EPIDEMIOLOGY OF BOTRYTIS BUNCH ROT IN BORDEAUX VINEYARDS
AND ALTERNATIVE CONTROL STRATEGIES

SUMMARY

- Introduction: *Botrytis cinerea* epidemiology and control

- Early disease risk indicators: The case study of floral calyptras

- Alternative strategies for *Botrytis* bunch rot control

- Conclusion
Introduction

*Botrytis cinerea* epidemiology and control
Botrytis cinerea

- Filamentous fungi
- Necrotrophic pathogen
- Diverse substrates
- Many economically important hosts
Botrytis cinerea

- Grapevine: *Botrytis* Bunch Bot (BBR)
- Quantity losses
- Quality losses (Ky et al. 2013)
BBR epidemiology in vineyards

Elmer y Michailides, 2004
BBR epidemiology in vineyards

Elmer y Michailides, 2004
Secondary inoculum mainly produced in early season (FLOWERING) → Connexion with BBR development??

Quantification of potential secondary inoculum in early season = indicator BBR

Hypothesis:
Would be % *B. cinerea* incidence on floral calypters a good indicator?
BBR Control

- Synthetic fungicide application
  - Development of pathogen resistance
  - Negative effects on environment and health
  - High cost of antibotrytic products

- Fungicide use reduction and Alternative control strategies
  - Cultural practices
  - Decision Support Systems / Disease Risk Models
  - Natural products
  - Biological control
  - Combinations!

Tests in Bordeaux vineyards

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EARLY DISEASE RISK INDICATORS
The case study of floral calyptrae

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Early disease risk indicators

Materials and Methods

- **Objective:**
  To correlate infection of floral calyptras and BBR in developing bunches

- Four growing seasons (2012 to 2015)

- Experimental field site: “La grande Ferrade”

- cv. Merlot noir

- Six replicate plots distributed on the field site
Early disease risk indicators

Materials and Methods

- Calyptras sampling and processing:
  - 80-100% cap fall
  - Inflorescence shaking for cap recovery
  - 8 malt agar plates per replicate plot / Six caps per plate
  - Incubation at 15-18°C during 15-20 days
  - Assessment of B. cinerea mycelium

Early disease risk indicators

Materials and Methods

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Early disease risk indicators

Materials and Methods

❖ BBR assessment:
  ▪ 30 days after mid véraison
  ▪ 40 bunches per replicate plot
  ▪ % Incidence and % severity

❖ Meteo Data
  ▪ Weather station in the field site → T, RH, Rainfall and wind speed
  ▪ Calculation of disease risk index*

\[ y = \frac{a \times Teq \times (1-Teq)}{1 + \exp(d-e \times RH/100)} \]

No correlation between % Incidence of *B. cinerea* on calyptras and BBR 30 d after 50 % véraison
**Early disease risk indicators**

### Results

<table>
<thead>
<tr>
<th>Year</th>
<th>15 days before mid-flowering to 1FC assessment</th>
<th>1FC assessment</th>
<th>Mid-veraison to BBR assessment (approx. 1 month)</th>
<th>BBR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ΣWind (m/s)</td>
<td>ΣPP (mm)</td>
<td>Σ²Ind</td>
<td>Wind (m/s)</td>
</tr>
<tr>
<td>2012</td>
<td>39.0</td>
<td>39.0</td>
<td>2.7</td>
<td>10.0b</td>
</tr>
<tr>
<td>2013</td>
<td>55.7</td>
<td>186.5</td>
<td>6.7</td>
<td>39.3a</td>
</tr>
<tr>
<td>2014</td>
<td>42.0</td>
<td>56.5</td>
<td>5.6</td>
<td>0.0c</td>
</tr>
<tr>
<td>2015</td>
<td>34.6</td>
<td>6.5</td>
<td>4.2</td>
<td>0.7c</td>
</tr>
</tbody>
</table>

- % Incidence on caps mainly related to rainfall ... except in 2014
- BBR Incidence & Severity related to *B. cinerea* risk index
Early disease risk indicators

Results. Residue analysis

\[ y = 0.3363x - 0.712 \]
\[ R^2 = 0.4494 \]

\[ 0 \]
\[ 0.5 \]
\[ 1 \]
\[ 1.5 \]
\[ 2 \]
\[ 2.5 \]
\[ 3 \]
\[ 3.5 \]
\[ 4 \]
\[ 4.5 \]

Index

% Severity BBR

\[ 0 \]
\[ 0.5 \]
\[ 1 \]
\[ 1.5 \]
\[ 2 \]
\[ 2.5 \]
\[ 3 \]
\[ 3.5 \]
\[ 4 \]
\[ 4.5 \]

% Incidence *B. cinerea* floral calyptras
ALTERNATIVE STRATEGIES AGAINST BBR
Alternative strategies against BBR

Developing solutions for growers

Project title: BIOBOT, Optimisation of *Botrytis* bunch rot biocontrol, integrated and global disease management
Time period: 3 years
Funding: ONEMA – Ministry of Agriculture (France)
Partnership: IFV + Chambre Agriculture Gironde + INRA

- Vineyards: Organic winegrowers network of Aquitaine

- Objectives:
  - Reference on registered products
  - Determine factor for successful application
  - Optimise its use with the help of other indicators
  - Transfer techniques to growers
Alternative strategies against BBR

2015 Field Trials. Materials and Methods

- 2 Experimental field sites: Montagne and St. Yzan
- cv. Merlot noir
- Four replicate plots per treatment
- 10 vines per replicate plot
- Application rate: 200 L ha\(^{-1}\) / 300 L ha\(^{-1}\)
- Other parameters measured: vigour, attacks on leaves or pedicels, phytotoxicity
Alternative strategies against BBR
2015 Field Trials. Materials and Methods

<table>
<thead>
<tr>
<th>Commercial name</th>
<th>Active ingredient</th>
<th>Brand</th>
<th>Registration status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sokalciarbo Surround</td>
<td>Argile kaolinite calcinée</td>
<td>Agrisynerge</td>
<td>NODU Vert Biocontrol list</td>
</tr>
<tr>
<td>Wicker tea</td>
<td>Dried plant</td>
<td>Bioservices</td>
<td>Registered in France</td>
</tr>
<tr>
<td>Armicarb</td>
<td>Potassium bicarbonate</td>
<td>De Sangosse</td>
<td>NODU Vert Biocontrol list</td>
</tr>
<tr>
<td>Fongicover</td>
<td>Fatty acid emulsion</td>
<td>BioDurcal</td>
<td>Registered in Spain</td>
</tr>
<tr>
<td>M3AEY</td>
<td>Terpenes</td>
<td>Sumi-Agro</td>
<td>ADE Authorised for research issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Registered soon</td>
</tr>
</tbody>
</table>

- Application at key phenological stages:
  - 10% Flowering
  - 100% Flowering-Fruit set
  - Pre bunch closure
  - Véraison
  - Fruit ripening (one or two)

- Application following disease risk index
  - Post-véraison
  - Weather forecast
  - Formula → Decision rules
  - 3 applications in 2015
Alternative strategies against BBR

2015 Field Trials. Results

BBR at harvest - St. Yzan field site

Control Wicker Tea M3AEY Fungicover Kaolinite Kaolinite - ES Armicarb Armicarb - Model

% Incidence % Severity

0 10 20 30 40 50 60 70 80 90 100

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Alternative strategies against BBR

2015 Field Trials. Results

BBR at harvest - Montagne field site

- Control
- Wicker Tea
- M3AEY
- Fungicover
- Kaolinite - Model
- Kaolinite - ES
- Armicarb
- Armicarb - Model

% Incidence
% Severity

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Expliquer difference armicarb model avec graphique moment d’application - pluie

2015 Field Trials. Results
CONCLUSION

- *B. cinerea* incidence on floral calyptras is not a good indicator of disease risk during bunch development

- Alternative strategies for BBR control:
  - 2 interesting products
  - 2 non interesting products
  - Application following disease risk index may improve efficacy for some strategies. Although more research has to be done
Thanks for your attention!