Effects of different temperatures on the development and fitness of Western Corn Rootworm

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Populations of *Diabrotica virgifera virgifera* used:

- USDA non diapausing laboratory strain
- North Italy
- Hungary
Larval development without diapause / quiescence

Larval development without diapause

USDA laboratory strain WCR larvae hatch after 2 weeks without diapause.

No larval development without diapause possible for European WCR.
Larval development without quiescence

Post diapausal development without quiescence
• start of eclosion
• 50% of eclosion
• end of eclosion

Cumulative eclosion rate ± SD [%] vs. Age of eggs [d]

Mean eclosion rate ± SD [%] vs. Origin

HU vs. IT
Larval development without quiescence
Larval development at different temperatures

10 DWD stations
soil temperatures 2006 - 2009

Monthly average -5 cm
Monthly average -10 cm
-5 cm max
-5 cm min
Larval development at different temperatures

- 3 climate cabins (15°C, 20°C, 25°C) at constant conditions
- Several sample dates according to temperature and speed of development, each sample date with 3 subsamples (pots with maize), 40 L1/pot

<table>
<thead>
<tr>
<th>temp</th>
<th>USDA</th>
<th>HU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15°C</td>
<td>20°C</td>
</tr>
<tr>
<td>n sample</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>dates</td>
<td>72</td>
<td>22</td>
</tr>
<tr>
<td>period (d)</td>
<td>72</td>
<td>22</td>
</tr>
</tbody>
</table>

- Heat extraction of larvae with modified McFadyen heat extractor
- Weighing of dried larvae with Mettler Toledo XP26 scale
Larval development at different temperatures

**USDA larvae**

- Δ 15°C
- ○ 20°C
- ▲ 25°C

**HU larvae**

- Δ 15°C
- ○ 20°C
- ▲ 25°C

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Larval development at different temperatures

**USDA larvae**
- Mean developmental time (d)
- Dry weight (mg)
- 15°C L1
- 20°C L2
- 25°C L3

**HU larvae**
- Mean developmental time (d)
Larval development at different temperatures

Conclusions

• American data based on studies on non diapausing strains of *D. v. virgifera* are of limited use for a European WCR forecast model
Ability of larvae to starve

- larvae of all 3 larval stages were exposed to periods without food (0-5 days), afterwards fed for 2 days, 20 replications/starvation period
- weighing of start weight, weight after starvation, weight after 2 days of feeding
### Ability of larvae to starve

Mean percentage survivals of *Diabrotica* larvae (L1-L3) exposed to different periods of starvation (St) and 2 days feeding (n=20).

<table>
<thead>
<tr>
<th>St (d) after St</th>
<th>L1 after 2dF</th>
<th>L2 after 2dF</th>
<th>L3 after 2dF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>94.7</td>
<td>100.0</td>
<td>100.0</td>
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<tr>
<td>1</td>
<td>100.0</td>
<td>85.0</td>
<td>100.0</td>
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<tr>
<td>2</td>
<td>90.0</td>
<td>80.0</td>
<td>95.0</td>
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<tr>
<td>3</td>
<td>40.0</td>
<td>5.0</td>
<td>80.0</td>
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<tr>
<td>4</td>
<td>5.0</td>
<td>0.0</td>
<td>75.0</td>
</tr>
<tr>
<td>5</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Ability of larvae to starve

Starvation time (d)

MRGR

L1  y = 0.702 - 0.149x (r² = 0.803)
L2  y = 0.231 - 0.014x (r² = 0.132)
L3  y = 0.084 - 0.014x (r² = 0.694)
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