Protein restricts sap uptake by aphids

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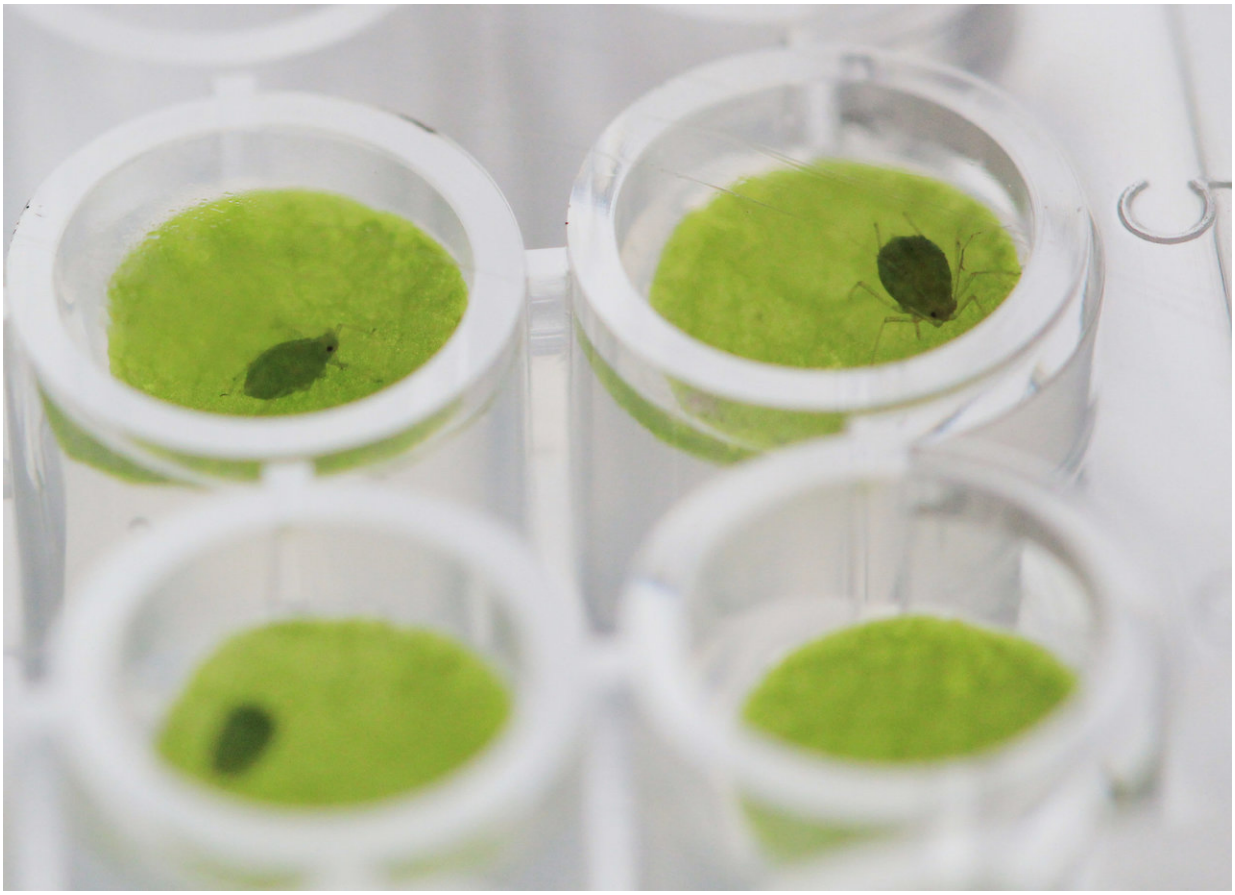

Aphids. Credit: Karen Kloth

Researchers at Umeå University and Wageningen University have discovered how plants can defend themselves against aphids. They recorded aphid behavior on video, and identified a plant protein that keeps aphids from feeding. The results have been published in *The Plant*

Cell.

During her PhD, Karen Kloth studied aphid feeding behavior on different varieties of the model plant Arabidopsis thaliana, collected from 350 different locations on the northern hemisphere. Together with other Dutch researchers she built a video-tracking platform to measure how often aphids penetrated the plants and were feeding.

On resistant plants, the aphids were feeding less from the sugar-rich sap than on susceptible plants. This behavior was associated with one specific plant gene, coding for a protein with unknown function. At the Umeå Plant Science Centre, UPSC, Umeå University, the researchers thereafter studied where in the plant the protein was located. They transformed plants with a fluorescent version of the protein, and found that the protein coats the inside of the vessels where sugar-rich sap is transported.

Further experiments showed that aphids had a slower sap ingestion and produced fewer offspring on resistant plants. The researchers think that the protein might occlude the narrow food canal of the aphid. At high temperature, plants produced more of the protein and were more resistant to aphids. In addition, plants with the protein had another advantage; they were able to produce more seeds during heat stress.

Karen Kloth, today post doc at the Department of Plant Physiology at Umeå University, has been working for almost six years on this study:

"In the beginning, we did not know if the video platform would work. We kept the aphids in a very artificial environment, and it is debatable whether this represents whole plants in natural conditions. When the first results confirmed that we had indeed found a new resistance gene, I was really excited."

Natural plant resistance to aphids and better tolerance to heat stress are of interest for plant breeding companies. Breeding crops with effective resistance proteins can help to reduce insecticide application and yield losses due to hot conditions. In the long term, this research could help to produce more sustainable fruits and vegetables.

More information: Karen J. Kloth et al. SIEVE ELEMENT-LINING CHAPERONE 1 restricts aphid feeding on Arabidopsis during heat stress, *The Plant Cell* (2017). DOI: 10.1105/tpc.16.00424

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