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Letter to the editor

Comment on ‚In Turkish wheat cultivars the resistance allele of LR34 is ineffective against leaf rust'

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Yildirim et al. (2012) studied the effect of the wheat disease resistance gene *Lr34* in Turkish wheat cultivars. They reported that all *Lr34* containing wheat cultivars were susceptible to leaf rust in their field experiment and concluded that *Lr34* is ineffective in Turkish wheat cultivars. According to the authors this 'erosion' of *Lr34* resistance might be caused by new leaf rust races that have overcome this resistance gene. In our opinion however, the phenotypic data presented in this study are inadequate to assess partial disease resistance. Much more careful field trials and additional data would be needed to rule out additional explanations and to support the claim of 'ineffectiveness' of *Lr34* in Turkish wheat cultivars.

Lr34 is one of the most important disease resistance genes in wheat breeding because it confers durable and race non-specific protection against several fungal diseases. The effect of *Lr34* is partial, resulting in longer latency periods and reduced infection frequency. This phenotype is also named 'slow rusting'. Towards the end of the growing season, even *Lr34* containing wheat cultivars can show disease symptoms. Under high disease pressure and in environments that favour disease development, *Lr34* alone might confer insufficient protection and *Lr34* containing cultivars might be misclassified as susceptible. Hence, extreme care must be taken in field trials to adequately phenotype wheat cultivars with partial resistance. To adequately judge the effectiveness of partial resistance genes, wheat cultivars need to be evaluated during several field seasons ideally at different locations. Singh (1992) for example evaluated leaf and stripe rust resistance in *Lr34* containing cultivars over two years in two different locations in Mexico.

In this study, the cultivars were only evaluated once and in one location. Artificial field infections are usually initiated by inoculating spreader rows of highly susceptible cultivars (Schnurbusch et al. 2004, Singh 1992, Singh et al. 1998). In this study, experimental plots were directly sprayed twice with leaf rust suspension. This kind of infection is likely to result in high disease pressure on the experimental plots. Furthermore, some important control cultivars such as the near isogenic lines Jupateco 73R/Jupateco 73S or Thatcher/Thatcher *Lr34* (Singh 1992) were not included in this field trial. Based on the single field season, the infection strategy and the lack of proper controls we consider it likely that the authors misclassified some of the cultivars as susceptible. A more careful evaluation might have revealed the partial effect of *Lr34*.

We know of some wheat cultivars where *Lr34* is non-functional because of additional point mutations. The American wheat cultivar 'Jagger' for example showed presence of *Lr34* using molecular markers but was classified as susceptible. Complete sequencing of the 'Jagger' *Lr34* allele revealed an additional point mutation resulting in a premature stop codon and possibly a non-functional protein (Lagudah et al. 2009).

Here, the authors did not sequence the full *Lr34* gene in susceptible cultivars. Only a 649 bp fragment of the 12 kb gene has been sequenced in some cultivars. Hence, it cannot be ruled out that additional point mutations are present in the *Lr34* allele in Turkish wheat cultivars. Only the sequence of the full-length gene including promoter region can answer this question.

In summary, we think that the claim that *Lr34* has been overcome by new leaf rust races cannot be made based on the data presented in this manuscript. *Lr34* has so far been classified as race non-specific. The question whether new leaf rust isolates have overcome the *Lr34* resistance gene is of great importance to the wheat community and such claims should only be made if all other possibilities can be ruled out.

References

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