Öko-SIMPHYT

(= organic-SIMPHYT)

A forecasting system for specific scheduling of copper fungicides against Late Blight

Workshop Euroblight
Arras, 5 May 2010

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Preventive measures against Late Blight in organic farming

- Choice of location
- Choice of variety
- Pregermination
- Nutrient supply
- Plant resistance improvers

- **Use of copper**
  - EU Organic Regulation: max. 6 kg/ha
  - Grower’s associations: No approval (Demeter) or max. 3 kg/ha with special approval (Bioland, Naturland)
  - Active ingredients: Copper hydroxide, Copper octanoate, Copper oxychloride
Aims

• Development of a fungicide strategy against Late Blight in organic potatoes based on the use of copper

• Copper reduction (number of treatments, application rate, treatment break) in years with low disease pressure

• Development of procedures to achieve best antifungal activity in years with high disease pressure based on the maximum allowable application rate

• Development of a forecasting system based on
  SIMPHYT1 (recommends first treatment)
  SIMPHYT3 (recommends treatment interval and application rate)
Project participants / Tasks

- Copper application strategies (different copper formulations, different nozzle types, different application rates)

- Development of the decision support system Öko-SIMPHYT, programming of new web pages in www.isip.de, introduction to agricultural practices

- Nationwide demonstration experiments for the validation of Öko-SIMPHYT

Bavarian State Research Centre for Agriculture

Julius Kühn-Institut, Federal Research Centre for Cultivated Plants

Central Institution for Decision Support Systems in Crop Protection

Information System for Integrated Plant Production

Plant protection services, Germany

sponsored by Bundesprogramm Ökologischer Landbau
Öko-SIMPHYT – Input

Kraut- und Knollenfäule an Kartoffeln im ökologischen Anbau - Prognose (Öko-SIMPHYT)

General information
- field name
- region
- met. station
- variety

Information to calculate the treatment start
- date of emergence

Information to calculate the treatment interval
- potato growth
- rainfall since last copper application
### Öko-SIMPHYT - Output

#### Prognostizierter Phytophthora-Behandlungsbeginn (SIMPHYT1)

<table>
<thead>
<tr>
<th>Individuelle Einstellungen</th>
<th>Prognose erstellt für den</th>
<th>Behandlungsbeginn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schlagne</td>
<td>Sorte</td>
<td>Auflauf</td>
</tr>
<tr>
<td>Hüven</td>
<td>Ditta</td>
<td>15.05.09</td>
</tr>
</tbody>
</table>

**Calculated treatment start, thereafter SIMPHYT3 starts**

#### Prognostizierter Phytophthora-Infektionsdruck (SIMPHYT3)

<table>
<thead>
<tr>
<th>Individuelle Einstellungen</th>
<th>Prognose erstellt für den</th>
<th>Infektionsdruck</th>
<th>Behandlungsabstand</th>
<th>Aufwandmenge rein Cu (g/ha)</th>
<th>Spritzpause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schlagne</td>
<td>Sorte</td>
<td>Krautwachstum</td>
<td>Niederschlag</td>
<td>Wetterstation</td>
<td></td>
</tr>
<tr>
<td>Hüven</td>
<td>Ditta</td>
<td>normal</td>
<td>&lt; 15 mm</td>
<td>Lindloh</td>
<td>18.06.09</td>
</tr>
</tbody>
</table>

**Variable input + Calculated infection pressure**

- Treatment interval based on last application
- Recommended application rate
- Possibility of a treatment break
### Öko-SIMPHYT – Scheme –

<table>
<thead>
<tr>
<th>Infection pressure</th>
<th>Treatment interval</th>
<th>Variable application rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>very low</td>
<td>12 days</td>
<td>250 g/ha</td>
</tr>
<tr>
<td>low</td>
<td>10 days</td>
<td>250 g/ha</td>
</tr>
<tr>
<td>medium</td>
<td>8 days</td>
<td>500 g/ha</td>
</tr>
<tr>
<td>high</td>
<td>6 days</td>
<td>750 g/ha</td>
</tr>
<tr>
<td>very high</td>
<td>4 days</td>
<td>750 g/ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potato growth</th>
<th>Addition/Reduction (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>completed</td>
<td>1</td>
</tr>
<tr>
<td>normal</td>
<td>0</td>
</tr>
<tr>
<td>strong</td>
<td>-1</td>
</tr>
<tr>
<td>very strong</td>
<td>-2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rainfall (mm) since last application</th>
<th>Reduction (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15</td>
<td>1</td>
</tr>
<tr>
<td>15-25</td>
<td>0</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>-1</td>
</tr>
</tbody>
</table>

Max. sum addition/reduction: +1 day / -3 days
Minimal treatment interval: 4 days
Slight increase of Late Blight disease in potato crop (pew < 0.4)

Favorable weather conditions with rapid spread of Late Blight (pew > 0.4)
Copper reduction by a treatment break

10.-16.07.06
7 consecutive days with pew = 0

17.07.06
Output („treatment break possible“)

01. + 02.08.06
2 consecutive days with pew > 0

03.08.06
Output („end of treatment break since 05.08.“)
Öko-SIMPHYT – trial sites -

<table>
<thead>
<tr>
<th>Variant</th>
<th>Treatment Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variant 1</td>
<td>untreated control</td>
</tr>
<tr>
<td>Variant 2</td>
<td>500 g/ha Cu, weekly</td>
</tr>
<tr>
<td>Variant 3</td>
<td>variable rate and interval (Öko-SIMPHYT)</td>
</tr>
<tr>
<td>Variant 4</td>
<td>500 g/ha Cu, variable interval (Öko-SIMPHYT)</td>
</tr>
</tbody>
</table>

n = 49 trials
4 variants n = 17
3 variants n = 20
On-farm trials n = 12
Öko-SIMPHYT-trial (Rheda-Wiedenbrück 2009)
Öko-SIMPHYT-trial (Börry 2008)

Disease severity (leaf), variety Princess

- untreated control
- 500g Cu/Woche (Σ Cu 3000 g/ha)
- Cu variable rate/interval (Σ Cu 2000 g/ha)
- 500 g Cu/variable interval (Σ Cu 2500 g/ha)
Model SIMPHYT1 - Validation 2006-2009

Hit rate of correct forecasts:
Evaluated by the difference between recommendation and first outbreak of Late Blight

- SIMPHYT1 (n=46)
- SIMBLIGHT1 (n=42)
Efficiency (%) of copper strategies compared to the untreated control (n=10)

- 500g Cu/week
  - Efficiency: 43.4%
  - Number of applications: 5.0
  - Total copper: Σ 2500 g copper ha\(^{-1}\) year\(^{-1}\)

- Cu variable rate/interval
  - Efficiency: 37.7%
  - Number of applications: 4.4
  - Total copper: Σ 1965 g copper ha\(^{-1}\) year\(^{-1}\)

- 500 g Cu/variable interval
  - Efficiency: 38.5%
  - Number of applications: 4.5
  - Total copper: Σ Cu 2225 g copper ha\(^{-1}\) year\(^{-1}\)
**Treatment start not predicted**

- **Risk map of treatment start**

- **Comment of extension officer**

- **Prognosis for different emergence dates and for the two risk levels**

<table>
<thead>
<tr>
<th>Ort</th>
<th>Prognose erstellt für den Auflaufbeginn</th>
<th>Gefährdungsgruppe</th>
<th>Treatment start not predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hüben</td>
<td>10.07.09</td>
<td>12.06.09</td>
<td>21.06.09</td>
</tr>
<tr>
<td></td>
<td>21.06.09</td>
<td>24.06.09</td>
<td>Treatment start in the next days</td>
</tr>
</tbody>
</table>

- **Treatment start in the next days**

- **Treatment start**
Summary

• By timing the treatment interval and adjusting the application rate with the help of the decision support system Öko-SIMPHYT it was possible to get results comparable to standardized weekly applications, applying less copper. In certain cases it was possible to save up to 1000g/ha of copper.

• On average 0.6 applications were saved and the reduction of copper was 535g/ha.

• The prognosis model is available for farmers and extension officers via the internet on the homepage www.isip.de.

Thank you for your attention!