Oilseed rape pests in Norway

Nina Svae Johansen, Annette Folkedal, Gunda Thöming, Wendy Waalen
OILSEED RAPE PRODUCTION

- Mainly in South-East Norway
  - 4160 ha
  - 87% spring rape
    - 2/3 spring oilseed rape
    - 1/3 spring turnip rape
  - 13% winter oilseed rape
PESTS

Regular
• Pollen beetles (Brassicogethes/Meligethes spp.)
• Flea beetles (Phyllotreta spp)

Occasional
• Diamondback moth (Plutella xylostella)
• Brassica pod midge (Dasineura brassicae)
• Turnip seed weevil (Ceutorrhynchus obstrictus = C. assimilis)
• Cabbage stem weevil (Ceutorrhynchus quadridens = C. pallidactylus)
• Turnip sawfly (Athalia rosae)
PEST CONTROL

• Mainly insecticides
• Area treated
  – Spring oilseed rape 70 %
  – Winter oilseed rape 10 %

• Treatment threshold (pollen beetles) or at appearance

<table>
<thead>
<tr>
<th>Growth stage</th>
<th>No. of pollen beetles/plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early bud stage</td>
<td>0,5-1,0</td>
</tr>
<tr>
<td>Medium bud stage</td>
<td>1-2</td>
</tr>
<tr>
<td>Late bud stage</td>
<td>2-3</td>
</tr>
</tbody>
</table>
## ACTIVE SUBSTANCES 2017

<table>
<thead>
<tr>
<th>MoA-group</th>
<th>Active ingredient</th>
<th>Field rate (Al/ha)</th>
<th>Treatments/year</th>
<th>Pollen beetle</th>
<th>Flea beetles*, DBM*, Turnip sawfly*</th>
<th>Cabbage seed pod weevil</th>
<th>Cabbage stem weevil, Brassica pod midge</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td>Alpha-Cypermethrin</td>
<td>10.0 - 12.5</td>
<td>2</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deltamethrin</td>
<td>5.0 – 7.5</td>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Esfenvalerate</td>
<td>7.5 - 15</td>
<td>2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lambda-cyhalothrin</td>
<td>5.0</td>
<td>1-2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tau-fluvalinate</td>
<td>48.0</td>
<td>1-2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4A</td>
<td>Thiacloprid</td>
<td>72.0</td>
<td>1-2</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22A</td>
<td>Indoxacarb</td>
<td>25.5</td>
<td>1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Pests also in other crops
SEASONAL OCCURRENCE OF MAIN PESTS

- **Snails**: Winter
- **Pollen beetles**: Winter Oilseed Rape
- **Iron phosphate**: Winter Oilseed Rape
- **Indoxacarb**: Winter Oilseed Rape

Figure from: Bekämpningsrekommendationer. Svampar och insekter 2017. Jordbruksverkets växtskyddscentraler, mars 2017
http://www2.jordbruksverket.se/download/18.44d1a6d715b53cf7b561f74c/1491802974655/be17v19.pdf
SEASONAL OCCURRENCE OF MAIN PESTS

Figure from: Bekämpningsrekommendationer. Svampar och insekter 2017. Jordbruksverkets växtskyddscentraler, mars 2017
http://www2.jordbruksverket.se/download/18.44d1a6d715b53cf7b561f74c/1491802974655/be17v19.pdf
RESISTANCE MONITORING: POLLEN BEETLES

- **Cyhalothrin/technical grade (2007-2017)**
  - IRAC Method no. 011
  - Test vials from Syngenta and Bayer CropScience

- **Thiacloprid/Biscaya OD 240 (2010-2017)**
  - IRAC Method no. 021
  - Test vials from Bayer CropScience

- **Indoxacarb/Avaunt 150 EC (2012-2017)**
  - IRAC Method no. 027
  - Test vials from DuPont

- Pollen beetles from spring oilseed rape and spring turnip rape
POLLEN BEETLE SUSCEPTIBILITY TO λ-CYHALOTHRIN

% mortality (± SE) at 100 % field rate

AKERSHUS COUNTY

HEDMARK COUNTY

ØSTFOLD COUNTY

VESTFOLD COUNTY
POLLEN BEETLE SUSCEPTIBILITY TO λ-CYHALOTHIRIN

% mortality (±SE) at 100% field rate
POLLEN BEETLE SUSCEPTIBILITY TO $\lambda$-CYHALOTHIRIN

% mortality (±SE) at 100% field rate
POLLEN BEETLE SUSCEPTIBILITY TO λ-CYHALOTHIRIN

% mortality (± SE) at 100 % field rate
Resistance level (IRAC)
- Highly resistant (5)
- Resistant (4)
- Moderately resistant (3)
- Susceptible (2)
- Highly susceptible (1)
POLLEN BEETLE SUSCEPTIBILITY TO BISCAYA OD 240

% mortality (± SE) at 100 % field rate
POLLEN BEETLE SUSCEPTIBILITY TO BISCAYA OD 240

% mortality (± SE) at 100 % field rate

Expected mortality
**BISCAYA OD 240 (THIACLOPRID)**

Susceptibility data 2012

<table>
<thead>
<tr>
<th>Mean values for 9 field strains, 2012</th>
<th>n</th>
<th>$\text{LC}_{50}$ ng Al/cm²</th>
<th>95 % FI</th>
<th>$\text{LC}_{95}$ ng Al/cm²</th>
<th>95 % FI</th>
<th>Slope ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>307 ± 5</td>
<td>0,042</td>
<td>0,027 – 0,062</td>
<td>1,090</td>
<td>0,579 – 2,901</td>
<td>1,14 ± 0,07</td>
</tr>
</tbody>
</table>

Mortality at discriminating concentrations, 25 and 100 % of recommended field rate (mean of collected strains)

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of sites</th>
<th>Counties</th>
<th>Rate (µg Al/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.029</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>AK, HE, VF</td>
<td>65 ± 15</td>
</tr>
<tr>
<td>2017</td>
<td>10</td>
<td>AK, HE, VF, ØF</td>
<td>42 ± 18</td>
</tr>
<tr>
<td>Expected mortality (IRAC Method no. 021)</td>
<td>50 ± 10</td>
<td>93 ± 6</td>
<td>98 ± 3</td>
</tr>
</tbody>
</table>
## AVAUNT 150 EC (INDOXACARB)

### Susceptibility data 2012

<table>
<thead>
<tr>
<th>Mean values for 7 field strains, 2012</th>
<th>n</th>
<th>LC$_{50}$ ng AI/cm$^2$</th>
<th>95 % Fl</th>
<th>LC$_{95}$ ng AI/cm$^2$</th>
<th>95 % Fl</th>
<th>Slope ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>348 ± 30</td>
<td>34.3 ± 3.2</td>
<td>29.0 – 39.3</td>
<td>82.9 ± 6.0</td>
<td>68.5 – 111.4</td>
<td>4.65 ± 0.54</td>
</tr>
</tbody>
</table>

### Mortality at 25 and 100 % of recommended field rate (mean of collected strains)

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of sites</th>
<th>Counties</th>
<th>Rate (ng AI/cm$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>63.75</td>
</tr>
<tr>
<td>2012</td>
<td>7</td>
<td>HE, VF</td>
<td>83 ± 15</td>
</tr>
<tr>
<td>2017</td>
<td>10</td>
<td>AK, HE, VF, ØF</td>
<td>100 ± 1</td>
</tr>
</tbody>
</table>

Expected mortality (IRAC Method no. 027)  
> 90 | > 90
TOWARDS IPM IN SPRING OILSEED CROPS IN NORWAY

Aim in WP3: Reduced crop losses from pests and diseases. Pests with focus on:

**Pollen beetles**
*Brassicogethes/Meligethes* spp.

**Flea beetles**
*Phyllostreta* spp.
FLEA BEETLE SPECIES COMPLEX, SPRING OILSEED RAPE IN NORWAY

Akershus county, Ås (first evaluated in 2016)

<table>
<thead>
<tr>
<th></th>
<th>Phyllotreta nemorum</th>
<th>P. undulata</th>
<th>P. striolata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ås</td>
<td>3</td>
<td>73</td>
<td>24</td>
</tr>
</tbody>
</table>

Large Striped Flea Beetle  Small Striped Flea Beetle  Striped Flea Beetle

Foto: argoatlas.ru  Foto: argoatlas.ru  Foto: argoatlas.ru
MELIGETHE SPECIES COMPLEX IN NORWAY

Akershus/Østfold counties, 2015:

<table>
<thead>
<tr>
<th>%</th>
<th>M. aeneus</th>
<th>M. coeruleivirens</th>
<th>M. subaeneus</th>
<th>M. subrugosus</th>
<th>M. viridescens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Askim</td>
<td>76</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Ås</td>
<td>60</td>
<td>16</td>
<td>1</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Kråkstad</td>
<td>70</td>
<td>15</td>
<td>3</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Rakkestad</td>
<td>88</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Sarpsborg</td>
<td>91</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Species complex and resistance level

% mortality at field rate ± SE

% Meligethes aeneus

Lambda-cyhalotrin
Biscaya OD 240
TRAP CROPS

Trap plants with attractive colour and odour along the field edge lure pests away from the main crop.
FIELD 2016

Flea beetles, *Phyllotreta* spp.

![Image of flea beetles]

**Graph:**
- **Trap crop**
  - Majong WITH trap crop
  - Majong WITHOUT trap crop
  - Valo as trap crop
- **Rape**
  - Silver Shadow WITH trap crop
  - Silver Shadow WITHOUT trap crop
  - Majong as trap crop
FIELD 2016

Pollen beetles, *Brassicogethes/Meligethes* spp.
SUMMARY

- Pyrethroid resistance in pollen beetles stabilized or partly reversed? Reduced susceptibility towards thiacloprid of concern. Indoxacarb is effective, also against pollen beetles with reduced sensitivity to pyrethroids and thiacloprid.

- Resistance in flea beetles not investigated.

- Development of alternative control methods and anti-resistance strategies important to avoid more serious resistance problems.

- Trap crops with summer turnip rape promising control method for flea and pollen beetles in spring oilseed rape.
  - Treatment threshold exceeded less often
  - Pests on trap crop must be effectively controlled at the right time to avoid immigration and damage in the main crop.

- Occurrence of species complex of flea beetles and pollen beetles in spring oilseed crops: Effect of insecticides, resistance dynamics and IPM-strategies?
Thank you for your attention!