

# ILVO

Instituut voor Landbouw-,  
Visserij- en Voedingsonderzoek

 **LIÈGE université**  
**Gembloux**  
**Agro-Bio Tech**

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

### VALORHIGHTS

Euphresco 2023-E-447

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Health  
Food Chain Safety  
Environment



**EUPHRESKO III**

*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**

Eupresco 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:

**ILVO**

Flanders Research Institute for  
Agriculture, Fisheries and Food

**LIÈGE université**  
**Gembloux**  
**Agro-Bio Tech**



Animal and Plant Health  
Inspection Service

Ministry for Primary Industries  
Manatū Ahu Matua



**NIBIO**

NORSK INSTITUTT FOR  
BIOØKONOMI

**NIB** NACIONALNI INŠTITUT ZA BIOLOGIJO  
NATIONAL INSTITUTE OF BIOLOGY

**SASA**  
Helping Scotland Grow



**anses**  
alimentation, environnement, travail

**ABIOPEP** PLANT  
HEALTH

**crea**  
Consiglio per la ricerca in agricoltura  
e l'analisi dell'economia agraria



Agricultural  
Institute of  
Slovenia



The Food and Environment  
Research Agency



Australian Government  
Department of Agriculture







## Transnational approach

# 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

### 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)





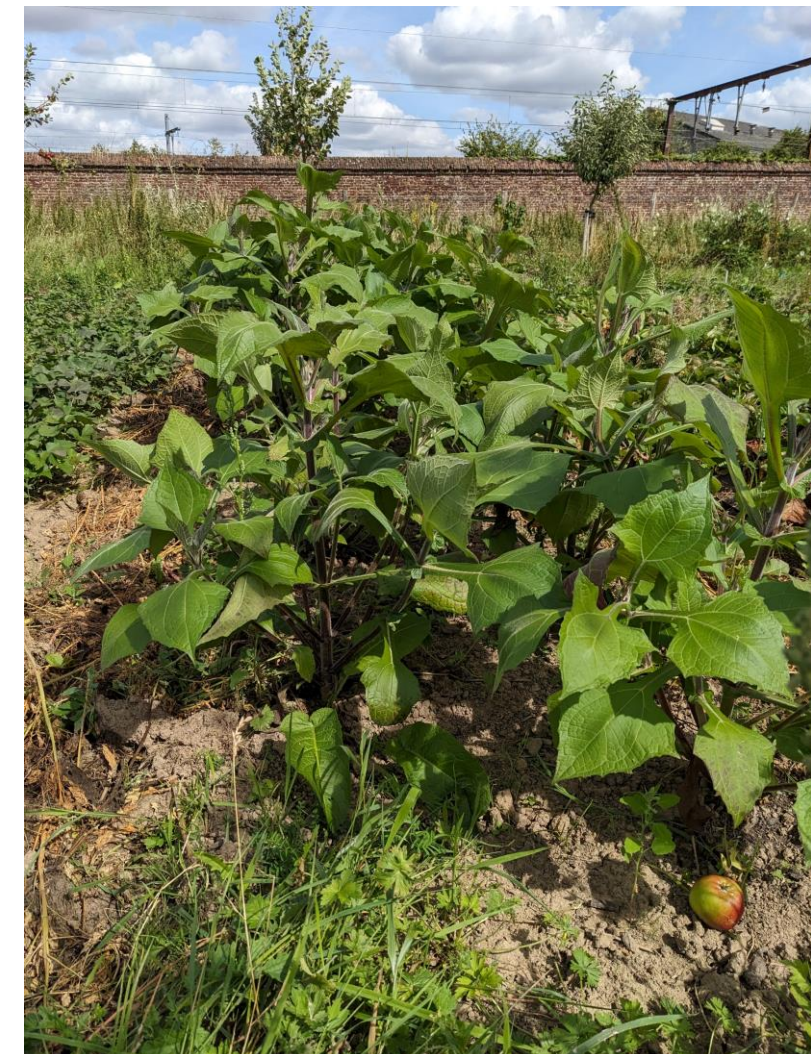
# WP3 – Biological characterization of the selected species

## 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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