

VISACANE, an up-to-date CIRAD quarantine tool for exchanging disease-free sugarcane varieties

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CIRAD

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Visacane



- CIRAD’s quarantine service
- Disease-free sugarcane varieties
- Import as well export quarantine service
- Far from sugarcane growing areas
- Scientific environment
- A 50 year experience in quarantine process

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Sugarcane diseases

More than 70 infectious sugarcane diseases have been reported so far



Streak



Mosaic



Smut



Leaf scald

White leaf





Gumming

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Detecting diseases at Visacane

12 major diseases



Leaf scald (*X. albilineans*)
Grassy shoot (phytoplasma)
Yellow leaf (SCYLV)
Mosaic (SCMV)
Streak mosaic (SCSMV)
Streak (SSV, etc.)

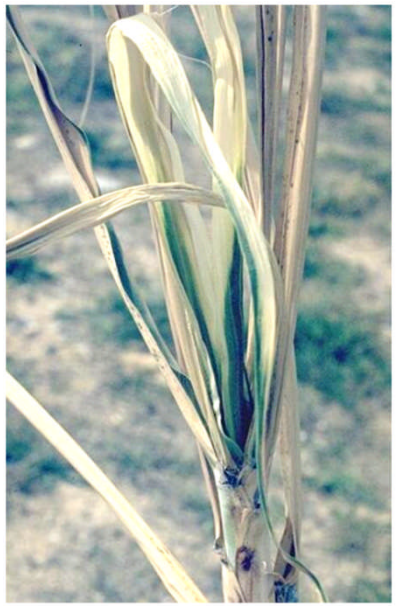
Ratoon stunt (*L. xyli* subsp. *xyli*)
White leaf (phytoplasma)
Ramu stunt (virus)
Mosaic (SrMV)
Fiji leaf gall (FDV)
Red leaf mottle (PCV)

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Detecting diseases at Visacane

A special emphasis on latent diseases



Leaf scald

Ratoon stunt



Yellow leaf



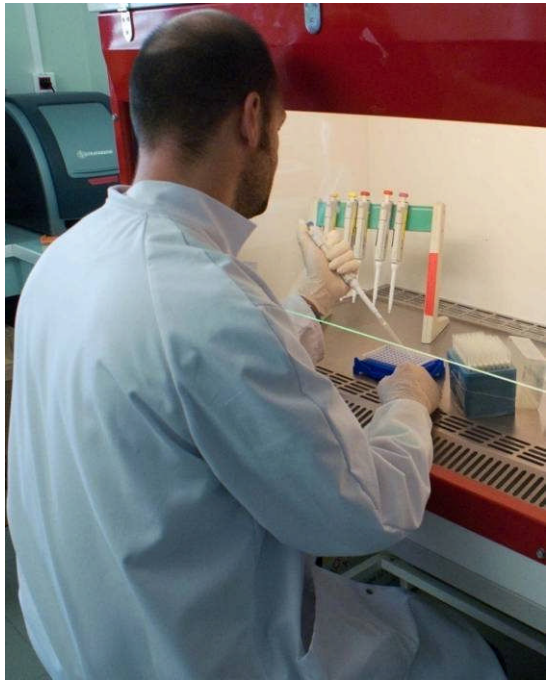
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Detecting diseases at Visacane

Which tests?

- Isolation and culture of pathogens
- Immunological techniques
- Molecular techniques (PCR, RT-PCR, nested PCR)



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Disease elimination at Visacane

- Long hot water treatment
- Apical meristem culture
- Destruction of variety





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Disease elimination by hot water treatment

- Long hot water treatment: 48h at 25˚C then 3h at 50˚C
- All the varieties are subject to a long hot water treatment between the 2 quarantine cycles
- In case of infection by RSD pathogen or phytoplasmas, varieties return to the 1st quarantine cycle

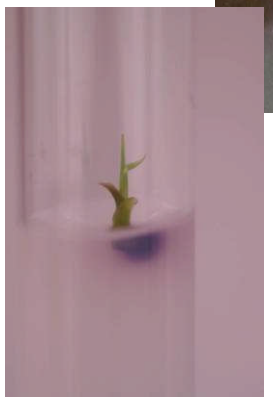
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Disease elimination by apical meristem culture

- In case of infection by *Sugarcane yellow leaf virus* or by *Sugarcane streak mosaic virus*
- Regenerated plantlets are weaned and return to the 1st quarantine cycle

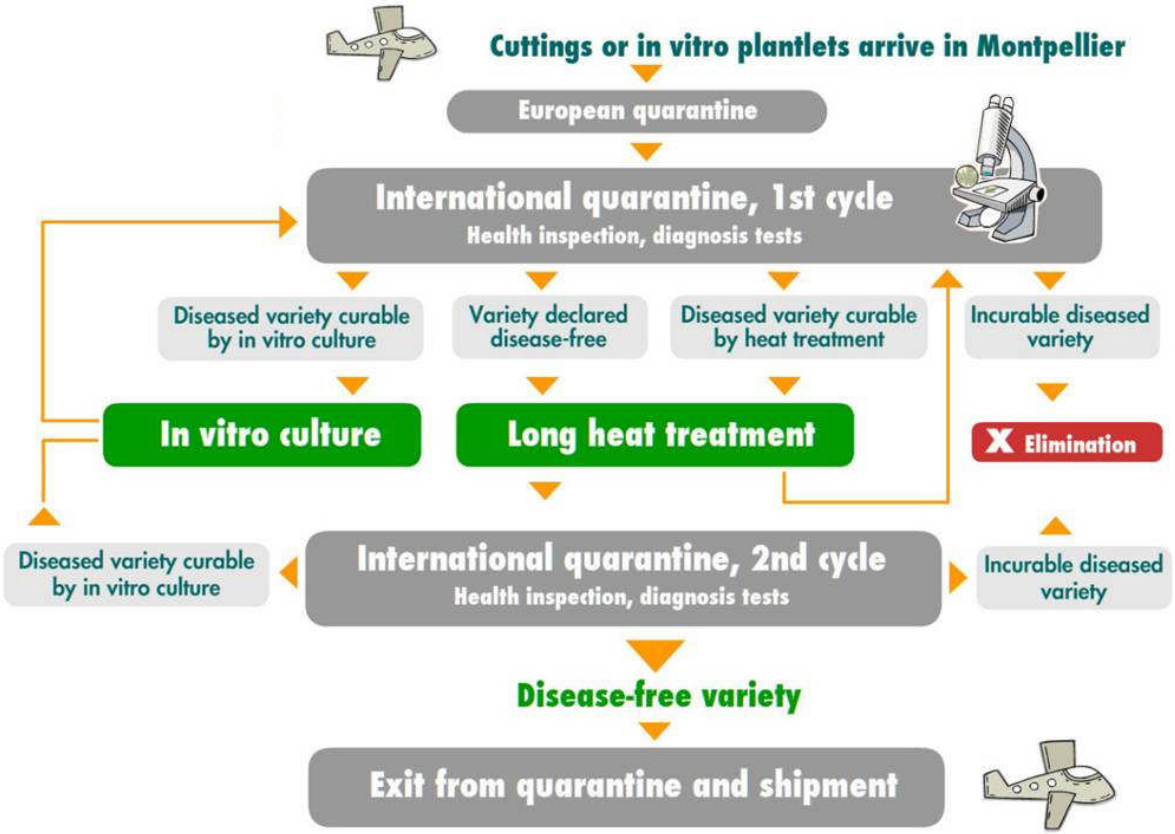




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Visacane guarantees disease-free planting material



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Legal support



- Protection of intellectual property rights
- Respect of genetic resource transfer regulations
- Compliance with national phytosanitary rules

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Commercial support

Contracts for all situations:

- Quarantining
- Supply of disease-free varieties
  - Visacane contract
  - MTA
- Licensing agreements

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Available varieties



- International varieties free of rights
- CIRAD's varieties (Guadeloupe)
- WICSCBS's varieties (Barbados)
- Elite varieties from eRcane (Reunion), SRA (Australia), CHACRA (Argentina) etc.

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Available varieties

And a few clones as

- Energy cane: high fiber content, multipurpose cane
- Genetic resources
- Sugarcane relatives and ancestrals: *Miscanthus, Erianthus*, etc.

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Available varieties in 2015

Visit Visacane website:

http://visacane.cirad.fr/en/

Quarantine season:
January to March



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Quarantine costs in 2015

Contribution to the quarantine operations depends on the type of varieties and quantity:

With a Visacane contract:

- **International varieties free of rights**

  Annual batch of 10 varieties

  4400 Euros for a batch of 10 varieties

- **Elite varieties**

  740 Euros / variety for 5 varieties

  485 Euros / variety for 15 varieties

  (in addition: royalties for the variety owners)

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How to order?

- Signing a general agreement with CIRAD for the supply of varieties
- Every year:
  - ✓Choosing varieties from October
  - ✓Signing licensing agreements for elite varieties
  - ✓Signing a MTA with the conditions for use of chosen varieties
  - ✓Sending an import permit

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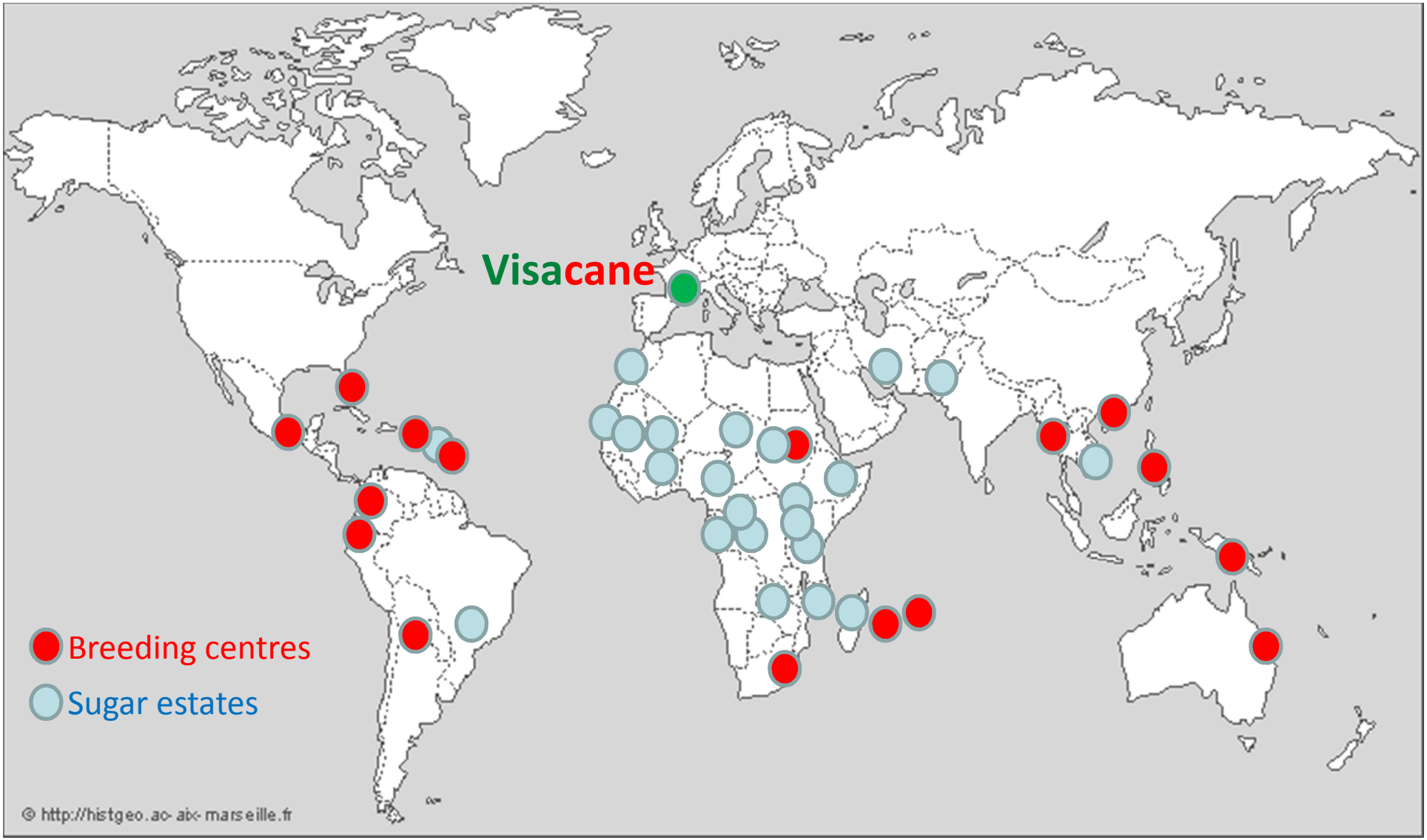
A few data

- A new modern glasshouse facility since 2012
- 300 m^2 quarantine glasshouse and 50 m^2 pathology glasshouse
- 2008-2014 period:
  - 860 sugarcane varieties released
  - 8000 disease detection tests performed
  - 285 varieties treated by apical meristem culture
- More than 30 partners all over the world

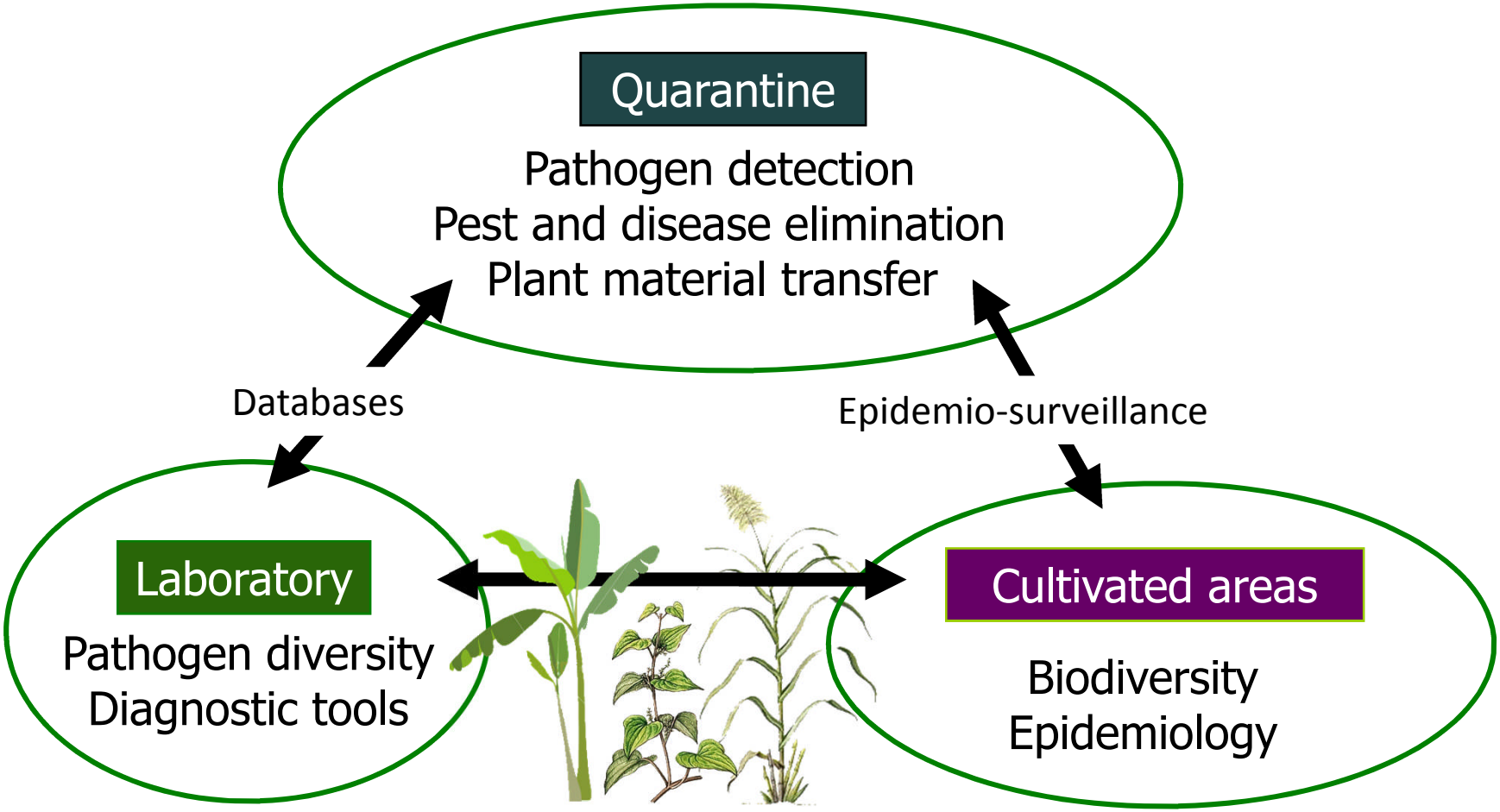
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Visacane at the heart of an international sugarcane network



Visacane: a service activity in a pathology research unit



update of expertise in quarantine process

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Constant improvement of detection tools at Visacane

Yellow leaf



For the last 30 years…

- **Improvement of detection techniques**

  - Visual observation, *in vitro* isolation of pathogens, electronic microscopy
  - Immunological techniques
  - Molecular techniques (PCR, RT-PCR)
  - Metagenomics: new emerging virus diseases

SCMV



Streak mosaic



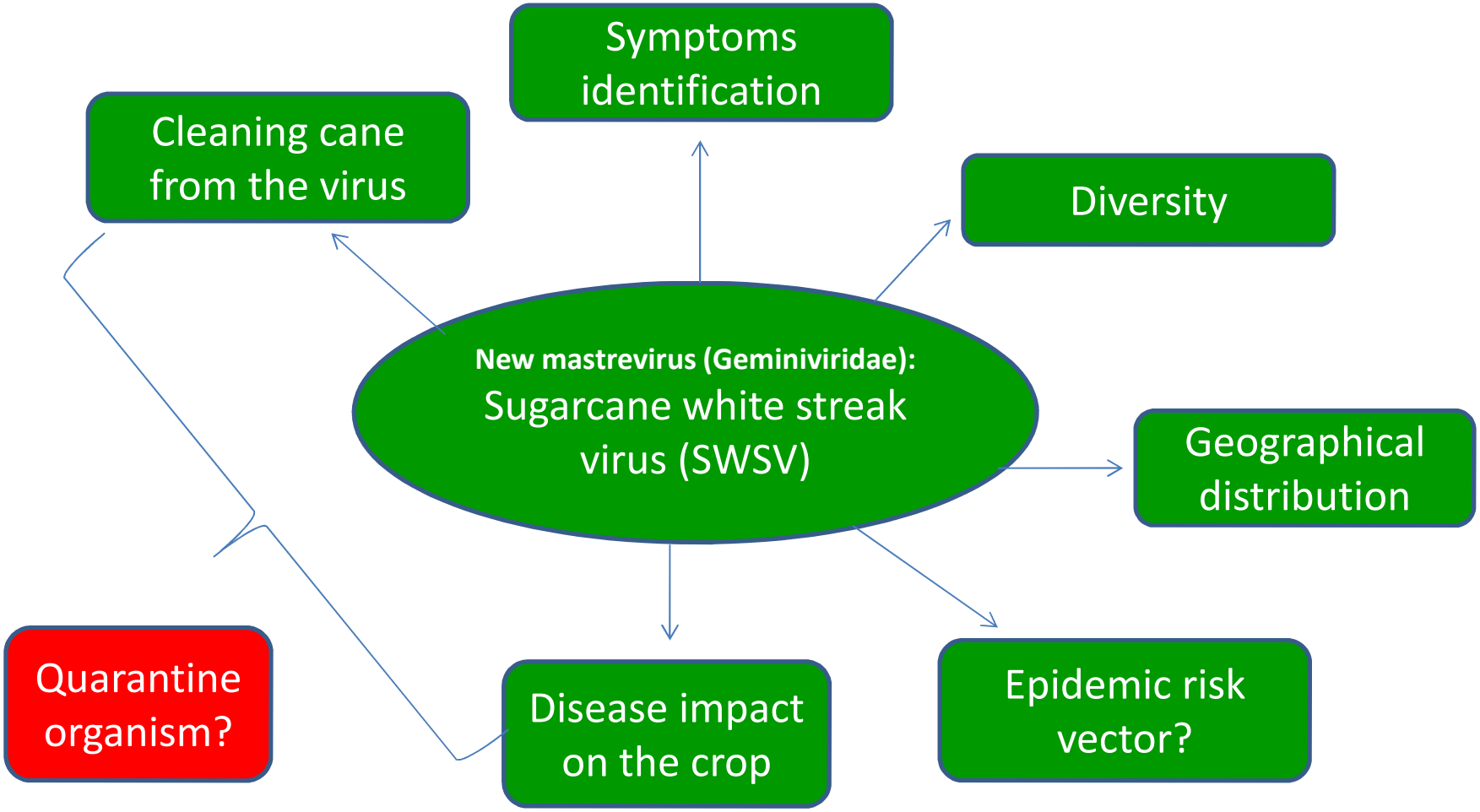
- **Improvement of diagnosis**

  - Emergence of new pathogens: *Sugarcane streak mosaic virus*, *Ramu stunt virus,* etc.
  - Emergence of new strains of pathogens: *Sugarcane Yellow Leaf Virus*: genotypes CUB, BRA-PERU, RUN, etc.

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New technologies impact on quarantine work

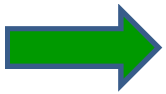


Candresse T. *et al.* 2014. Appearances Can Be Deceptive: Revealing a Hidden Viral Infection with Deep Sequencing in a Plant Quarantine Context. DOI: 10.1371/journal.pone.0102945

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SWSV: Geographical distribution

- Detected in CIRAD quarantine on cultivars originated from Sudan, Egypt and Reunion Island.
- Not detected in CIRAD quarantine on cultivars issued from breeding program of Australia, Mauritius, Guadeloupe, Barbados…
- Detected in the germplasm collections of Barbados and Guadeloupe, solely on varieties from Sudan.
- Detected in the germplasm collection of Reunion Island on local bred cultivars and also in cultivars from different origins.



- The virus is transmitted on other cultivars as Sudan ones in Reunion but not in the Caribbean.
- The potential vector (*Cicadulina mbila*) is present in Africa and Reunion but not on the American continent.

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SWSV: Epidemic risk and impact

- No particular symptoms observed in the quarantine but symptoms like freckles observed on R cultivars in Martinique and Senegal.
- SWSV is transmitted by the vector *Cicadulina mbila* at least in Reunion Island.
- The vector is not only related to sugarcane and may be able to transmit the SWSV to other poacea (Corn).



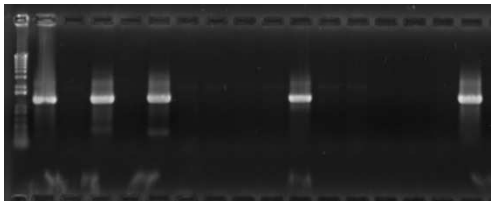


Risk for the areas where the vector is present

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SWSV: diagnostic and cleaning method

- Specific primers were designed to detect SWSV



- Cleaning process is under work:
  - Tip meristem in vitro cultured
  - First results give 90% efficiency

Cleaning SWSV seems possible





We will apply the cleaning method by tissue culture of apical meristem to infected cultivars

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Visacane training on sugarcane diseases

CIRAD organizes seminars on molecular methods to detect viruses and bacteria.

- Focus on the detection of:
  - *Sugarcane yellow leaf virus; Sugarcane mosaic virus; Sugarcane streak virus*
  - *Leifsonia xyli* subsp. *xyli; Xanthomonas albilineans*

- Target audience:
  - Sugarcane quarantine managers
  - Researchers and technicians involved in plant pathology, plant breeding, biotechnologies
  - Heads of phytosanitary bodies in sugarcane producing countries, etc.

- Training session on request:
  - Next one: 5-9 October 2015 at CIRAD in Montpellier, France
  - 10 participants

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THANK YOU!