Genetic mapping of an extreme PVY-resistance locus in *Solanum tarnii*

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Potato virus Y (PVY) is the most important potato virus worldwide causing high losses of yield and quality. Therefore, PVY resistance is of certain interest to potato breeders. Resistance breeding is based on identifying appropriate resistance donors, revealing the inheritance of PVY resistance as well as mapping of resistance loci to the potato genome, including the development of molecular markers suitable for selection of resistant genotypes. A phenotype expressing extreme PVY resistance was observed within the Mexican wild species *S. tarnii*, Hawkes et Hjerting (2n=2x=24; genome BB), which belongs to the series *Pinnatisecta* (Hawkes 1990; Thieme et al. 2008). A F_2 mapping population was generated which segregated into 65 PVY-resistant and 15 susceptible lines, which may still be consistent with a 3:1 ratio (Chi^2= 2.17; p= 0.5) indicating monogenic dominant inheritance of virus resistance. A genetic map based on DArTseq, SNP and SSR markers was constructed comprising 3.357) markers in 12 linkage groups that correspond to the twelve potato chromosomes with a total length of 3166cM. The average marker distance is 0.9 cM. The 3.357 markers represent recombining loci. Based on this map and relevant scoring data, three resistance genes on chromosomes III, V, and XII were identified, however these genes are functionally identical and a phenotypic differentiation is not possible. Further studies revealed that each of these genes alone confers extreme resistance to all tested PVY strains. So far only resistance genes Ry_{sto} and Ry_{fsto} were mapped on chromosome XII (Song et al. 2005). Based on the sequence information of the DArTseq markers and using the potato reference genome, co-dominant SNP markers were derived, thereby significantly reducing the genetic marker distance. With a determined diagnostic value between 84 % and 92 %, these markers are well suited for marker assisted selection and to extend the genetic basis of PVY resistance in potato breeding.

References:

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