Dormancy and persistence of volunteer oilseed rape

The problem: concerns
- Weed control in following oilseed rape and broad-leaved crops.
- Crossing between volunteers and varieties with different agronomic or quality characteristics.

Are seeds dormant?
Freshly shed seeds are not dormant but they develop dormancy over the first month after shedding. Water stress and darkness are primary requirements. Darkness, together with anaerobic soil conditions and low temperatures, may also increase dormancy.

Variety differences
Seeds of 26 spring and 21 winter rape varieties were placed in an osmotic solution (polyethylene glycol) in the dark to simulate dry soil for four weeks. Germination was tested in water after two weeks. Variety Starlight was included in all tests.

Varieties differed widely in the degree to which seeds became dormant. Figure 1 presents a sample of results. Growers should avoid highly persistent varieties, such as Apex, if a volunteer problem is anticipated. There was some variation in the results, as dormancy declined in older seeds.

Also seeds of the same variety from different farms exhibited slightly different responses.

Cultivation effects
Post-harvest management strategies were compared over three years. Seeds were broadcast or left on the soil surface following harvest of a previous crop. The aim was to minimise volunteers in following crops.

Action:
- If volunteers are a problem on your farm, grow oilseed rape varieties with limited persistence.
- If different variety types (food and industrial) are grown, lengthen rotations to minimise volunteer numbers and the risk that volunteers from one crop contaminate a following crop.
- Minimise shedding losses during harvesting. Harvest when crops are ripe – not over-ripen.
- Leave soil uncultivated for as long as possible after harvest before sowing the following crop, preferably four weeks. Do not lightly cultivate soils after rape harvest if the soil is dry, as this will increase persistence.

Figure 1. How varieties differ in dormancy
Further information:
Contact: Dr Peter Lutman, IACR Rothamsted
Tel: 01582 763133

Project Report OS32
Ongoing project 2085 (LINK BRIGHT project)

Summary
Oilseed rape presents a particular problem as a weed. Between five and ten thousand seeds/m² may fall to the ground before and at harvest. Losses are particularly high if harvest is delayed. Some seeds survive in the soil for many years. MAFF and HGCA funded a project over four years to help farmers manage the problem.

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Results (Table 1) indicated that cultivation should be delayed for as long as possible. In some cases all seeds left on the surface for four weeks germinated immediately.

Most seeds persisted when incorporated into dry soil immediately after harvest. Only 4 mm of rain was required, prior to cultivation, to minimise survival. Consequently, high levels of persistence would only be anticipated after dry harvests. Light cultivation to mix seed into soil reduced germination and increased persistence in dry soil.

Long-term persistence
Seeds were buried in soil and dug up after fixed periods. Then germination was tested. Persistence varied between years, being greatest when soil was dry immediately after burial and least when it was wet.

Decline in seed survival in soil was relatively slow. Some 5% survived for 3 years. It would probably take 6-7 years for all seeds to die. From an initial 5,000 seeds/m², loss of 95% would leave 250 seeds/m², enough to produce significant infestation in the next crop.

Population dynamics
Farmers need both to minimise volunteer germination in an immediate following crop, and to ensure clean crops throughout the rotation. One project aim was to quantify seed losses at all stages in current and following crops. This should enable effects of cultivation method or crop rotation to be predicted and so provide guidance on management approaches to ensure that seed numbers in the soil never get too high.

Table 1. Results of 1995 field experiments

<table>
<thead>
<tr>
<th>Rapeseed Variety</th>
<th>Immediate Plough</th>
<th>3 x weekly stubble tillage + plough in week 4</th>
<th>Plough after 4 weeks</th>
<th>Non-inversion cultivation after 4 weeks</th>
<th>No cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apex</td>
<td>18.3</td>
<td>18.0</td>
<td>4.6</td>
<td>1.1</td>
<td>0</td>
</tr>
<tr>
<td>Bristol</td>
<td>21.2</td>
<td>14.3</td>
<td>4.8</td>
<td>2.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Envol</td>
<td>12.4</td>
<td>10.0</td>
<td>1.6</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Apex</td>
<td>55.0</td>
<td>36.8</td>
<td>5.4</td>
<td>1.1</td>
<td>0</td>
</tr>
<tr>
<td>Bristol</td>
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<td>33.6</td>
<td>7.4</td>
<td>0.4</td>
<td>0</td>
</tr>
<tr>
<td>Envol</td>
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<td>29.6</td>
<td>4.7</td>
<td>0.2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Results are expressed as % of seeds sown, assessed 7 months after the start of the experiments.

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