Discovery and characterisation of viral biocontrol candidates: viromics contribution to plant protection

Sarah Francois, Aymeric Antoine-Lorquin, Doriane Mutuel, Lisa Claude, Marie Frayssinet, Mylène Ogliastro, Luciana Galetto, Simona Abba,, Massimo Turina

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Context

The European legislation to ban many pesticides has led to increased demand for alternatives, including the use of viruses as biocontrol agents, which first requires knowledge of their diversity.

Objectives

Our objectives were to discover insect viral resources, and explore their potential for biocontrol.

Methods

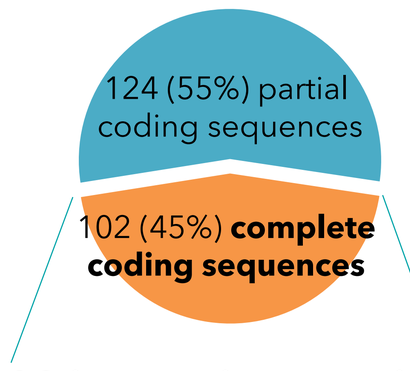
We collected
3 major agricultural pests
and their host-plants
from **agricultural ecosystems**
located in France and Italy.

We processed
~1000 samples, of pooled or unpooled individuals,
by **viromics*** coupled to
an **automated pipeline****
for virus identification.

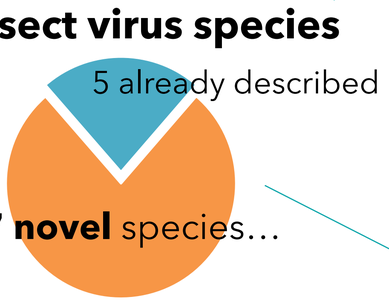
* The term viromics designates the study of viral communities through the without *a priori* detection and characterization of virus genome sequences.
Our complete virion-associated nucleic acids (VANA) metagenomic protocol is available at:

** The NearVANA pipeline, developed by Aymeric Antoine-Lorquin, is available at:

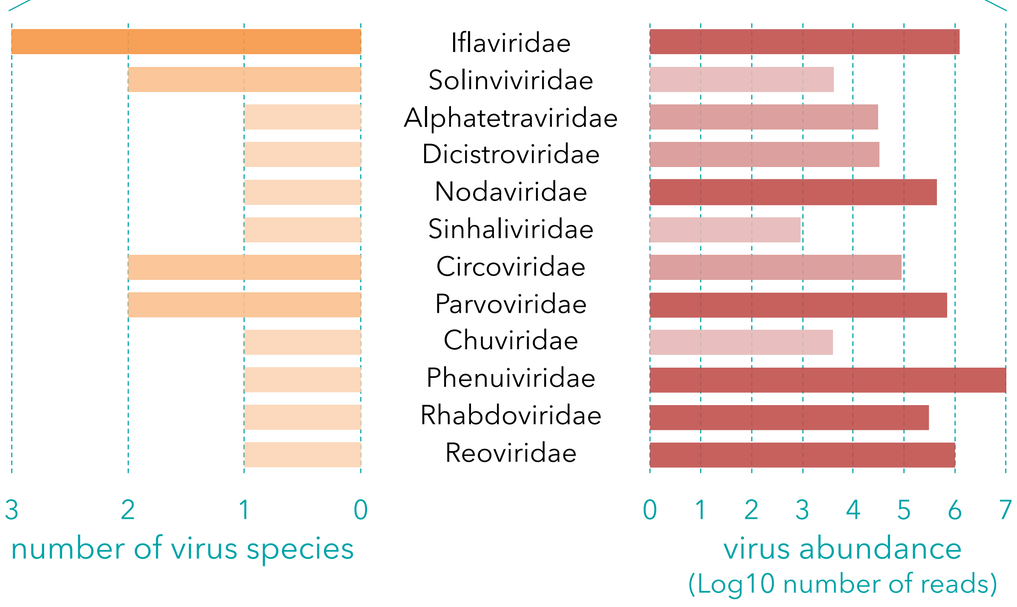
226 virus species
comprising insect viruses, bacteriophages and diet contaminants (plant and fungus viruses)



22 insect virus species



…classified into **12 families**



Results

We revealed a **high diversity** of viruses associated with insect pests:

We detected **54 families of viruses**.

We could classify some of those viruses into **236 virus species***.

We reconstructed the complete coding sequence of 58 **novel species**, including **17 insect viruses**, 26 plant viruses and 12 bacteriophages.

We also showed **disparities** in insect viruses prevalence and abundance, which are potentially linked to their **host range**.

* According to the International Committee on Taxonomy of Viruses (ICTV) standards

Conclusion & Perspectives

We discovered insect viruses in 3 major agricultural pests.
The characterisation of these viruses (*i.e.* spatio-temporal distribution and phylogenetic analyses) is ongoing.
Their impacts on insect pests will be investigated in future studies.

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scan me for updates!

https://viroplant.dgimi.inrae.fr

contact: **sarah.francois@inrae.fr**