

## **The wheat Sr22, Sr33, Sr35 and Sr45 genes confer resistance against stem rust in barley**

### **ABSTRACT**

In the last 20 years, stem rust caused by the fungus *Puccinia graminis* f. sp. *tritici* (Pgt), has re-emerged as a major threat to wheat and barley production in Africa and Europe. In contrast to wheat with 60 designated stem rust (Sr) resistance genes, barley's genetic variation for stem rust resistance is very narrow with only ten resistance genes genetically identified. Of these, only one complex locus consisting of three genes is effective against TTKSK, a widely virulent Pgt race of the Ug99 tribe which emerged in Uganda in 1999 and has since spread to much of East Africa and parts of the Middle East. The objective of this study was to assess the functionality, in barley, of cloned wheat Sr genes effective against race TTKSK. Sr22, Sr33, Sr35 and Sr45 were transformed into barley cv. Golden Promise using *Agrobacterium*-mediated transformation. All four genes were found to confer effective stem rust resistance. The barley transgenics remained susceptible to the barley leaf rust pathogen *Puccinia hordei*, indicating that the resistance conferred by these wheat Sr genes was specific for Pgt. Furthermore, these transgenic plants did not display significant adverse agronomic effects in the absence of disease. Cloned Sr genes from wheat are therefore a potential source of resistance against wheat stem rust in barley.