**Molecular markers for the detection of the wheat leaf rust and powdery mildew resistance genes in MAS**

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**Abstract**

Leaf rust, caused by *Puccinia recondita* f.sp. *triticina*, and powdery mildew, caused by *Blumeria graminis* f.sp. *tritici*, are the most prevalent of all of the wheat diseases in many regions of the world including Poland. These two diseases can cause serious epidemics in Poland.

The aim of presented research is pyramiding of leaf rust and powdery mildew resistance genes, like (*Lr41*+*Pm21*+*Lr47*), (*Lr41*+*Pm21*+*Pm37*), (*Lr41*+*Lr47*+*Pm21*+*Pm37*), *(Lr41*+*Lr55*+*Pm37*) and (*Lr41*+*Lr55*+*Pm21*+*Pm37*) in a one genotype.

The second objective of our study is to clarify the location *Lr55* gene in wheat genome and mapping closely linked molecular markers suitable for markers assisted selection (MAS).

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* and line NC99BGTAG11, which carries the *Pm37* gene derived from the *Triticum tiomopheevii*.

To detect resistance genes (foreground selection) several molecular markers (SSR) for *Lr41*, *Pm21*, *Lr47* 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*. The marker-assisted selection and resistance tests allowed to obtain lines carrying three or four resistance genes, (*Lr41*+*Pm21*+*Lr47*), (*Lr41*+*Pm21*+*Pm37*), *(Lr41*+*Lr55*+*Pm37*), (*Lr41*+*Lr47*+*Pm21*+*Pm37*), and (*Lr41*+*Lr55*+*Pm21*+*Pm37*) into a single genotype.

**Key words:** gene pyramiding, *Lr41* gene, *Lr47* gene, *Lr55* gene, marker-assisted selection, *Pm21* gene, *Pm37* gene,wheat

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