WINETWORK
European Knowledge Transfer

Flavescence Dorée and its management in the vineyard

Contain the disease and avoid further spread

How to manage FD with more precision in the regions already infected?

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Introduction

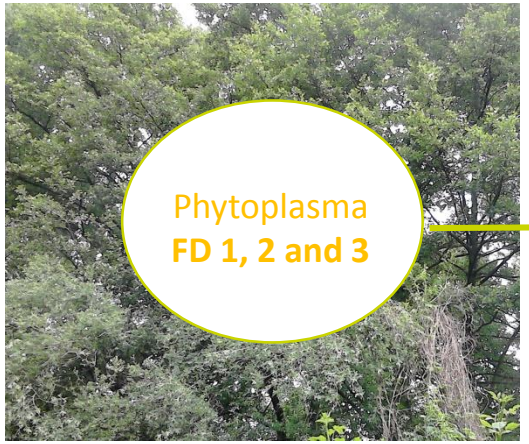
Flavescence dorée has been detected since 1950 in France

- Incurable quarantined disease
- Liste A2 EPPO
- Grapewine yellows symptoms
- Combination of a phytoplasma, a vector and a host

→ Rapid spread, important yield losses and vineyard dieback

Spread of flavescence dorée

- Phytoplasma : European origin



Alder and clematis

Several hypothesis of spread

Oncopsis Alni
©Tristan Bantock

Dictyophara europaea
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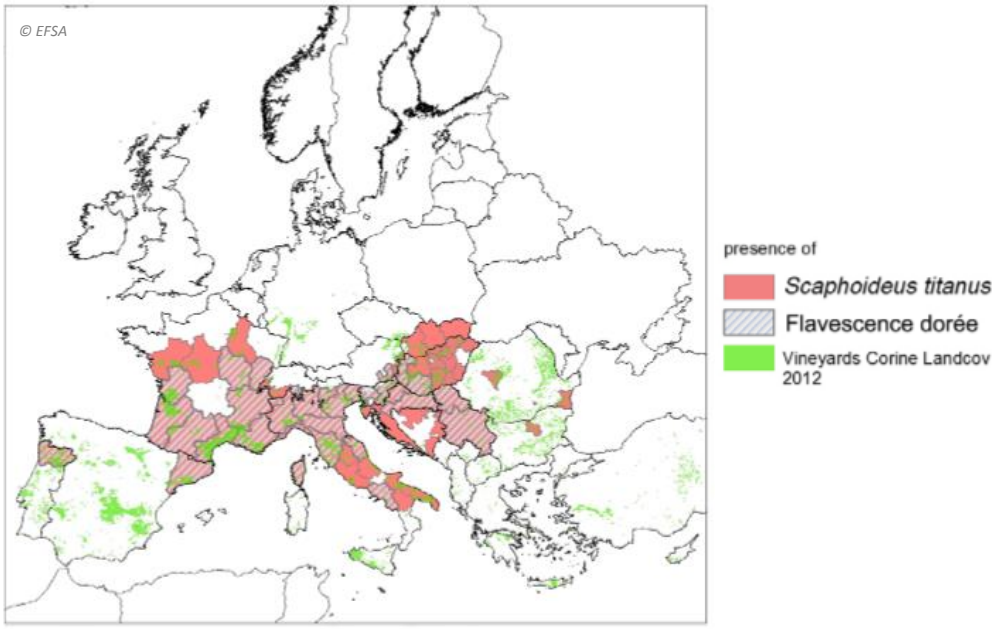
Scaphoïdeus titanus

Vitis Vinifera

- Vector : leafhopper named *Scaphoïdeus titanus* imported from North America

Spread of flavescence dorée

- Phytoplasma : European origin and spread from wild plant to grapevine
- Vector : leafhopper named *Scaphoïdeus titanus* imported from North America



→ Distribution of the leafhoppers is wider than the phytoplasma

→ Leafhopper *S. titanus* discovered in Alsace in 2016

Symptoms and impacts

Main symptoms but non distinguishable from other grapevine yellows

First symptoms

- Delay of budburst
- Lack of budburst

In spring

- Reducing growth of fruiting cane
- Change in leaf colour and curling leaves
- Premature leaf fall

In summer

- Failure to lignify
- Dessication of inflorescences and grapes

Symptoms and impacts

In case of any doubts

Check the simultaneous presence of the three following symptoms

Discoloration and curling leaves

Failure to lignify

©Canadian Food Inspection Agency

Dessication of the grapes

Symptoms and impacts

<u>Characteristic symtoms and non distinguishable from other grapevine yellows</u>

→ More or less visible depending onthe variety

→ Rootstocks can be asymptomatic

<u>Similar symptoms to Stolbur disease</u>

→ If a flavescence dorée hypothesis exists, a **PCR analysis** is done to identify the phytoplasma

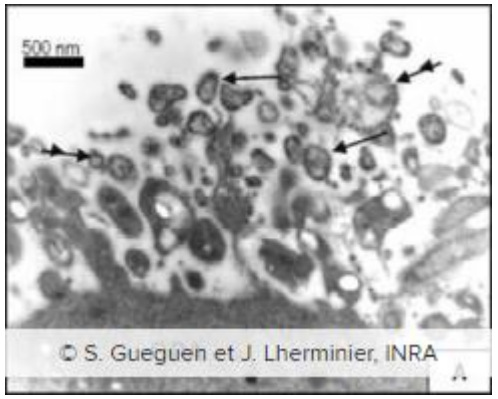
The actors of the disease

1) Infectious agents : FD 1, 2 and 3 phytoplasma

- Intracellular bacterium without wall living in the screened tubes of phloem → Transmitted by a vector or cuttings / grafting

- 3 genetic groups causing flavescence dorée:
  - FD1, mainly located in the South West of France
  - FD2, major group in Europe
  - FD3 mainly in Italy

  - Wild compartiment : *Aulnus* and *Clematis*

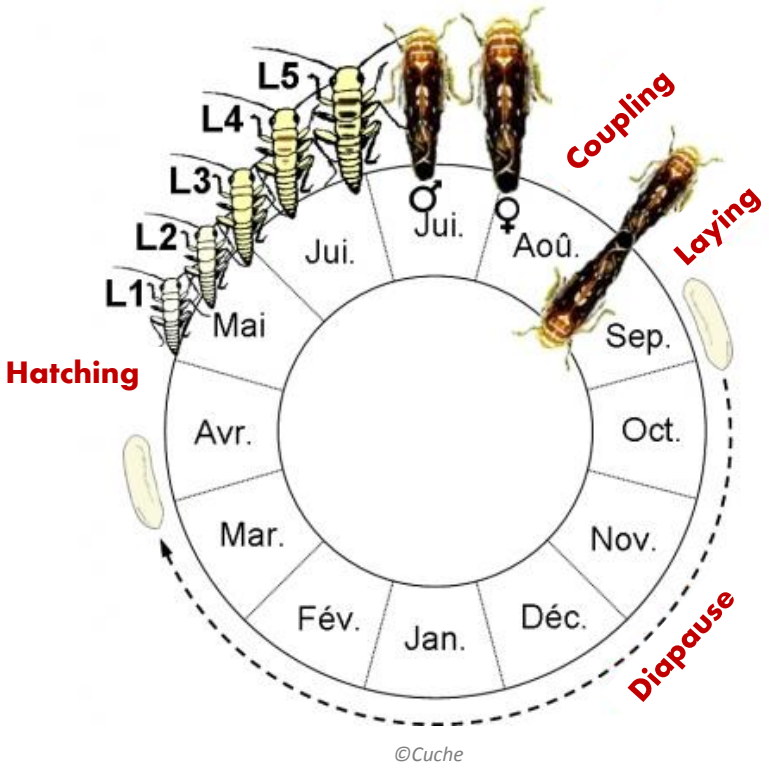


Phytoplasma

The actors of the disease

2) The vector : *Scaphoïdeus titanus*

Life cycle



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- Only one generation per year
- Usually larvae remain on the plant where they hatch
- Adults are very mobile and fly from vines in vines

The actors of the disease

2) The vector : *Scaphoïdeus titanus*

Feeding behavior

- A stinging and sucking insect that feeds on vine leaves
- Acquisition of the phytoplasma possible from the first larval stage
- Incubation period of one month and then infectious for life

The actors of the disease

3) The host: the vine

- *Scaphoïdeus titanus* depends vitaly on vines *:* the leafhopper can only carry out its life cycle on *Vitis vinifera*

  → very epidemic disease

- Phytoplasma present on other wild plants : *Alnus* or *Clematis*

  → Associated with other vectors: possible transmission

Oncopsis Alni
©Tristan Bantock

Dictyophara europaea
© Dimitri Geystor

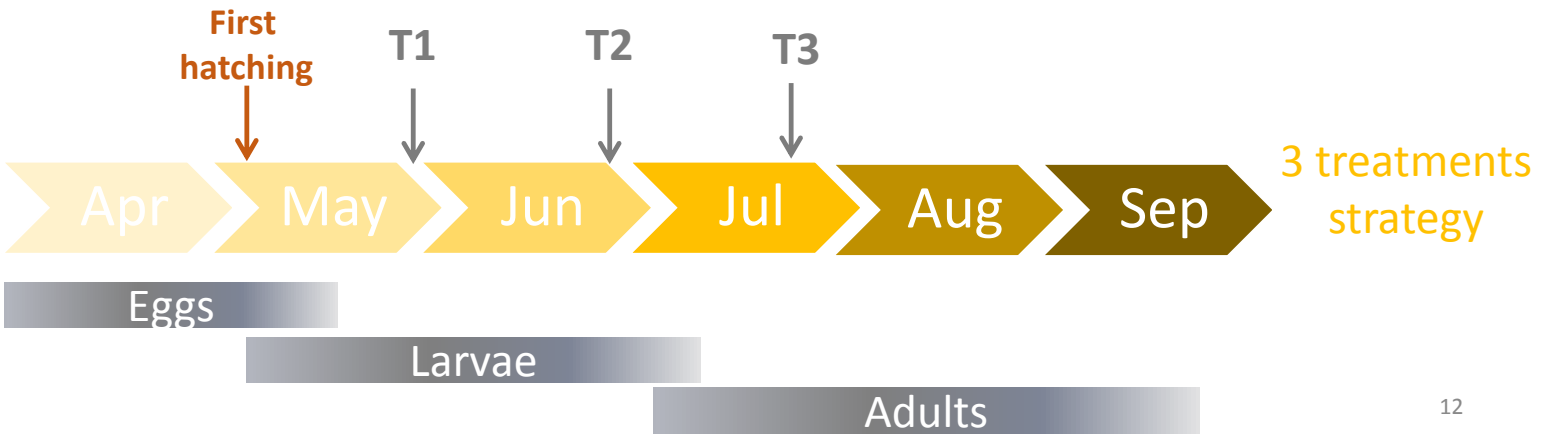
Clématis vitalba
© Visoflora

Alnus glutinosa
© Visoflora

Management of the vector

- **Treatment strategies :**
  - Use of insecticide → decrease vector population
  - Apply at the right moment → **national decree**

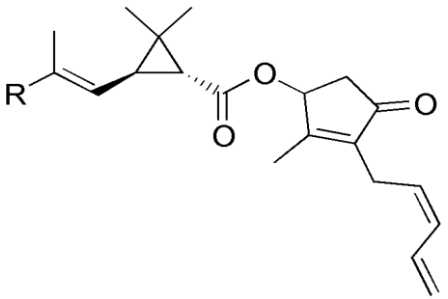
- First treatment **one month after hatching** (emerging cages and field monitoring)
- Second treatment at the end of remanence of the first
- Third treatment depends on the regions according to FD history



Management of the vector

- **Treatment strategies in organic viticulture:**

  - Monitoring with more precision
  - Limited efficacy → sensitive to hight temperature & UV radiation
  - Natural pyrethrum and Azadirachtin
  - Contact poison / Active principles-neurotoxic



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Prospecting and monitoring

Preventing infection by acting on potential reservoirs:

- Potential reservoirs of the vector: wild vines and other plants such as *Clematis* or *Alnus*:
  - Risk of epidemic emergence
  - BUT also important for biodiversity and ecosystems

→ To reason according to the situation

Prospecting and monitoring

Recognition of the leafhopper

2 symmetrical black points in dorso-lateral position

Larval stages : L1 on the left, L3 in the center and L5 on the right

- Brown color
- Size between 4.8 and 5.8 mm
- 3 strips on the head for females

Scaphoïdeus titanus

Prospecting and monitoring

Detection of the leafhopper

- Possible from the first larval stage by trained technicians
- Visual inspection on 100 to 200 leaves, on suckers and leaves close to the base
- Insecticides treatments : mandatory dates
- Sticky traps to capture the adult leafhopper in the plots or near wild vines : decision for the third treatment

Sitcky trap use by IFV

Atypical practices to control the vector

Can be used complementary to chemical treatments but can not replace it

Orange oil application

- Not registred as insecticide
- Dessicate nymphs
- Side-effects

Kaolin application

- Mortality on nymphs and adults

Management of infected vines

- Monitoring vineyard is the main **key point**
- Individual and regional scale
- Organized by a **dedicated organism**
- Laboratory analyses to confirm FD case

© Vitisphère

- **National decree → uprooting and destruction of all infected vines**

- Complete uprooting if more than 20% infected vines in the plot

Research on the vines

- **Cultivar sensitivity**

- Differences of sensitivity to FD → identify non attractive-cultivars
- Light or any symptoms on rootstocks
- Genetic resistance → Stimulate natural defenses

The less the cultivar express symptoms

→The less the phytoplasma multiplies

→ The less the disease spread

Research on the host and phytoplasma

- **Molecular inhibitors**

  - block phytoplasma before it reaches the cells

- **Air seeking**

  - using drones to early identify FD symptoms

Research to control the vector

- **Mating disruption**

- Disturbing signals emitted by males to attract females
- Inhibition of the reproduction
- Decrease of the population from one year to another

- **Biological control**

- Use parasitoids
- Impossible for a large scale

Conclusion

- Rapidly spreading serious disease and considerable economic losses
- **Collective management** is the key
- Importance of control measures of the vector and infected vines