CIPRA: using real-time weather information to forecast crop phenology, insects, diseases and physiological disorders

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Presentation

• What is CIPRA?
• Source of weather data
  • Observations
  • Forecasts
  • Normals
• Meteorological module
• Bioclimatic models in fruit crops: some examples
• Conclusion
Computer Centre for Agricultural Pest Forecasting

>100 Bioclimatic models and indices → ~25 Crops
Weather forecasts (hourly) → Bioclimatic models → Predicted values → Biological observations

Bioclimatic models

- Interpretation
- Evaluation
- Development and/or update
- Technology transfer
Operational weather network for bioclimatic models implemented in CIPRA for Eastern Canada (“real time”)
Weather module

Meteorological Report

Report type:
- Hourly
- Daily
- Weekly
- Monthly

Destination:
- On screen
- Text file (txt)
- CSV file (.csv)

Station layout in the report:
- Side by side
- One below the other
Weather observations: air temperature

### Cumulative heat units

<table>
<thead>
<tr>
<th>Cumulative heat units</th>
<th>Base temp.</th>
<th>Optimum temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD - Single average</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>DD - Single sine (Baskerville)</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Corn heat units</td>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>

*DD=degree days*
Weather observations: air temperature
# Weather forecast: air temperature

## Meteorological Report

|---------|---------|----------|----------------------|-------|

- Maximum temperature
- Minimum temperature
- Mean temperature
- Relative humidity
- Precipitation
- Probability of precipitations
- Cloud cover
- Wind speed

[OK] [Cancel]
Weather forecast: air temperature
Climate normals (averages of 30 years) generated from the daily 10 km gridded climate dataset for Canada (1950 to 2012)
Weather forecasts (hourly)

Climate normals (daily)

Bioclimatic models

Predicted values

Biological observations

- Interpretation
- Evaluation
- Development or Update
- Technology Transfer
Bioclimatic models in apple

Insects
- Codling moth *
- Plum curculio
- European apple sawfly
- Spotted tentiform leafminer
- Apple maggot
- Speckled green fruitworm
- Tamished plantbug
- Dogwood borer
- European red mite
- Obliquebanded leafroller
- Redbanded leafroller
- Fruit-tree leafroller
- Oriental fruit moth (Michigan)
- Oriental fruit moth (Pennsylvania)
- Oriental fruit moth (Penn/AAFC)

Phenology
- McIntosh (DD)
- McIntosh (BBCH)
- Firmness of McIntosh
  - Kilograms-force
  - Pounds-force

Postharvest Disorders
- Low temperature breakdown
- Superficial scald

Diseases
- Apple scab (Mills)
- Apple scab (St-Arnaud, Z=0)
- Apple scab (AAFC/IRDA)
  - Show infection and ascospores
  - Show infection only
  - Wetness estimation (CPVQ 1388)
  - Wetness estimation (MacHardy 1996)
- Fire blight (CougarBlight 2010)
Predicting apple phenology: cumulated degree days
Predicting apple phenology: BBCH stage
Forecasting codling moth: based on cumulated degree-days
Forecasting Low Temperature Breakdown

2015
Forecasting Fire Blight

CIPRA - Apple
Fire blight (CougarBlight 2010)

Stages/Thresholds:
- Extreme risk (350-500)
- High risk (200-350)
- Intermediate risk (100-200)
- Low risk (0-100)

Cumulative Risk Values

Timeline:
- 2015-05-13 00:00
- 2015-05-20 00:00
- 2015-05-27 00:00
- 2015-06-03 00:00
- 2015-06-10 00:00
- 2015-06-17 00:00
- 2015-06-24 00:00
- 2015-07-01 00:00

Weather Conditions:
- Standard Time

Graph showing risk levels over time with various stages and thresholds.
Bioclimatic models in other fruit crops

Cranberry

Insects
- Cranberry tipworm *
- Cranberry fruitworm *

Phenology
- Cranberry

Weather stations:
- France
- Montérégie
- Pom Basses Laurentides
- Pom Estrie
- Pom Montérégie E.
- Pom Montérégie O.
- Pom Québec
- Angers (FR)

* Presentation of results
  - Cumulated degree days
  - Cumulative curve (%)
  - Relative curve (%)

Display the Chart

Close
Bioclimatic models in other fruit crops

Strawberry

- Insects: Strawberry bud weevil
- Phenology:
  - Bounty
  - Redcoat
- Diseases:
  - Ramularia leaf spot

Weather stations:
- France
- Montérégie
- Pom Basses Laurentides
- Pom Estrie
- Pom Montérégie E.
- Pom Montérégie O.
- Pom Québec
- Arran (FP)

Display the Chart  Close
Bioclimatic models in other fruit crops

Elderberry

Phenology
- Native *
- Early flowering *
- Early midseason flowering *

Weather stations:
- France
- Montérégie
- Pom Basses Laurentides
- Pom Estrie
- Pom Montérégie E.
- Pom Montérégie O.
- Pom Québec
- Angora (EP)

Presentation of results
- Cumulated degree days
- Cumulative curve (%)
- Relative curve (%)
Bioclimatic models in other fruit crops

Insects
- Leafhopper*
- Grape Phylloxera
- Tarnished plantbug*
- Grape berry moth

Phenology
- Seyval Blanc
- Early bud burst vine varieties
- Semi-late bud burst vine varieties

Diseases
- Grape powdery mildew

Cold Hardiness
- Concord
- Chardonnay
- Cabernet Sauvignon

Weather stations:
- France
- Montérégie
- Pom Basses Laurentides
- Pom Estrie
- Pom Montérégie E.
- Pom Montérégie O.
- Pom Québec
- Angus (FD)

* Presentation of results
- Cumulated degree days
- Cumulative curve (%)
- Relative curve (%)

Display the Chart
Bioclimatic models in other fruit crops

Raspberry

Insects
- Spotted wing drosophila
CIPRA at a glance

- 23 crops: vegetables (9), fruits (6), grains (3), forage (3), potatoe, turfgrass
- Models: phenology (24), insects (36), diseases (14), physiological disorders (2)
- Real-time and forecasted predictions (observations and weather forecast)

\[
\pm 215\, \text{users:} \\
\text{Canada (195), France (6), USA (4), Spain (2), Canary Islands (1),} \\
\text{Ireland (1), Korea (1), Morocco (1), Namibia (1), Nigeria (1), Dakar (1), Ethiopia (1)}
\]
For more information on bioclimatic models

- Guide on bioclimatic models of CIPRA
- Available on-line
- Information
  - Pest descriptions
  - References for the models (thresholds, dev. temp., etc.)
  - Interpretations of the curves

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http://publications.gc.ca/pub?id=9.698631&sl=0
Thank you!

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