

Stubble Management Guidelines



Snail control



Barley ready for harvest infested with white Italian snail.
Photo: Helen Brodie, SARDI

In the absence of natural predators, exotic snail species are increasing in numbers across the low-rainfall cropping regions of southern Australia. At plant emergence and during the early stages of the growing season snails can eat the crop biomass, reducing soil cover and yield potential. During harvest snails clog harvesting machinery and contaminate grain.



Snails aestivating on machinery before harvest even begins.
Photo: Helen Brodie, SARDI

Key facts

- » Exotic snails are a major problem for grain growers across Southern Australia.
- » The impacts have been found to cost growers in the Yorke Peninsula – Lower North region up to 14 per cent of farming profit.
- » The key to successful snail management is timely integrated snail management. Timely bait treatments, harvest measures and summer control measures help minimise snail problems.
- » Monitoring roadsides, machinery and other vehicles, goods and produce entering your property will help prevent snails from becoming an increasing problem.

Project information

This *Snail control* guideline has been developed for the Upper North Farming Systems Group (UNFS) as part of the Maintaining Profitable Farming Systems with Retained Stubble Initiative, funded by the Grains Research and Development Corporation (GRDC UNF00002).

The Stubble Initiative involves farming systems groups in Victoria, South Australia and southern and central New South Wales, collaborating with research organisations and agribusiness, to address challenges associated with stubble retention.

The GRDC, on behalf of growers and the Australian Government, is investing \$17.5 million in the initiative that has been instigated by the GRDC Southern Regional Panel and the four Regional Cropping Solutions Networks that support the panel.



There are four key pest snail species divided in to two groups — round and conical.

Round snails: the common white snail or vineyard snail (*Cernuella virgata*) and the white Italian snail (*Theba pisana*).



Common white snail



White Italian snail

Conical snails: the pointed snail (*Cochlicella acuta*) and the small pointed snail (*Prietocella barbara*).



Pointed snail
Photos: Greg Baker, SARDI



Small pointed snail



Conical snails aestivating in grasses. Photo: Helen Brodie, SARDI

All four types of pest snail have a similar life cycle, however their movement and feeding patterns and preferences differ.

More detailed information can be found in the [PestNote](#) for each species on the [cesar website](#).

Snail life cycle

- » Snail activity is minimal when temperatures are high and humidity levels are low.
- » In sandy and loamy soils snails become active at 90 per cent relative humidity (when there is sufficient moisture to change the colour of the soil surface). In heavier soils rain is often required to break aestivation (hibernation).
- » Mating is usually triggered by cool moist weather in autumn.
- » Egg laying can occur about two weeks after mating, when soils are moist, to a depth of 30mm. Eggs are placed below the soil surface in small clusters. In favourable moist cool conditions, egg laying can continue through late spring.
- » Hatchlings emerge after about two weeks and may be found briefly in clusters above the eggs-lay site before they disperse.

Monitoring snail activity and controlling snails before mating and egg laying are integral to minimising snail numbers.



Snail egg cluster. Photo: Susanne Short



Snails mating. Photo: Michael Richards, Ag Excellence Alliance



Hatchlings of white Italian snail. Photo: Helen Brodie, SARDI



The best time to monitor snails is when they are moving.
Photo: Michael Richards, Ag Excellence Alliance.

Monitoring on the move

The best time to monitor snails is when they are on the move — when relative humidity levels are up around 90 per cent (dewy mornings and evenings or during showers). Attempting to quantify the number of snails present when snails are inactive, is likely to provide inaccurate results.

In sandy and loamy soils, round snails will move from two to four metres, with five hours above 90 per cent relative humidity. This level of random snail movement increases the probability of snails consuming bait. After 10mm of rain snails can move up to 8m.

Snails move up through the crop canopy as crops mature and temperatures rise during the spring period.

Snails are more prevalent in areas with calcareous and highly alkaline soils, on roadside verges, along fencelines and in permanent pasture or non-arable areas. Higher snail populations are likely to be found around water troughs and in areas where livestock regularly camp.

When monitoring paddock perimeters check the range of snail sizes. (A range of small to large sizes of the same snail species indicates they are breeding in the area. If they are all one size, they have moved in from adjacent areas.)

Broadleaf crops, such as canola and field peas can significantly increase snail numbers, as can brassica and broadleaf weeds. Live plants during summer and autumn increase snail survival and reduce the efficacy of summer control treatments and autumn baiting.

Key snail monitoring periods include:

- pre-sowing (February – April) to develop strategic baiting operations
- in-crop (late May – June) monitor in the crop, paddock perimeters and non-arable areas with a view to implementing baiting program to avoid reinfestation of crops
- spring (August – October) to develop strategic harvest strategies and post-harvest grain-cleaning operations
- post-harvest (November – December) to plan and implement summer control strategies.



Tips for more effective baiting

When to bait — Mid-March to early April is an ideal time to bait round snails across Southern Australia. Baits persist in the environment longer as temperatures drop and day length shortens.

Mice vs snails — If mice numbers are high, baiting mice before snails provides better mouse and snail control. (Mice will consume snail bait before snails, reducing the amount of bait available to snails reducing snail mortality. Snail bait has limited effect on mice, however after consuming snail bait mice become bait shy, reducing uptake of mouse bait when it is applied.)

Bait before rain — Applying bait before rain maximises the exposure of active snails to bait. However, very heavy or extended rain events will degrade bait.

Bait rates — Increase bait application rates where snail numbers are high. Around 30 baits per square metre improves your control by increasing the chance a snail will encounter a bait. If post-bait monitoring indicates all baits eaten but some snails still living, a follow up application may be required, especially in high populations of large hungry snails.

Double dose — Multiple bait application may be required before mating and egg laying between March and May to reduce the number of juvenile snails at harvest. Snail mortality from baiting rarely exceeds 80 per cent, and snails vary in terms of their activity and mating behaviour.

Monitor impact — Monitor snail populations six days after baiting to assess baiting efficacy.

Careful calibration — It is important to correctly calibrate spreading equipment specifically for baiting operations, as the aerodynamic characteristics of snail bait differ from those of fertiliser and may not be spreading as wide as expected.

Bait types — Baits containing the active ingredient iron-EDTA were prone to breakdown after significant rainfall (10 millimetres). Metaldehyde baits degrade with high temperatures, reducing bait efficacy and snail mortality. Check metaldehyde bait manufacture dates, and where possible consider storing baits in cool locations.

BELOW: Clusters of dead conical snails around bait.
Photo: Helen Brodie, SARDI





Tips for effective harvest management

Stripper fronts — Stripper fronts significantly reduce snail contamination in grain and the build-up of snail pulp in harvesting equipment.

Grain rollers — Snail crusher grain rollers can reduce snail contamination in most grain types and conditions, with a minimum impact on grain quality and grain loss. Grain cleaning rates of 20–50t/hr can be achieved when using snail crusher grain rollers.

Harvester sieves — Replacing harvester sieves with sheet metal sieves can lower snail numbers in canola and pulses, but will usually reduce harvest speeds and harvester capacity.



'Shmik' snail crusher grain roller, modified to increase throughput, and better manage small snails in canola. Photo: Michael Richards, Ag Excellence Alliance

Multi-pronged approach keeps snails under control

Luke and Scott Clark, Jamestown

Luke and Scott Clark have been dealing with snails for about 10 years, first noticing them on leased country with difficult to control summer weeds. Snail numbers significantly increased six to seven years ago when Luke and Scott started liming their acidic soils every three years.

The Clarks establish all their crops with a disc seeder in a no-till stubble retention (NTSR) system. They run stock on their hill country but do not graze their cropping country.

To manage snails, the Clarks control weeds during summer and lay baits prior to the snail mating period, but concede that roadside verges and non-arable areas make snail control more difficult.

Effective weed control and bare inter-rows in canola are assisting with snail control during the post-harvest summer period supported by autumn snail baiting.

Upgrading their bait spreader has significantly improved baiting efficacy by allowing bait to be evenly applied across the entire target working width.

Monitoring snail movement by installing a paddock-based snail camera has also improved snail control through a better understanding of when snails are moving. When showers started at 7.30pm on 12 March 2017, on the Clarks' heavier soils, snails started moving after midnight and continued moving until mid-morning when humidity fell. The next evening snails started moving again when relative humidity reached 90 per cent.

When showers or rain trigger snail movement, following the long hot summer period, snails regularly move two to three metres on their



Luke and Scott have experienced yield losses up to 400kg/ha in canola due to snail and slug damage. Photo: Helen Brodie, SARDI

heavy soils after several hours of humidity. Two to three metres of snail movement provides effective snail control from evenly-applied bait on soils with no living plants.

Direct heading canola has also reduced snail contamination by allowing the Clarks to harvest above the snails. Cereal crops are harvested using a stripper front, which eliminates snail contamination in cereal grains.

Luke and Scott have minimised issues in bean crops by achieving effective weed and snail control in the previous canola crop.

Rolling their heavy clay soils didn't provide adequate snail control due to snails sheltering in the press-wheel furrow. They now focus on maximising snail control before mating and egg laying starts and do not apply snail bait during the growing season.

Attention to detail drives snail decline

Andrew and Marie Kitto, Gladstone

In 2016 Andrew and Marie Kitto achieved effective snail control on heavy soils by applying bait during mid-March when conditions were conducive to high snail activity (90 per cent relative humidity).

However the dry conditions leading up to the mid-March period during 2017 saw less favourable results. While Andrew noticed higher numbers of small snails during September 2017 he didn't have any problems with snail contamination at harvest. The dry conditions leading up to the mid-March period, reduced snail movement and uptake of bait.

Andrew has been able to reduce the number of snail bait applications during recent years by paying closer attention to snail control — he applies higher bait rates in areas with higher numbers of snails and rolls paddocks during summer. Andrew has observed reducing the amount of non-arable areas where snails harbour has assisted with snail control (i.e. strategic removal of contour banks, rock heaps and fence lines).

As part of their contract harvesting operations, Andrew has noticed increased snail numbers in the Wandearah area in recent years. The Kitto's effective integrated approach has reduced snail numbers without the need for burning or cultivation.



Andrew achieves effective snail control by increasing baiting rates in areas with high snail numbers. Photo: Andrew Kitto

References and further information

» *Bash'Em Burn'Em Bait'Em: Integrated snail management in crops and pastures*, (GRDC). [Click](#)

» *Snail Management*, GRDC Fact Sheet (GRDC). [Click](#)

» *Snail Identification and Control*, Back Packet Guide (GRDC). [Click](#)

» *Snail Bait Application*, GRDC Fact Sheet (GRDC). [Click](#)

» GRDC Update paper (GRDC). [Click](#)

» *Integrated approach best for snail control*, GRDC Ground Cover, 131, November–December 2017 (GRDC). [Click](#)

» Pestnotes (CESAR and SARDI). [Click](#)

» *Snail bait distribution trial*, GRDC YouTube video clip (GRDC). [Click](#)

Acknowledgements

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