A candidate for *Lr19*, an exotic gene conditioning leaf rust resistance in wheat

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ABSTRACT

Lr19, one of the few widely effective genes conferring resistance to leaf-rust in wheat, was transferred from the wild relative *Thinopyrum ponticum* to durum wheat. Since *Lr19* confers a hypersensitive response to the pathogen, it was considered likely that the gene would be a member of the major nucleotide-binding site (NBS)-leucine-rich repeat (LRR) plant *R* gene family. NBS profiling, based on PCR amplification of conserved NBS motifs, was applied to durum wheat-*Thinopyrum ponticum* recombinant lines involving different segments of the alien 7AgL chromosome arm, carrying or lacking *Lr19*. Differential PCR products were isolated and sequenced. From one such sequence (*AG15*), tightly linked to *Lr19*, a 4,121 bp full-length cDNA was obtained. Its deduced 1,258 amino acid sequence has the characteristic NBS-LRR domains of plant *R* gene products and includes a coiled-coil (CC) region typical of monocots. The genomic DNA sequence showed the presence of two exons and a short intron upstream of the predicted stop codon. Homology searches revealed considerable identity of *AG15* with the cloned wheat resistance gene *Pm3a* and a lower similarity with wheat *Lr1*, *Lr21* and *Lr10*. Quantitative PCR on leaf-rust infected and non-infected *Lr19* carriers proved *AG15* to be constitutively expressed, as is common for *R* genes.

Key words: *Triticum durum*; *Thinopyrum ponticum*; NBS-LRR genes; RGAs; *Lr19*; codominant marker

Running title: *Lr19* candidate gene

INTRODUCTION

MATERIALS AND METHODS

Plant materials

NBS profiling and fragment isolation

Development of STS markers

Sequence extension

Sequence analysis

Southern blot analysis

Leaf rust inoculation

RNA isolation and expression analysis

RESULTS

Sequences identified by NBS profiling

Extension of the AG15₂₁₂ sequence and the development of a co-dominant assay for Lr19

Structure and characterization of the AG15 full length sequence

Transcription analyses

DISCUSSION