a) herbicide resistance of Wild Oat in RLP

b) estimation of herbicide sensitivity in the field
Contents

a) herbicide resistance of Wild Oat
   - test system
   - results

b) logarithmic testing of herbicide sensitivity
Spread of Wild Oat in RLP

summer Crops + winter crops

WRGS, Paris

01.10.2015
Seed samples from fields in RLP with potential resistance....

<table>
<thead>
<tr>
<th>Year</th>
<th>Blackgrass</th>
<th>Silky Bentgrass</th>
<th>Wild Oat</th>
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<td>14</td>
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<td>2007</td>
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<td>20</td>
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<td>2008</td>
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<td>2009</td>
<td>20</td>
<td>20</td>
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<td>2010</td>
<td>13</td>
<td>25</td>
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<tr>
<td>2014</td>
<td>45</td>
<td>30</td>
<td>9</td>
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</table>
Test system

1. biotest: detection of resistance

2. biotest: verification + intensity (since 2009)
Improving germination of Wild Oat

...GA-treatment

peeling...
improving germination of Wild Oats

...after 4 days

...germination chamber
Cultivation of *A. fatua*-testplants

sowing

germination
Treatment
### Herbicide treatment

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Vgl.</th>
<th>dose /ha</th>
<th>HRAC</th>
<th>Vgl.</th>
<th>dose /ha</th>
<th>HRAC</th>
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<tr>
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<td>Kontr.</td>
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<td></td>
<td>Kontrolle</td>
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<tr>
<td>2.</td>
<td>Ralon S. Power Pl.</td>
<td>1,2 l + 0,4 l</td>
<td>A</td>
<td>Ralon S. Power Pl.</td>
<td>2,4 l + 0,4 l</td>
<td>A</td>
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<tr>
<td>3.</td>
<td>Ralon S. Power Pl.</td>
<td>2,4 l + 0,4 l</td>
<td>A</td>
<td>Ralon S. Power Pl.</td>
<td>4,8 l + 0,4 l</td>
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<tr>
<td>4.</td>
<td>Husar Power Set</td>
<td>0,1 l + 1,0 l</td>
<td>B</td>
<td>Topik</td>
<td>1,2</td>
<td>A</td>
</tr>
<tr>
<td>5.</td>
<td>Husar Power Set</td>
<td>0,2 l + 1,0 l</td>
<td>B</td>
<td>Axial 50</td>
<td>1,2 l</td>
<td>A</td>
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<td>6.</td>
<td>Axial 50</td>
<td>2,4 l</td>
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<tr>
<td>7.</td>
<td>Traxos</td>
<td>1,2 l</td>
<td>A</td>
<td></td>
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<tr>
<td>8.</td>
<td>Focus Ultra</td>
<td>2,5 l</td>
<td>A</td>
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<tr>
<td>9.</td>
<td>Monitor + Monfast</td>
<td>25 g + 0,2 %</td>
<td>B</td>
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<tr>
<td>10.</td>
<td>Broadway + FHS</td>
<td>220 g + 1,0 l</td>
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</table>
Evaluation: 3 and 4 weeks a. treatment

before ranking: correction of efficacy

corr. efficacy = \frac{\text{efficiency factor of test population} \times 100}{\text{efficiency factor of sensitive population}}

ranking of resistance
mod. after Moss 1999

<table>
<thead>
<tr>
<th>S</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>progress. resistant</td>
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B. Augustin, DLR R-N-H, Abt. Landwirtschaft

1.10.2015  Folie 11
# Classification of resistance

<table>
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<tr>
<th>Rank</th>
<th>Upper limit (%)</th>
<th>Lower limit (%)</th>
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## Herbicide resistance of Wild Oat
### - samples 2011-12 -

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<tr>
<th>Treatment</th>
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<th>Power Plus</th>
<th>Topik</th>
<th>Axial</th>
<th>Traxos</th>
<th>Focus Ultra</th>
<th>Husar Power Set</th>
<th>Monitor + Monfast</th>
<th>Broadway + FHS</th>
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<td>(+)*</td>
<td>(+)*</td>
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<td>(+)*</td>
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<tr>
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<td>—</td>
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</tbody>
</table>

- "(+)*" survival of individual plants
- "—" not tested
- "+" target site res. not confirmed
- "++" sensitive
# Herbicide resistance of Wild Oat

- samples 2013 -

<table>
<thead>
<tr>
<th>Origin</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
<th>Treatment 5</th>
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<td>Kettenheim</td>
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<td>Alzey</td>
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<td>Harxheim</td>
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<tr>
<td>Bergweiler</td>
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</table>

**Internal:** sensitive
**Herbiseed:** sensitive

++ + +

target site res. not confirmed
# Herbicide resistance of Wild Oat

## - samples 2014 -

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ralon Super</th>
<th>Power Plus</th>
<th>Topik</th>
<th>Axial</th>
<th>Traxos</th>
<th>Focus Ultra</th>
<th>Husar Power Set</th>
<th>Monitor + Monfast</th>
<th>Broadway + FHS</th>
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<tr>
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<td>+++</td>
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<td>+</td>
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<td></td>
</tr>
</tbody>
</table>

- **internal:** sensitive
- ++ target site res. not confirmed
- + resistant
- sensitive
Conclusions: Wild Oat

- improvement of germination is essential
- up to now: every year herbicide resistance was detected
- only ACCase-resistance has been proofed:
  - 4 target site mutations (I1781L/W1999C/I2041V/C2088N)
  - affected: FOP`s + DEN
  - DIM`s were mostly efficient
- decreasing sensitivity against ALS-inhibitors
Results: Wild Oat samples 2011
b) Logarithmic pesticide application

a well-known field test

- optimize application rate
- check of herbicide sensitivity

phytotoxicity
Principle of logarithmic application

air

water
(1,0 l)

spray liquid (0,4 l)

thinning ratio:
1 : 25

WRGS, Paris
1.10.2015
Experimental device
Variation of application rate by means of a logarithmic sprayer

control (untreated)

treatment

desired application distance: 15 m
(nozzle: DG 11004 VS 1.4 bar / 3.6 km/h / 330 l/ha)

excessive field rate

standard field rate

excessive field rate

(watertank empty)

0 m

15 m

X m
Estimation of the application rate

\[ y = -1.2433 \ln(x) + 3.2358 \]

\[ R^2 = 0.9943 \]
resistant black grass after logarithmic treatment
Conclusions: logarithmic spray technique

site specific, real time information about dose-/response-relations of herbicides
Thank You for attention