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REAL-TIME MONITORING OF FEEDING AND OTHER ACTIVITIES IN APHIDS BY LSCI

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Stoyan Yordanov, Martin Drucker, Kaloian Koynov, Hans-Jürgen Butt



Max Planck Mainz
Germany



Aphids cause great crop damage by feeding on plant sap

Yvan Rabhe

Aphid mouth parts

Food canal

Saliva canal

Common canal

Unknowns while feeding:

- Inward and outward flow
- Controlled injection of saliva
- Different saliva types
- Plant sap highly pressurized (up to 20 bar)

→ How does it work?

Biologic problem

Laser Speckle Contrast Imaging to record aphid feeding

Axonometric View:

Laser

Aphid

Speckle

3D-Stage

Camera

+

Image analysis

- 633 nm laser for coherent light
- 3D stage to place aphid
- Objective (optional) for higher resolution
- High speed camera to record speckles
- Speckle analysis software

LSCI set-up

Flow velocity measurement on artificial medium

Mouth parts

Brightfield

Analysis

mean intensity

50 μm

Mouth parts

Speckle

Autocovariance

τ [s]

Flow velocity:

- 0.27 mm/s (region 1)
- 0.18 mm/s (region 2)
- 0.15 mm/s (region 3)

Canal \emptyset

LSCI measurement on starving aphid

Aphid

Brightfield

Analysis

velocity

31.5 mm/s

1.16 mm/s

901s

Aphid

Speckle

V [mm/s]

Time [s]

901s

Proof of principle