Phytophthora - pepper interaction: genetic, cytological and biochemical analyses

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Phytophthora blight is a serious problem in many crops worldwide. Management practices help to control epidemics. Nevertheless Phytophthora remain the most destructive pathogen in pepper, where no major resistance gene was deployed and only partial polygenic resistances were reported. Ongoing genetic, cytological and biochemical analyses aim to unravel their genetic, molecular and functional bases. In YW susceptible line, cells of elongation zone of early infected roots are severely disorganised and invaded by mycelium while in CM334 resistant line, a necrotic reaction of the root epidermis stops the parasite. The detailed assessment of resistance and its dissection into QTLs highlighted its complex genetic architecture and diversity. Phenotypic and molecular analyses of populations from phenotypic selection for P. capsici resistance pointed out that low effect resistance alleles and epistatic interactions were lost after several backcrosses, explaining difficulties to transfer this resistance from exotic lines to elite cultivars. Conversely, when achieving marker-assisted backcrosses, four QTLs with additive and epistatic effects were validated and elite resistant lines obtained. Comparative mapping within the genus Capsicum showed that the major effect QTL located on P5 chromosome is common to 5 resistant lines. It confers a broad spectrum resistance to 8 P. capsici isolates from different geographical origins. Colocations between resistance QTLs to 3 Phytophthora species within C. annuum and within Solanaceae suggests the existence of common resistance factors which possibly derive from common ancestral genes. To further investigate the major effect resistance QTL and colocations, near-isogenic lines were constructed. They are used in fine mapping and for transcriptomic and biochemical analyses. These results, together with ongoing sequencing programs in Solanaceae and Phytophthora, are expected to increase the knowledge on Solanaceae-Phytophthora crosstalk.