Mechanisms of virus-vector interactions mediating disease transmission

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To cite this version:
Christiane Then, Fanny Bellegarde, Geoffrey Schivre, Tou Cheu Xiong, Martin Drucker, et al.. Mechanisms of virus-vector interactions mediating disease transmission. 19. HFSP Awardees Meeting, Jul 2019, Tsukuba, Japan. 2019. hal-02947634

HAL Id: hal-02947634
https://hal.inrae.fr/hal-02947634
Submitted on 24 Sep 2020

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Do plant viruses perceive the presence of aphid vectors?

Aphid punctures trigger instant calcium elevations at the puncture site. They might be the first step in establishment of plant defense responses against these predators (see model above).

Many plant viruses are transmitted by aphids. There is evidence that viruses modify plant defenses, for example to modify interactions of plants with virus-transmitting aphids.

Such modifications could effect the very first steps in virus-aphid interactions (transmission).

Therefore, we tested whether virus infection interferes with local calcium elevations.

Experimental system

Method:
Recording of aphid activity by bright field microscopy
Recording of calcium concentration by fluorescence radiometry
Tempo-spatial analysis

Results

Analysis of calcium signal

Viruses alter calcium signaling differently

Can a plant virus perceive the presence of a plant while being retained in its insect vector?

Viruses that retain in the foreguts of whitefly vectors must be released and inoculated into the plant in order to achieve transmission.

Many whitefly-transmitted viruses are emerging viral pathogens of important food and fiber plants.

Although whitefly feeding (on plants) contributes to the inoculation of foregut borne viruses, nothing is yet known about the role(s) that plants play, if at all, in virus inoculation.

Therefore, we conducted studies to test the hypothesis that the inoculation of a foregut borne virus can be mediated by a plant trigger.

Experimental system

Establish virus host (B. rapa) and non-host (B. napus)

Plant-to-plant transmission of lettuce infectious yellow virus (LIYV) to B. rapa or B. napus

Reverse transcription (RT) – PCR

Virus Retention Assays

<table>
<thead>
<tr>
<th>Virus</th>
<th>B. rapa</th>
<th>B. napus</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIYV +</td>
<td>0.2%</td>
<td>11.3%</td>
</tr>
<tr>
<td>LIYV +</td>
<td>0.3%</td>
<td>11.6%</td>
</tr>
</tbody>
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Acknowledgments: