Development of diagnostic markers for the detection of functional and non-functional alleles of Yr15 (Carmel)

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Stripe rust, caused by the fungus *Puccinia striiformis* f.s. *tritici* (*Pst*), is a destructive disease of wheat globally. Depletion of effective resistance to *Pst* in cultivated wheat has led to search for new resistance genes in the wild relatives of wheat. One of the most promising genes conferring broad-spectrum resistance to stripe rust is *Yr15*, derived from wild emmer wheat (*Triticum dicoccoides*) accession G25. *Yr15*, mapped on chromosome arm 1BS, has recently been cloned by our consortium and designated as *Wheat Tandem Kinase 1* (*WTK1*). We found *wtk1* susceptible alleles in most 274 tested durum, bread, and wild emmer wheat lines. Out of 69 tested durum and bread wheat cultivars and lines, only 33 *Yr15* introgression lines contained the functional allele (*Wtk1*) from G25 and were resistant to *Pst*. The remaining 36 susceptible lines carried non-functional alleles (*wtk1*), which included insertions of large transposable elements that resulted in changes in reading frame. Development of reliable molecular markers can facilitate the introgression of *Yr15* into new varieties via marker-assisted selection. Diagnostic markers designed based on the polymorphism between the *WTK1* alleles are preferred in order to avoid negative linkage drag. Therefore, we have designed highthroughput co-dominant KASP markers that can differentiate between the functional (*Wtk1*) and all known non-functional (*wtk1)* alleles, and can be used in breeding programs for development of modern cultivars with high resistance to stripe rust.

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