

Traditional and Modern Plant Breeding Methods with Examples in wheat

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Objectives

The aim of presented research is pyramiding of leaf rust and powdery mildew resistance genes in a one genotype.

Methods used

As the donor of resistance to leaf rust several lines were used. 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*.

As the donor of resistance to powdery mildew two lines were applied. 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*.

To detect resistance genes (foreground selection) several molecular markers for *Lr41*, *Lr47*, *Lr55*, *Pm21* and *Pm37* were applied. In addition, plant materials were inoculated in the greenhouse at the three-leaf stage with a natural pathogen population of *P. recondita* and *B. graminis*.

Results and Conclusion

The marker-assisted selection and resistance tests allowed to obtain homozygous lines carrying three or four resistance genes to leaf rust and powdery mildew in winter wheat. 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.

Key words: *Blumeria graminis*, gene pyramiding, marker-assisted selection, *Puccinia recondita*.