

Molecular mapping of leaf rust resistance gene *Lr55* and pyramiding genes for leaf rust and powdery mildew resistance in common wheat

ALEKSANDRA PIETRUSIŃSKA, KINGA SMOLIŃSKA¹, JERZY HENRYK CZEMBOR, MIROSLAW TYRKA²

¹National Centre for Plant Genetic Resources, Plant Breeding and Acclimatization Institute, National Research Institute at Radzikow, 05-870 Blonie, Poland, email: a.pietrusinska@ihar.edu.pl

²Department of Biotechnology and Bioinformatics, Rzeszow University of Technology, 35-959 Rzeszow, Poland, email: mtyrka@prz.edu.pl

Aim

The aim of presented research is molecular mapping of leaf rust resistance gene *Lr55* and gene pyramiding in programs breeding for leaf rust and powdery mildew resistance.

Methods

Two F₂ populations derived from crosses Nadobna × *Lr55* (KS04WGRC45) and Bogatka × *Lr55* and consisting of 94 individuals, were used for molecular mapping.

In the breeding programs the Polish cultivars of wheat Nadobna, Bogatka, Kampana were used as a susceptible parent for leaf rust and powdery mildew. As the donor of resistance to leaf rust and powdery mildew several lines were applied. The line KS90WGRC10, which carries the *Lr39* (= *Lr41*) gene derived from the diploid wild wheat *Triticum tauschii* (syn. *Aegilops squarrosa*). The line KS04WGRC45, that carries the *Lr55* gene derived from the *Elymus trachycaulus*. The line HRS Yecora Rojo, which carries the *Lr47* gene derived from *Triticum speltoides*. A 6VS/6AL translocation line of Yangmai5 that carries the *Pm21* gene derived from the wild cv. *Dasypyrum villosum*. Line NC99BGTAG11, which carries the *Pm37* gene derived from the *Triticum timopheevii* and line NC97BGTD7, which carries the *Pm34* gene transferred from the *Aegilops tauschii*.

A set of 68 microsatellite markers and 15 DArTs from 1B chromosome were used for mapping purposes.

In addition to detect resistance genes (foreground selection) several molecular markers for *Lr41*, *Lr47*, *Pm21*, *Pm34* and *Pm37* were applied. To determine infection type (disease reaction phenotype) plants from both mapping populations and plant materials in breeding programs were inoculated in the greenhouse at the three-leaf stage with a natural pathogen population of *P. recondita* and *B. graminis*.

Results

Results from this study will be useful for marker-assisted selection and gene pyramiding in program breeding for leaf rust and powdery mildew resistance. Up to now, any molecular markers to identity the *Lr55* gene has not been determined. Moreover, the newly produced homozygous wheat lines, can be used as the source of effective resistance for the leaf rust and powdery mildew by geneticists, breeders and plant pathologists.