

## HIP WP3.3: Insect resistance

### Report 2021

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Potato cultivation is suffering from a range of insect pests, including the Colorado potato beetle (CPB), various aphids, fleas and psyllids. Next to direct damage caused by feeding, insects can also cause indirect damage by transmitting virus and bacterial diseases which can lead to additional yield losses. Combating insects mainly takes place by chemical means, which is undesirable from an environmental perspective and is increasingly facing societal opposition. In Buildingblock 3 workpackage 3.1 we explore the use of host plant resistance to insects as an environmental friendly solution to the insect problems in potato.

**Highlights:** The work is divided into two modules:

Module CPB: From screenings done in 2020, a selection of clones that were highly resistant to CPB, both diploid and tetraploid, were selected for further study. In 2021, the following activities were carried out:

- The effect of plant age on resistance was studied, and while there were no large differences in resistance between 12-week old plants and 6-week old plants, it was found that for some of clones, resistance increased in older plants.
- Plant resistance was compared to three different CPB populations. Two populations were collected in the North and South of the Netherlands and compared to the Wageningen CPB population, but no significant differences were found. Two clones were consistently very resistant in the experiments and will be used for further studies.
- Finally, crosses were attempted to generate 10 small populations of resistant material with tuberosum. Material for some of the crosses is now ready to be tested in 2022.



Figure 1: Larvae of the Colorado Potato Beetle

Module trichome: From assays in 2020, four clones were selected that were highly resistant to both aphids and whitefly, and all clones showing full resistance were densely populated with type IV glandular trichomes. To study how genetically complex the trichome-based resistance is, populations were generated of type IV producing clones with tuberosum material. Trichome type and density, and insect resistance was studied in a population of a cross between a *Solanum berthaultii* clone and tuberosum.



Figure 2: A potato leaf with many glandular trichomes.

**Bottlenecks:** None were encountered.

### Planning:

#### CPB resistance

We will phenotype 2 small populations of CPB resistant di- and tetraploids with tuberosum with the aim to map CPB resistance in these populations and study the resistance mechanism.

### Aphid and whitefly resistance

We will phenotype trichome type and density on selected insect resistant and susceptible genotypes, and will perform more crosses to produce a segregating population. The population will be phenotyped for trichome type, density, and insect resistance, with the aim of mapping insect resistance and type IV trichomes in this population.

### **Products:**

- Solanum plants have been identified that are resistant to CPB, aphids and whiteflies.
- We have generated material for segregating populations to study insect resistance.