

ILVO

Instituut voor Landbouw-,
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LIÈGE université
Gembloux
Agro-Bio Tech

Valorization of HTS output data in view of a timely risk assessment of regulated or emerging plant viruses

VALORHIGHLIGHTS

Euphresco 2023-E-447

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*FPS Health funded project
under the acronym VIRISK*



Theme

Facilitating access to relevant information

Project title

Valorization of HTS output data in view of a timely risk assessment of regulated or emerging plant viruses

VALORHIGHTS

Euphresco 2023-E-447

Goals

- Map ongoing/finished HTS screenings and/or data sharing initiatives
- Define and standardize in a multistakeholders approach the prioritization criteria to identify, within these datasets, organisms of concern
(e.g. emerging in several important crops or in several areas, regulated as EU quarantine organisms but with limited individual characterization data available, related to known harmful organisms,...)
- Perform an in-depth characterization herewith testing and optimizing a standardized framework

Physostegia chlorotic mottle virus symptoms on tomato - Photo : Coline Temple

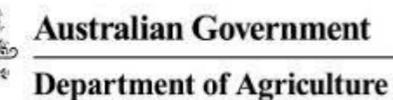
Transnational Consortium



The Plant Health Bioinformatics Network fine-tuning the collaboration activities between pathologists and bioinformaticians

Valorization of HTS output data in view of a timely risk assessment of regulated or emerging plant viruses

13 transnational partners:





Transnational approach

Yacon plants- © 2024 Diana's mooie moestuin

How to actively involve the transnational project partners

- **Formation of smaller focus groups:**
 - Target/host based (*e.g. ToFBV/tomato*)
 - Activity based focus group (*e.g. defining and standardizing criteria to identify, within these datasets, organisms of concern*)
- **Organize specific interaction moments within the smaller focus groups** (online meetings, in person meetings at other events, etc) specifically in relation to the project tasks (criteria, test cases, etc)
- **Organize plenary feedback meetings** and discussions, both online and (at least once) in person
- **Prepare joint dissemination material** (meetings, papers, updated biological information, updated PRA documents, etc.)



Nat. project goals

Yacon plants- Copyright © 2024 Diana's mooie moestuin

Research questions and objectives that will be addressed in the Belgian parallel project VIRISK (FPS Health funded):

- Compile an **inventory of the ongoing/finished HTS screenings** on viruses and viroids through data sharing initiatives (WP1).
- **Define and standardize criteria to identify, within these datasets, organisms of concern** that need further biological characterization to underpin plant health policy. (WP2).
- **(Partial) characterization** (based on the *Biol. Framework of Massart et al. (2017)*, further refined by *Fontdevilla et al. (2023)*) of selected viruses of phytosanitary concern from previous HTS datasets. They will also serve as **test cases** for the WP2 criteria (WP3).
 - ✓ potato yellowing virus (PYV),
 - ✓ *Physostegia* chlorotic mottle virus (PhCMoV)
 - ✓ tomato fruit blotch virus (ToFBV))



Nat. project goals

Research questions and objectives that will be addressed in the Belgian parallel project VIRISK (FPS Health funded):

- **Draft or update the existing PRA documents** (for the test cases, PYV, PhCMoV, ToFBV and potential other cases that were selected) + distribute to stakeholders (WP4).
- The **standardised process** will be evaluated against the test cases dealt with by the transnational consortium, **optimised and made available so that it will be useful to assess future datasets**, and allowing to graft future research initiatives (WP4)

WP1 – Published new viruses

- Review and gathering new viruses discovered since 2009 in crops families of interest : ***Cucurbitaceae, Solanaceae***

***Cucurbitaceae* : 29 virus species identified from 12 virus families**

- Host range mostly limited to the plant family, except for melon mild mottle virus (MMMoV)
- Mostly associated with symptoms, sometimes in co-infection with other cucurbit viruses
- Half of the studies performed transmission to indicators

***Solanaceae*: ongoing**

- Resources: two review articles and EFSA reports (2020-2021) for tomato, potato, wild and cultivated *Solanaceae* (2020-2021)
- New viruses identified since 2021, e.g. new trichovirus in *Physalis peruviana* (Bacca *et al.* 2023)

WP3 – Biological characterization of the selected species

➤ Task 3.1. In silico mining of available HTS datasets

Two species analyzed : **potato yellowing virus (PYV)** and **tomato fruit blotch virus (ToFBV)**

Use Serratus to scan SRA database to find virus sequences

New hosts identified

For PYV:

- Yacon (*Smallanthus sonchifolius*) – Tuber from Poland
- Common sneezeweed (*Helenium autumnale*) - China
- Andean raspberry (*Rubus glaucus*) – South America



For ToFBV:

- Tomato – North America, Europe
- Sweet potato – South Africa



WP3 – Biological characterization of the selected species

➤ Task 3.2. Biological characterization by bioassays and field surveys

Tree species analyzed : **Physostegia chlorotic mottle virus (PhCMoV)**, **potato yellowing virus (PYV)** and **tomato fruit blotch virus (ToFBV)**

For PhCMoV:

- Field survey – extensive screening of host plants in the vicinity
of infection focus

Greenhouse: detection in symptomatic tomato, eggplant as before

Test all plant species next to the greenhouse (12 species, 5 plant families)
for virus reservoir ?

New host identified: *Nicandra physaloides* (Solanaceae)

follow-up in winter/spring

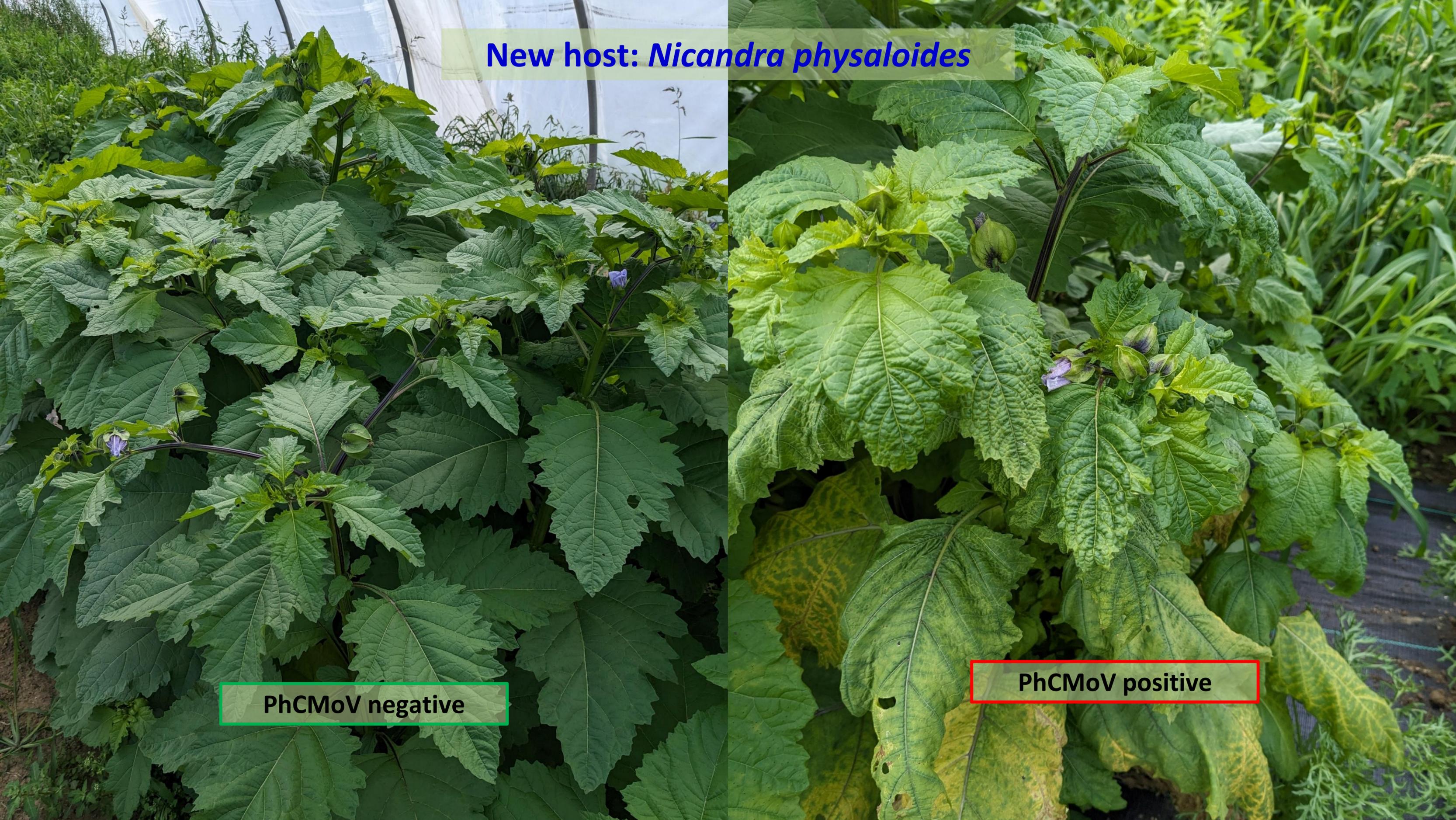


Symptomatic eggplant

New host: *Nicandra physaloides*

PhCMoV negative

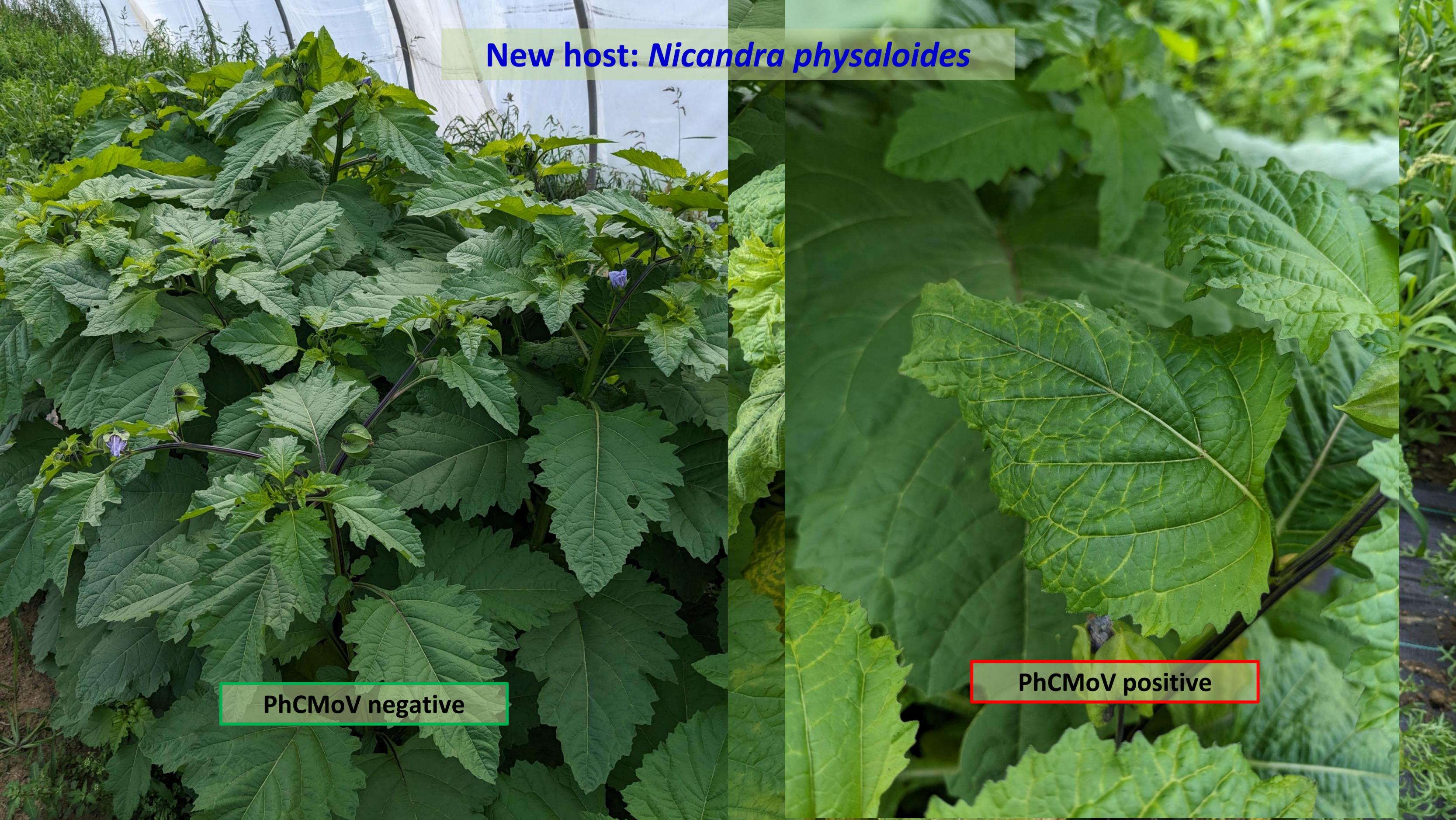
PhCMoV positive



New host: *Nicandra physaloides*

PhCMoV negative

PhCMoV positive



WP3 – Biological characterization of the selected species

➤ Task 3.2. Biological characterization by bioassays and field surveys

Tree species analyzed : **Physostegia chlorotic mottle virus (PhCMoV)**, **potato yellowing virus (PYV)** and **tomato fruit blotch virus (ToFBV)**

For PhCMoV:

- Bioassays – mechanical transmission: **ongoing**
- Test 18 plant species (9 families: crops, ornamentals, wild),
4 of which were found in vicinity of CTH in Gembloux.
- Test if non-detection *in situ* due to non host species or
absence of insect vector ?
- Bioassays – insect transmission: **ongoing**
Collect leafhopper in a previously PhCMoV positive site
Raise leafhoppers in cages with wild plants and vegetables



WP3 – Biological characterization of the selected species

➤ Task 3.2. Biological characterization by bioassays and field surveys

Tree species analyzed : ***Physostegia* chlorotic mottle virus (PhCMoV)**, **potato yellowing virus (PYV)** and **tomato fruit blotch virus (ToFBV)**

For PYV:

- Field survey – extensive screening of host plants in the vicinity of infection focus: **ongoing**

PRONC project (2018-2022): identification of yacon as host species in Belgium

Sept 2023 : HTS analysis on one positive Belgian site (Viaverda): no detection in surrounding wild *Asteraceae*.

Summer 2024 : screening PRONC sites + two yacon plots in Gembloux (47 plants collected)

- ✓ Collection garden from CTH (Gembloux): 7 yacons
- ✓ Yacon field in WASABI platform (Uliège – GxABT): 40 yacons
- ✓ Yacon from small biofarm (ILVO – Oosterzele): yacon pool
- ✓ *Physalis alkekengi* (ILVO - Botanical garden Meise)



WP3 – Biological characterization of the selected species

Task 3.2 Biological characterization by bioassays and field surveys

Tree species analyzed : **Physostegia chlorotic mottle virus (PhCMoV)**, **potato yellowing virus (PYV)** and **tomato fruit blotch virus (ToFBV)**

For PYV:

- Bioassays – mechanical transmission: **ongoing**
 - Yacon, sweet potato, *Physalis*, potato, tomato, sweet pepper
 - Symptom evaluation
- Bioassays – insect transmission: **started**
 - The green peach aphid (*Myzus persicae*)
 - Hosts
 - Symptom evaluation

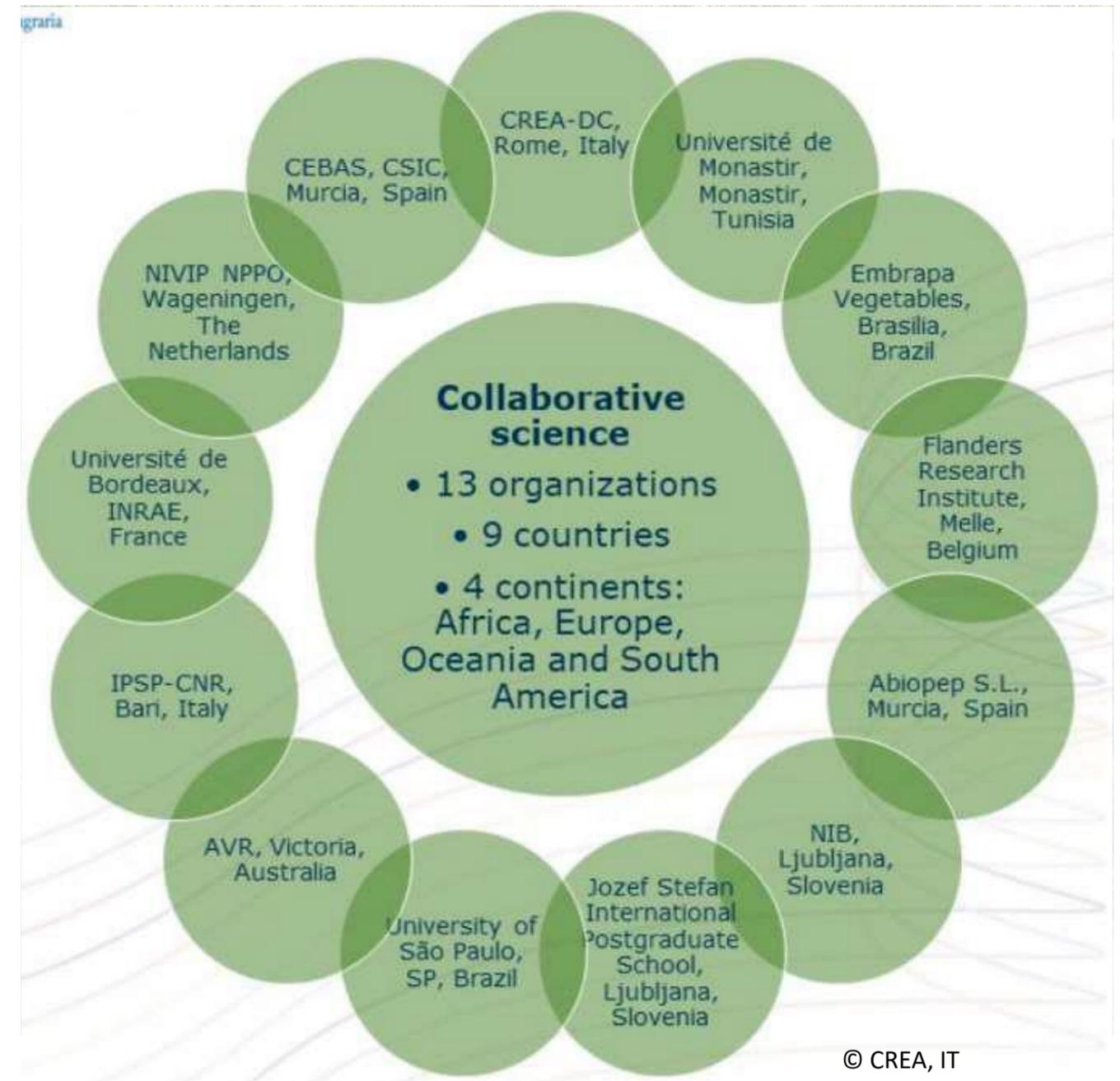


WP3 – Biological characterization of the selected species

➤ Task 3.2. Biological characterization by bioassays and field surveys

For ToFBV:

- Connect to existing Network, coordinated by CREA-IT
- Field survey – detection in tomato
 - follow-up in winter/spring: **ongoing**
- Bioassays – mechanical transmission: **ongoing**
 - Tomato, basil, *Cucurbitaceae*
 - Symptom evaluation
- Bioassays – insect transmission: **planned**
 - Tomato russet mite (*Aculops lycopersici*)
 - Hosts
 - Symptom evaluation





Growing Together:
*Cultivating Plant
Health Through
Global Collaboration*



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