Biology

Life cycle

Two wheat blossom midge species occur in the UK – orange wheat blossom midge (Sitodiplosis mosellana) and yellow wheat blossom midge (Contarinia tritici). In recent years orange wheat blossom midge (OWBM) has been the most significant and economically important.

Midges usually fly when air temperature exceeds 15°C but flight has been observed down to 10°C especially within crop canopies. Male midges fly to seek a mate on the first evening after hatching. Mated females then fly on the next five suitable evenings. Females fly in low light conditions. Therefore, on sunny days they fly later in the evening than on dull, overcast days. Females lay most eggs on their first evening of flight. Only female midges fly between fields, provided conditions are still. On windy days, they lay eggs on ears sheltered within crops.

Eggs are laid inside the florets of emerging wheat ears. Crops at mid-ear emergence (GS53–59) are vulnerable. Depending on temperature, larvae hatch within 4–10 days. After hatching, larvae crawl down to the developing grain and begin to feed. They exude enzymes that break down cell walls and convert starch back to sugar. Larvae hatching after flowering do not develop properly and cause little damage.

Orange wheat blossom midge survive in the soil, as larvae inside cocoons, for ten years or more. They pose a major threat for up to four years.

Larvae emerge and move to soil surface. If soil is warm (over 13°C) and moist – usually after heavy rainfall – larvae pupate. If conditions are unsuitable, larvae return to cocoon stage.

Larvae feed for about two weeks on developing grain before dropping to the ground. When conditions are suitable, usually after rain has moistened the soil surface, they burrow into soil and hibernate as larvae within cocoons.

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Natural enemies – provide a useful natural background control

Dance flies (Platyplapus spp.) feed on adult midges during flight. Occasionally, large numbers in June can significantly reduce midge populations.

Spiders – webs can trap many wheat blossom midges.

Ground beetles (Carabidae) usually eat few midge larvae. Numbers eaten increase if dry soil prevents larvae burrowing into soil.

Parasitic wasps

Macroglenes penetrans and Platygaster tuberosula lay their eggs within midge eggs. Wasp larvae attack midge larvae as they hatch the following year and prevent pupation.

All of these natural enemies are vulnerable to insecticides. Only use insecticides when orange wheat blossom midge infestations above the thresholds are observed and only treat at susceptible stages.
Monitoring

Unless resistant varieties are grown crops must be monitored and, if necessary, sprayed. Ears at GS53-59 are at most risk. The risk to a crop depends on the proportion of ears at this critical stage when midges fly.

**National**

Nationally, numbers of pupae and development of midges are assessed at a range of sites. Warnings are issued when a hatch is imminent via Dow Pestwatch. www.dowagro.com/uk/cereal/pest.htm

**On-farm**

Local conditions determine whether fields will be attacked. On-farm monitoring indicates where to target control measures.

Farmers growing susceptible varieties should monitor for orange wheat blossom midge.

**Pheromone traps** attract male midges and so provide the earliest warning of midge activity.

Place traps within fields damaged by OWBM in the past two years, whether the current crop is cereals, any other crop or fallow. A minimum of two traps should be placed in each field.

Attach traps at crop height to stakes at GS45 – a week before the first ears emerge. Leave them in position until any crop in the immediate area has reached flowering (GS61).

Pheromone traps should be placed to cover discrete blocks of cereals. Each block should represent different soil types, rotations, rainfall or soil temperature across the farm.

**Yellow sticky traps** may be used to assist visual inspection and monitor movement in current wheat fields. Both sexes are caught, as well as many other insects, so correct identification is essential.

Use at least two yellow sticky traps, hung at ear height in each field. Monitor throughout ear emergence. A catch of around ten midges/trap indicates significant risk.

**Visual crop inspection**, of susceptible crops at mid-ear emergence (GS53–59), is best conducted from mid-evening. As light levels fall, midges are spread evenly, so inspections can be made quickly.

Place pheromone traps at height of crop ears

One midge on six ears – the threshold for spraying quality wheat

Place yellow sticky traps level with emerging ears

<table>
<thead>
<tr>
<th>Variety status</th>
<th>Treatment threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistant</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Susceptible feed crops</td>
<td>Over one midge on 3 ears through GS35-59</td>
</tr>
<tr>
<td>Milling and seed crops</td>
<td>Over one midge on 6 ears through GS35-59</td>
</tr>
</tbody>
</table>

**Pheromone trap catches (midges/trap/day)**

30 or more General risk to crops in following week when fertilised females lay eggs. Monitor crops for female midges.

Over 120 Very high risk. Treat wheat crops in surrounding fields at susceptible growth stage as soon as possible.

Walk about 30 metres into the field, examining up to 100 ears, to assess if infestations exist and exceed threshold levels.

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Use at least two yellow sticky traps, hung at ear height in each field. Monitor throughout ear emergence. A catch of around ten midges/trap indicates significant risk.

Give priority to milling or seed crops, as well as to more sheltered feed crops and second wheats.

The highest crop risk is on the three nights following a rise in pheromone trap catches.
Decisions in orange wheat blossom midge management

1. Are you growing a midge resistant variety?
   - Yes: No further action needed, ie no need to monitor or apply insecticide.
   - No: Set up pheromone traps before ear emergence in fields where wheat was grown in previous years, as these are sources of the pest (if growing susceptible varieties).

2. Is wheat at the ear emergence growth stage?
   - Yes: Check pheromone traps. Are catches over 30/trap/day?
     - Yes: Treat infested and surrounding wheat fields as soon as possible as females can fly to nearby fields.
     - No: Continue evening assessment until risk period ends.
   - No: Is it at an earlier stage?
     - Yes: Check traps later when boots split.
     - No: Crop is no longer vulnerable when flowering starts. Remove traps.

3. Are catches over 30/trap/day?
   - Yes: Are catches above 120/trap/day?
     - Yes: Treat infested and surrounding wheat fields as soon as possible as females can fly to nearby fields.
     - No: Keep checking traps daily until flowering starts.
   - No: Assess wheat ears in field in evening. Is there over 1 midge on 3 ears of feed wheat or 6 ears of milling wheat/seed crops?

The susceptible growth stages

- GS53: Ear 1/4 emerged
- GS56: Ear 1/2 emerged
- GS57: Ear 3/4 emerged
- GS59: Ear fully emerged
Management and control

Rotations
Rotation has little effect on overall risk of OWBM. Where crops are grown in blocks, this may help monitoring and control in current crops. It may also reduce future risk.

Varieties
Variety choice must be based on market demand. Resistant varieties may ease management in remote fields that are difficult to monitor and treat, or in crops close to housing.

Resistant varieties
Wound plugs in developing grain of resistant variety.

A few winter wheat varieties are classified as resistant and do not require monitoring or insecticide treatment. Wound plugs form on attacked grains and prevent larvae from feeding.

Varieties on the 2009/10 HGCA Recommended List that are resistant to orange wheat blossom midge are Gatsby, Glasgow, Oakley, Qplus, Robigus, Scout and Viscount.

However, these varieties are susceptible to yellow wheat blossom midge, although this species has not yet presented a serious problem.

Chemical control
Three active substances are approved for orange wheat blossom midge control:

- **Chlorpyrifos** (eg Dursban WG), an organophosphate, kills adults as well as eggs and newly-emerged larvae on exposed parts of wheat florets. The effective treatment window is four to ten days. Apply treatments during ear emergence if control thresholds are reached.

- **Lambda-cyhalothrin** (eg Hallmark Zeon), a pyrethroid, only kills adults present at the time of spraying, not eggs. Thus, spray timing is more critical than for chlorpyrifos.

- **Thiacloprid** (Biscaya), a neonicotinoid, should be applied as soon as the OWBM threshold is reached during ear emergence to reduce damage from OWBM.

In all cases, follow label recommendations for field margin restrictions and for conservation headlands. Do not treat once the crop reaches an average growth stage of GS61 (start of flowering).

**Warning:**
Correct insecticide timing is critical. Any wrongly applied chemical will do more damage than good by killing beneficial species.

Observe The Voluntary Initiative’s ‘Insecticides guidance on best practice’.

Matching cropping plans to spraying capacity

Key actions
- Grow resistant varieties where suitable.
- Use pheromone traps to monitor activity.
- Focus control on premium crops, ie milling and seed.
- Give highest priority to crops at GS53–59.
- Treat crops at risk as quickly as possible – effective window is just days.
- Do not treat crops after GS61.

[Flowchart diagram showing decision process for matching cropping plans to spraying capacity]

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Acknowledgements

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Further reading

HGCA Recommended Lists for cereals and oilseeds (annual)

Additional information

Information from ‘Dow Pestwatch’ is distributed via agrochemical distributors, ‘ADAS National Crop Action’, crop consultants and the farming media.

Dow Pestwatch
www.dowagro.co.uk/cereal/pest.htm

Pheromone traps manufactured by:
AgriSense BCS www.agrisense.co.uk are marketed by Certis www.certiseurope.co.uk
These are available from local agricultural distributors.
The Voluntary Initiative – www.voluntaryinitiative.org.uk

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