SESSION 1b. Fundamental research
Language: English. Tarthorst Hall

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Some homologs of Verticillium dahliae effector Ave1 contribute to virulence in other plant pathogens

Verticillium dahliae is a fungal pathogen that causes vascular wilt in a broad range of host plants, including commercially important crops. The immune receptor Ve1, of which homologs are found in several host plants, confers resistance to Verticillium race 1 strains in tomato. Genome and RNA sequencing of V. dahliae race 1 and race 2 strains resulted in the identification of the highly expressed race 1-specific Ave1 gene that encodes the effector protein that is recognized by Ve1. Deletion of V. dahliae Ave1 does not only result in loss of recognition on Ve1 plants, but also makes the fungus less aggressive on tomato plants lacking Ve1. Homologs of Ave1 were mainly found in plants, but also in the plant pathogens Fusarium oxysporum, Cercospora beticola, Colletotrichum higginsianum and Xanthomonas axonopodis. To determine whether these Ave1 homologs can contribute to virulence, V. dahliae Ave1 deletion mutants were complemented with the homologs of F. oxysporum, C. beticola, C. higginsianum and X. axonopodis, and tested for aggressiveness on tomato plants lacking Ve1. Remarkably, only homologs of C. higginsianum and X. axonopodis complemented virulence of V. dahliae Ave1 deletion mutants. This suggests that there are different functions among the various Ave1 homologs. Ave1 deletion mutants are generated in F. oxysporum, C. beticola and C. higginsianum to study their contribution to virulence in these pathogens.

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An in vitro infection system for studying Phytophthora-host interactions using tomato cell suspensions

One of the most devastating plant diseases worldwide is late blight on potato and tomato caused by the oomycete pathogen Phytophthora infestans. During the early biotrophic phase of infection, Phytophthora penetrates host tissue and thereafter forms specialized feeding structures called haustoria. Here, effectors produced by the pathogen, are transferred into the host cells to manipulate the host cell machinery thereby suppressing plant defense. Therefore, studying the interface between the host and the pathogen at the early stages of infection is of great interest. An important drawback when studying the Phytophthora-host interaction in leaves is the lack of synchronization of the infection process. For this purpose, a new in vitro infection system was established, in which MsK8 tomato cell suspensions were challenged with zoospores of different Phytophthora species. Here we show that P. infestans infects MsK8 cells in a similar fashion as leaf tissue. In contrast, other Phytophthora species that are not pathogenic on tomato could not penetrate the MsK8 cells. The use of this novel infection system allows simplification and synchronization of the infection process, and is expected to provide a more detailed insight into Phytophthora-host interaction.

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Dominant resistance against the Tomato spotted wilt virus in Capsicum annuum is triggered by the RNA silencing suppressor protein

Resistance against Tomato spotted wilt virus (TSWV) isolates in Capsicum annuum is based on the dominant resistance gene Tsw. Unfortunately, resistance breaking isolates are meanwhile emerging and require monitoring and detection of their presence. Previous research performed on the identification of the avirulence determinant, the viral component triggering the resistance, showed contradictory results and left the issue unsettled. The first aim in my project was to determine which TSWV viral protein triggered the hypersensitive response (HR). For this a suitable transient expression system in Capsicum annuum had to be established, and this allowed us to identify the NSs protein of TSWV as the avirulence determinant of Tsw-mediated resistance in Capsicum annuum. In a next study we investigated whether the ability of NSs to trigger the Tsw-mediated resistance was functionally linked to the other known function of the NSs protein; suppressing the antiviral RNAi response. We were able to show that one function could be disrupted while the other...