genes in different genetic backgrounds and on most of the other known *Lr* genes suggesting the utility of SCAR markers in selection of leaf rust resistance genes in wheat.

SCAR markers linked to the gene *Lr9* and *Lr24* were employed for pyramiding the two phenotypically indistinguishable *Lr* genes in wheat cultivar HD 2329 through marker assisted selection (MAS). MAS was carried out in the F_2 generation in a population of a cross between the two near-isogenic lines (NILs) for the two *Lr* genes. MAS with SCAR markers enabled elimination of the susceptible and resistant F_2 plants possessing only

one of the two *Lr* genes. Plants possessing both the genes were advanced to the next generation to further check the homozygosity at both the marker loci.

Seven microsatellite markers located on the chromosome arm 7DL were found to be linked to the *Agropyron elongatum*–derived leaf rust resistance gene *Lr19.* Six microsatellite markers give null allele expression in *Lr19* carrying lines and one microsatellite marker amplified the critical marker allele in the *Lr19* carrying lines.