

## HIP WP3.1: Resistance to microbes and viruses report 2021

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Potato production in the Netherlands, like in the rest of the world is continuously threatened by a large number of pests and diseases. Without crop protection programs potato production at the current scale would not be possible. In the past, the Ministry of Agriculture from the Netherlands has invested in research programs to understand and provide solution for potato late blight. Other disease, that produce similar environmental pressure, have so far been underexposed but deserve similar research efforts. In buildingblock 3, three workpackages have been defined. In WP3.1 we produce high throughput assays and perform screenings of the Solanum germplasm to identify novel sources of resistance against microbial pathogens and viruses.

**Highlights:** In 2021 the modules soft rot and dry rot have yielded two shortlists of Solanum accessions that were consistently resistant to both *Dickeya solani* and *Pectobacterium brasiliense*, or *Fusarium solani* and *Fusarium sambucinum*, respectively. In the module agroinfiltration the first Solanum screens were started.

- Module soft rot: Solanum genotypes from the shortlist were crossed with susceptible genotypes. Offspring from several crosses were tested for their resistance to *D. solani*. A few populations with bimodal segregation were selected for genetic research in 2022.
- Module dry rot: Solanum genotypes from the shortlist were crossed with susceptible genotypes. Several crosses were made and a small selection will tested for segregation of resistance to *Fusarium* species in 2022.
- Module agroinfiltration: In this module we screen for responses of Solanum plants to effectors from 5 different fungal, bacterial, and viral effectors. In 2021 effectors from a viral and a fungal pathogens were cloned and expressed in leaves from Solanum plants. Several accessions responded with a specific hypersensitive response, which indicates that the plant could be resistant to the corresponding pathogen (Figure 1).



Figure 1. Agroinfiltration of selected pathogen effectors resulted in specific hypersensitive responses in several Solanum genotypes. 1: Effector1, 2: effector2, 3 and 5: negative controls.

**Knelpunten:** The cloning of effectors from one of the selected pathogens was delayed, and the planned screening could not take place. This activity has been shifted to 2022.

**Planning:**

- Modules soft rot and dry rot: Map positions of the genes that are causal for the resistance will be identified. Markers for introgression breeding will be generated.
- Module agroinfiltration: Germplasm screens will be performed in which effectors from bacterial and a viral origin through expression in the leaves. Responsive genotypes from the screens in 2021 will be crossed to non-responsive genotypes to investigate the genetics underlying the effector responsiveness.

**Products:**

- Solanum plants have been identified that are resistant to diverse isolates of Fusarium and Erwinia species.
- Solanum plants have been identified that specifically respond to pathogen effectors
- Cross-populations segregating for disease resistance have been generated for further genetic analysis.