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► To cite this version:

Carole Caranta, P. Arens, Laetitia Cavellini, Sophie Rolland, André Moretti, et al.. Development and evaluation of functional markers for tomato DUS testing of disease resistance genes. 5. Solanaceae Genome Workshop, Oct 2008, Cologne, Germany. hal-02755619

HAL Id: hal-02755619

<https://hal.inrae.fr/hal-02755619>

Submitted on 3 Jun 2020

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#212: Development and evaluation of functional markers for tomato DUS testing of disease resistance genes

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The objective of this project was to develop and/or evaluate the use of molecular characteristics as predictor of obligatory disease resistance characteristics in the applicable CPVO tomato DUS (Distinctness, Uniformity and Stability) protocol. Depending on the molecular data available for resistance genes, two types of molecular markers were considered: linked markers for the Tomato mosaic virus Tm1 and the Fusarium I resistance genes, and functional markers (within the sequence of cloned resistance genes) for the Verticillium genes Ve1 and Ve2, the Tomato mosaic virus Tm2 and Tm22 genes, the Meloidogyne incognita Mi1-2 gene and the Fusarium I2 locus. The markers were tested for their robustness in 5 distinct laboratories and subsequently validated in a set of approx. 70 tomato varieties. In 97% of the cases the molecular marker assays confirmed the results obtained from the pathogenesis assays. Pathogenesis assays and marker assays gave identical results for the nematode resistance gene Mi1-2 and Tm resistance genes. For Verticillium and Fusarium resistance genes, minor deviations between the pathogenesis and marker assays were observed. Observed discrepancies are most likely due to the pathogenesis assay, which is strongly dependent on the conditions used and the inoculums. These are more difficult to standardize and are more subjectively interpreted than the assays for virus and nematode resistance. Marker assay have the advantage that the results are clearer and homozygote/heterozygote presence of the resistance gene can be detected. Markers assays are also good at spotting heterogeneity.