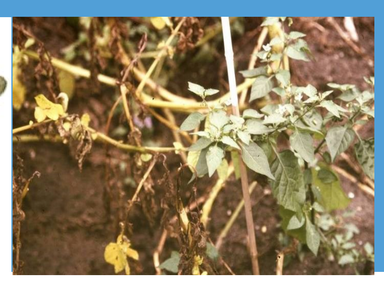
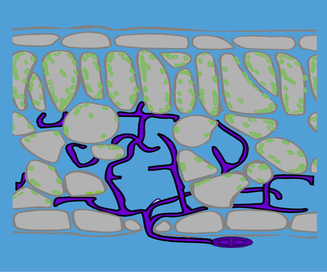
The SOL group: susceptibility and resistance in Solanaceous plants

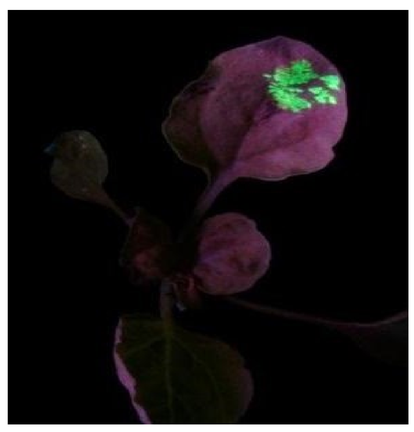


In the Solanaceae (SOL) group we want to unravel how plants are able to resist harmful pathogens. We focus on Solanaceous plants as these represent economically important crops, such as tomato and potato, and they are also versatile model plants in the lab.

Our main interest is to exploit susceptibility and resistance traits, which are present in nature, to generate pathogen-resistant plants. With such plants, the use of harmful chemicals in food production can be diminished.

We aim to sort out, using a very diverse set of techniques, what determines the susceptibility of plants to pathogens and how pathogens are perceived by resistant plants. How do resistance (R) proteins (so-called immune receptors) trigger defence and which downstream signalling protein cascades are activated. Furthermore, we study how successful pathogens can manipulate these responses and suppress them.

Which plant proteins are crucial for the susceptibility of plants to pathogens?

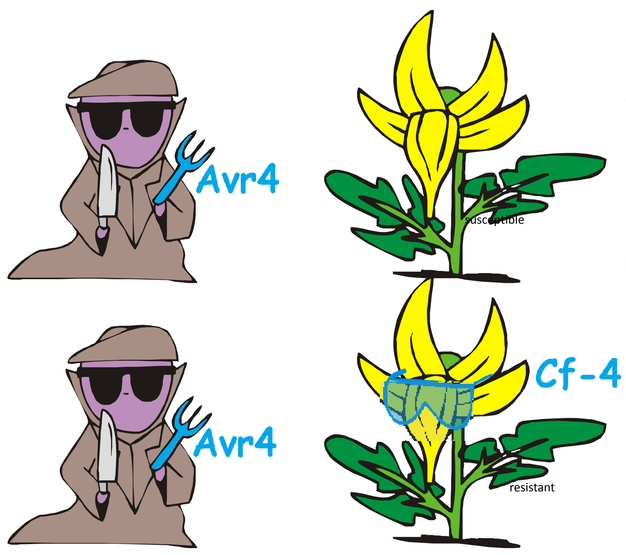



Pictures: Laurens Deurhof

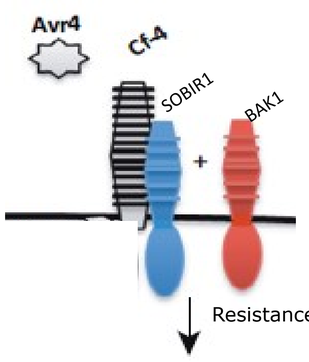
- We are interested in the identification of so-called susceptibility factors of plants to pathogens, for example viruses. Taking away, or mutating such factors should result in resistance.
- The pictures on the left show tobacco plants (*N. benthamiana*), in which a gene required for viral replication has been silenced (plant on the right). Plants were inoculated with Potato Virus X fused to fluorescent GFP protein. Due to the lower expression of the gene, the plant has changed from susceptible (left) to partially resistant (right).
- Over-expression of such a susceptibility factor might result in increased susceptibility to the virus; see picture on the right (arrow).

Picture: Yu Du

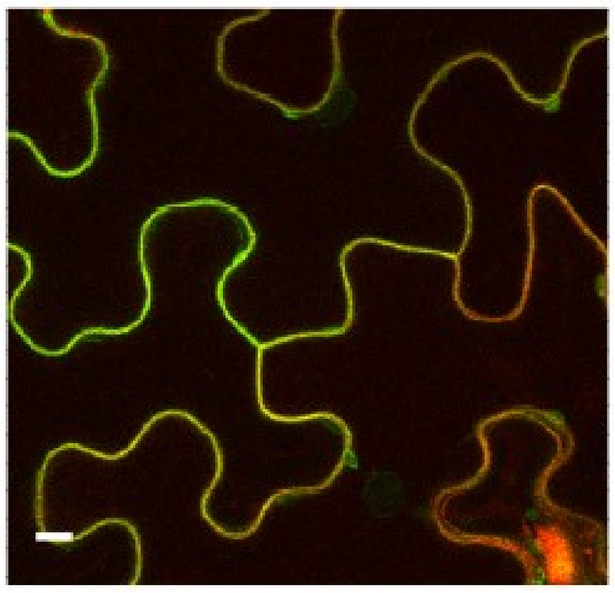
How do extracellular immune receptors detect virulence proteins from the fungus *Cladosporium fulvum* and subsequently activate the defence response?



Cartoon: Renier van der Hoorn



- We focus on elucidating the perception mechanisms of virulence proteins such as Avr4, by extracellular receptors, such as Cf-4.
- The cartoon on the left shows that a plant with the immune-receptor Cf-4 (glasses) can see and resist the attacker with Avr4 (fork), whereas a plant without Cf-4 cannot. The upper plant is susceptible and will be colonised by the pathogen, whereas, the lower plant will not be colonised and is resistant.
- The Cf-4 protein is a kind of extracellular receptor protein. We have labelled this receptor with a fluorescent tag and found that Cf-4 is located on the plasma membrane (see picture on the right). So, the Cf-4 receptor is the first barrier the pathogen encounters when it enters the plant.
- We want to know how Cf-4 is able to recognise Avr4 and how this recognition event results in the activation of the resistance response of the plant.



Picture: Jelle Postma

This is the current model, as drawn by Thomas Liebrand, that we have developed concerning the perception of Avr4 of *C. fulvum* by Cf-4 of tomato. The Cf-4 protein (a receptor-like protein; RLP) constitutively interacts with the receptor-like kinase (RLK) SOBIR1. When the Avr4 effector is being perceived by the Cf-4/SOBIR1 complex, BAK1 is recruited to the complex and resistance is activated.

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