Improved Snug Management

Slides from Michael Nash SARDI
Contents

• Know your enemy
• Assessing risk of slugs and snails
• Monitoring
• Control options
  – Biological
  – Cultural control
  – Chemical (baits)
Grey field slug
(Deroceras reticulatum)

What is known:

- Light grey to fawn colour
- Dark brown markings
- Up to 50 mm long
- Mainly surface active
- Milky-white mucus
- Reproductive maturity 138 days
- 21-22 days for eggs to hatch
- Optimum 18°C
- Soil water >20%
- Opportunistic annual life cycle
- 0.5 – 1.5 m² damaging to canola
- 5 damaging to cereals??
Black keeled slug  
*(Milax gagates)*

- Black / dark grey in colour
- Sharp ridge (keel) along back
- 40 – 60 mm long
- Reproductive maturity 240 days
- 40 days for eggs to hatch
- Optimum 17-18 °C
- Annual or Biannual lifecycle
- Burrows underground
- Tolerant of Metaldehyde
- Feeds at surface AND below ground
- < 1/m² damaging to canola
- 1-2 damaging to cereals
Conclusions slugs

• *Milax gagates* are excellent bio-indicators of soil moisture availability
  – wider distribution
  – drier areas i.e. >450mm rainfall
  – heavy soils are an indirect factor
  – heavy autumn rainfall

• *D. reticulatum* distribution has shifted up in elevation (Nash 2013)
  – temperature the key factor
  – prefers colder conditions
  – requires more moisture i.e. 500mm

• Brown field slug distribution has increased
  – increased summer rainfall?
  – over use of metaldehyde?
Snails

Round:

Vineyard or common white  
*Cernuella virgata*

White Italian snail  
*Theba pisana*

Conical:

Small conical snail  
*Cochlicella barbara*

Conical or pointed snail  
*Cochlicella acuta*
Temperature
Moisture
Rainfall, Evaporation, Soil conditions

Chance of slug problem

Field

Previous outbreaks
National

What species do I have

Monitor problem areas
See identification guide

Will they be a problem

Moisture

Soil type (clay)
Stubble (retained)
Summer volunteers
Previous crop type (canola, beans)

Yes to > 1 of the above factors

Control options

Chemical: Bait
Cultural
Biological

Are they going to be controlled by one method? Unlikely

Temperature
Moisture
Rainfall > 450mm
## Factors for increased snail risk

The table below summarizes the factors influencing snail risk for different varieties of snails:

<table>
<thead>
<tr>
<th>Variable</th>
<th>common white</th>
<th>pointed</th>
<th>small pointed</th>
<th>white Italian</th>
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<td>Precipitation - warmest quarter (Bio18)</td>
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<td>Radiation - seasonality (Bio23)</td>
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<td></td>
<td>X</td>
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<td>Moisture Index - seasonality (Bio31)</td>
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<td>X</td>
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<td>X</td>
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<td>pH</td>
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<td></td>
<td></td>
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<tr>
<td>ASRIS 0-30cm Clay Content</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Substrate Calcrete</td>
<td>X</td>
<td></td>
<td>X</td>
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</table>
Identifying slug risk: Paddock level

**High risk**
- Irrigated and/or > 500mm
- Above average spring – autumn rainfall
- Cold wet establishment conditions
  - No till stubble retained
  - Presswheels, raised beds, cloddy seed bed
  - No sheep in enterprise
  - Soil with improved moisture holding capacity; i.e. increased clay content and organic matter
- **Summer volunteers**
  - Slow crop establishment
  - Conventional TT varieties
- **Previous paddock history**
  - Slug damage
- **Rotation: Beans/canola**
  - Sclerotinia

**Reduced risk**
- 500mm - 450mm
- Dry spring hot finish
- Warm dry conditions
  - Burnt only
  - Sheep on stubbles

**Low risk**
- <450mm
- Drought
- Tillage and Burnt stubbles
  - Full disturbance sowing compacted seedbed
  - Poor moisture holding capacity; i.e. Sand no OM
  - No volunteers
  - No slugs
  - No sclerotinia
  - Poor Cereal crop
  - No weeds
Monitoring: surface refuges

Note: Monitoring is not going to provide absolute assessment of slug density

9 refuges placed in a ‘W’ shape in each field (13 > 20ha)  HGCA Topic sheet no. 85

- 30 cm x 30 cm approx. slugs / m²
- 50 sampling points  40ha
- Effected by moisture > 20% activity
- Check susceptible crops regularly
- Concentrate on areas known to suffer from slug damage
- Check in the mornings when moist
Snail monitoring
Chance of slug problem

Field
Previous outbreaks
National

What species do I have
Monitor problem areas
See identification guide

Will they be a problem

Moisture

Soil type (clay)
Stubble (retained)
Summer volunteers
Previous crop type (canola, beans)

Climate
Rainfall > 450mm

Yes to > 1 of the above factors

Control options

Chemical: Bait
Cultural
Biological

Are they going to be controlled by one method? Unlikely
Biological control – conserving natural enemies
Native generalist predators limit slug populations

Nash et al. 2008; Biological Control 47:328–334. GRDC GRS80
Cultural control

• Traditional burning
  • Even hot burn required to kill 80-100% of round snails
  • Patch burn 50-80% of snails killed
  • Wild fire reduced grey field slugs by 50%
    – But increase in black keel slugs by 300%

• Cultivation
  • Shallow disking reduced grey slugs by 40-60%

• Rolling reduces snail and slug habitat

• Remove summer volunteers

• Flog paddocks with Sheep
Cultivation to control grey field slugs

Shallow cultivation in March reduced grey field slug numbers late into the growing season
Cultural control - cultivation
Establish crop before slugs become active

Hybrid sown 6 May

Deroceras reticulatum

5 kg / ha Bait May 15

*Denotes $P < 0.01$,

Nash unpublished data 2009

Canola 4 leaf stage
Bait Basics

Dry Process  →  Steam Process  →  Wet Process
Bran (Chook food)  →  Flour (pasta)
Before 1980  →  1990’ -2000’s
Dust & size  ←  cost
rain fastness
palatability
[metaldehyde]
Improving chemical control

“The chief obstacle to improving chemical control of slugs is not the lack of molluscicidal materials but the difficulty of getting them into the animal” (Briggs and Henderson, 1987)

Chance of encounter:
1. slug activity
2. attractiveness of bait (slugs)
3. number of baits per unit area
4. complexity of habitat (snails)

Consumption of active:
1. enough bait
2. enough toxicant in the bait
3. palatability
Number of baits per unit area

bait number to achieve 80% chance of encounter

Pellet type

- Dry process
- Wet process
- Dry process
- Dry process
- Double rate
- Farm practice

Western Victorian Practice already applied May and June

kg/ha

Bait per M2
Comparing products @ 13 d

META
15 g Metaldehyde
Improve bait efficacy

- How cost effective are bran based baits

- Concentration of Metaldehyde needs to be increased to ≥ 3%
- Increase field life of products
- Apply bait evenly
Apply bait evenly

**Calibrate** spreader for specific bait

- Consider narrower passes (bout width)
- Consider the spreader being used
  - Single disk lopsided spread of bait
  - >1000 rpm breaks up bait
- Consider product size and density
- Does the bait break up easily
- Look at the end results
<table>
<thead>
<tr>
<th>Product</th>
<th>A.I.</th>
<th>Rate</th>
<th>kg / ha</th>
<th>Baits / m²</th>
<th>g a.i./kg</th>
<th>Pellet</th>
<th>Rain Fast</th>
<th>Spreader</th>
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<td>label</td>
<td>3</td>
<td>30</td>
<td>30</td>
<td>flour</td>
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<td>MetaKill</td>
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<td>4 - 8</td>
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<td>15</td>
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<td>13.5</td>
<td>15</td>
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<td>farmer</td>
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<td>4</td>
<td>15</td>
<td>bran</td>
<td>No</td>
<td>Poor</td>
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<tr>
<td>Pestmaster 2.5mm</td>
<td>farmer</td>
<td>5</td>
<td>13</td>
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<td>No</td>
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<td>Bran based 2.5mm (optimal)</td>
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<td><strong>11</strong></td>
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<tr>
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<td>43-47</td>
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</table>

Products should always be applied as per label recommendations where these are available. This table is provided as a guide only. Some rates vary due to pellets / kg. Rates (kg / ha) that result in optimal bait densities for slugs (>25 / m²) are in Bold. Bran bait rates results in sub optimal bait densities based on values. Label recommendations for bran based baits can be misleading (e.g. Slugger rate 500 kg/ha) hence the rate used in broad acre is often 5 - 7.5 kg / ha.

No one control method will work

Slugs - Bait to protect seedlings

Snails – bait early on Autumn rains on bare ground, follow up bait at sowing

Assess bait application
  • Evenness of spread
  • Number of bait points
  • Enough for the number of snugs
Decision timeline for slugs

Cultural control

Chemical control

Biological control

Monitoring for activity when moist

Monitoring record problem areas

Control summer volunteers

Crop selection

Bare earth
SP’s

Limit spring pesticides that harm carabids

Grazing

Burning

Baiting*

Early sowing

Baiting pre emergence

Baiting*

Summer

Autumn

Winter

Previous spring

Sowing

* Pending monitoring results and moisture
Decision timeline for snails

- **Cultural control**
- **Chemical control**
- **Biological control**

**Monitoring record problem areas**

**Control volunteers**
- Grazing
- Burning
- Rolling, cabling
- Baiting*
- Baiting pre emergence
- Baiting*
- Header modifications
- Grain cleaning

- **Previous spring**
- **Summer**
- **Autumn**
- **Winter**
- **Sowing**
- **Summer Harvest**

* Pending monitoring results and moisture
NORTHERN, SOUTHERN AND WESTERN REGIONS
SLUG IDENTIFICATION AND MANAGEMENT

In the higher rainfall areas of northern and southern regions, slugs are a major problem. As no singlecontrol method will provide complete protection, an integrated approach is best.

SLUG IDENTIFICATION

Slugs are soft bodied, slipper-like animals, up to 10cm (4in) in length, and black in color. They spend their time out of sight and only emerge at night, often after rain. Slugs have a very unique body structure where the digestive system is located near the head. Due to this, slugs are more susceptible to drought stress than snails. Slugs can be distinguished from snails by the absence of shells and the presence of the head and feet. Slugs are often found in compost piles, vegetable gardens, around gardens and along potential run-off areas.

SLUG MANAGEMENT

Slugs can be managed using a variety of methods, including physical, chemical and biological controls. Physical controls include hand picking, setting slug traps, and using barriers such as cardboard or aluminum foil. Chemical controls include slug pellets, which are commonly used to control slugs in the field. Biological controls include the use of predatory snails and ladybirds, which can help to reduce slug populations.

KEY POINTS

- Slugs prefer moist and shady locations, such as around trees, bushes, and under mulch. Slugs also thrive in areas that have a lot of moisture, such as near water sources, beneath trash, or in areas that are constantly wet.
- Slugs can cause significant damage to crops and vegetables, particularly during spring and summer. They can also contaminate soil with their slug casts, which can attract predators and other harmful insects.
- Slugs are a major pest in vegetable gardens, orchards, and fruit orchards. They can cause significant damage to root vegetables, such as carrots, beets, and potatoes, as well as to fruit trees, such as apples, pears, and peaches.

Avoid reaction to slugs

Some people are allergic to the antigen that is present in the slug’s digestive system. This antigen can cause an allergic reaction in some people, which can include itching, redness, and swelling. If you are allergic to slugs, you should avoid handling them or coming into contact with their excreta. It is also important to avoid eating any food that has been contaminated by slugs, as they can carry harmful bacteria such as E. coli.

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