

# Metagenomics and quarantine: searching for the unknown

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## Plant Quarantine



« Procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests<sup>1</sup>. The word comes from the Italian (seventeenth century Venetian) language, quarantena, meaning forty day period»

## Sugarcane Quarantine



CIRAD sugarcane quarantine in Montpellier covers the main three quarantine operations: plant material transfers, disease detection, and elimination of pests and diseases

A broad cataloging and study of viruses is fundamental for conducting safe quarantines

Disease detection is one of the main quarantine operations: safe quarantine ideally must detect very small quantities of pathogen and all the variants of the same pathogen

## However...



... a major challenge remains by using the classical detection tools: detecting latent diseases and **identifying new, unknown, imperceptible and asymptomatic viruses** that could be associated with emerging diseases in a near future

## Metagenomics



We aim at applying the promising “Ecogenomics” approach<sup>2</sup> to studying quarantine double-stranded RNA viruses, a hallmark of RNA virus infection: sampling of quarantine sugarcane plants, tagged-RT-PCR and 454 pyrosequencing.

This approach is expected to link the quarantine double-stranded RNA viruses to their specific plant

This approach could be useful:

- to decipher the imperceptible and asymptomatic part of the virus diversity
- to discover potentially emerging viruses, at a very early stage
- to assess the rate of viral co-infections
- to estimate spatial distributions of the viruses detected in the quarantine greenhouse

<sup>1</sup> International standards for phytosanitary measures. Pest risk analysis for regulated non-quarantine pests. ISPM no. 21. Secretariat of the International Plant Protection Convention FAO. Rome. 2004.

<sup>2</sup> Roossinck *et al.* Ecogenomics: Using massively parallel pyrosequencing to understand virus ecology. *Molecular Ecology*. *In press*