

Optimising baiting for snails

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EXTENSION



Key messages

- For effective snail baiting, apply baits at the right time and at sufficient pellet density to ensure snails encounter the pellets.
- Bait in autumn as soon as snails become active and before they lay eggs, check spreader calibration, apply an adequate rate and select an appropriate product for the field conditions.

Why do the trial?

Snail baiting trials were conducted to investigate the optimal rates and timing to maximise effectiveness of snail baiting programmes.

Background

Four introduced snail species (two round: Common white snail, *Ceratomyxa virgata*; Italian snail, *Theba pisana*; two pointed: Conical snail, *Cochlicella acuta*, Small pointed snail, *Prietocella barbara*) are major pests in grains crops. The export market access threat posed by snails (due to harvest contamination) is increasing. Modern low disturbance farming systems create an ideal paddock environment for snails to survive and reproduce and make some options for summer control (e.g. burning, cultivation) less practical. Effective snail baiting programmes remain critical for managing snail

populations. Baiting MUST occur at the right time (before egg lay) and using an adequate rate of product to ensure snails encounter the pellets.

SARDI, with GRDC investment support, is undertaking research investigating (1) baiting performance under different pellet densities, snail densities and environmental conditions; and (2) how the movement activity and reproductive status of snails changes during the season according to weather conditions, in different regions of Australia. The work aims to provide refined guidelines to assist growers to maximise the impact of their baiting programmes.

This article provides a brief snapshot of selected trials from two sites – Palmer (SA Mallee) and Urania (Yorke Peninsula) – in South Australia, focusing on the common white snail.

How was it done?

Trial 1: Seasonal changes in the reproductive status of snails

This trial assessed the seasonal reproductive cycle of snails to better understand the optimal timing and weather conditions for baiting (to pre-empt reproduction). Common white snails were collected each month (approx. 50 per month) from Palmer (SA) and dissected in the laboratory to allow measurement of the length of their albumen glands (reproductive gland). Swollen albumen glands indicate that snails are reproductively active.

Trial 2: Seasonal changes in snail mortality response to bait

This trial assessed whether the susceptibility of snails to bait

changes during the year. Common white snails were collected each month from Palmer (SA) and Urania (SA), then exposed to Metarex baits in laboratory trials.

Each month, the field collected snails (five snails per arena x 10 arenas (n=50 snails) per treatment) were placed into moist arenas (500 ml ventilated plastic food containers with moist substrate) in the laboratory at 21°C and provided with one of two treatments: (1) Metarex® pellets or (2) placebo pellets (Metarex® pellets minus the active ingredient). Pellets were removed after 2-3 nights and snail mortality assessed after a further 4-5 nights. The amount of bait consumed, snail weight, body moisture content, shell size and reproductive stage were also measured.

What happened?

Trial 1: Seasonal changes in reproductive status of snails

Measuring the albumen glands of snails collected monthly from Palmer SA revealed a strong seasonal pattern of reproductive activity over four years (Figure 1). Generally, swelling of the albumen glands commenced around March and peaked in April to June. Commencing in July, an increasing proportion of snails 'shut down' reproduction, as shown by albumen glands returning to 'normal' size (see Figure 1 and caption). A high proportion of non-reproducing snails were found from August onwards in 2015 and 2016.

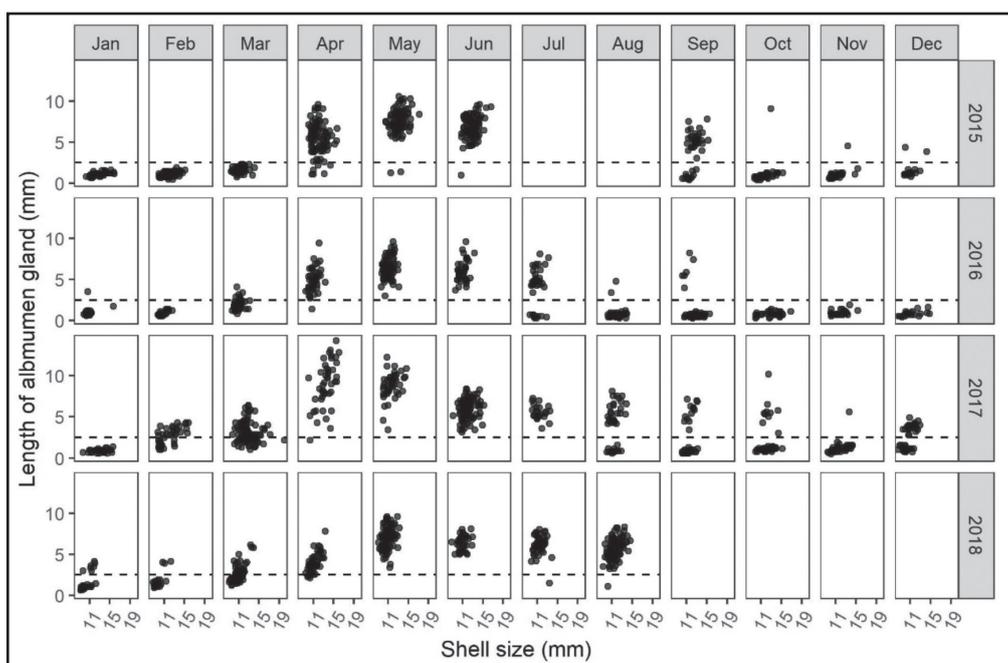


Figure 1 Scatterplot showing the length of the albumen glands, with respect to shell size, of common white snails collected each month from Palmer SA over four years. Each black dot represents one snail. Swollen glands indicate that snails are (or are about to become) reproductively active. Non-reproducing snails have small glands and appear below the dotted line on each panel.

The seasonal pattern is driven by rainfall and adequate moisture allowing snails to feed and mature their reproductive organs. Although some reproduction may have been possible prior to April in 2017 and 2018 (shown by some snails with swollen glands), the vast majority of reproduction occurred from April to mid-winter. Although summer moisture can trigger snail movement events, in this trial little reproduction occurred prior to at least March. Similar trials are yet to be conducted in very wet summers.

Trial 2: Seasonal changes in snail mortality responses to bait

Laboratory trials found that snails' susceptibility to Metarex bait changes during each season (Figure 2). Mortality ranged between approximately 15% and 80% despite a similar amount of bait consumed across the season (not shown). A similar seasonal trend in mortality response was observed for snails collected from two sites - Palmer and Urania: Generally, mortality was highest during April to August (Palmer - 3 year dataset) or May to July (Urania - 9 month dataset), coinciding with the period of peak reproductive

activity (Figure 1). At both sites we observed decline in mortality from August onwards.

What does this mean?

Snail movement and reproductive activity is regulated by environmental conditions, and particularly the onset of sufficient moisture following summer aestivation (dormancy). Baiting when snails are moving sufficiently to encounter pellets, but prior to significant reproduction, is essential for managing snails.

Laboratory baiting trials suggested snails may be physiologically more or less susceptible to baits at certain times of year (Figure 2). At two sites, baiting efficacy was highest during periods of snail reproduction (Figures 1, 2). This suggests baiting efforts should be concentrated during the autumn and early winter period for maximum efficacy, but most importantly to prevent reproduction. Baiting either prior to March or after late winter may be less effective.

Snapshots

Baiting rates

A recent snail research project (DAS00134), conducted by SARDI with GRDC investment support, thoroughly investigated baiting rates and performance under different snail densities, bait pellet densities and environmental conditions in more than 30 trials.

The work concluded that:

- A minimum of 30 bait pellets per square metre (up to 60 pellets per square metre at very high snail densities) should be applied to ensure a sufficient density of bait points and chance of encounter. The higher rates may be needed in heavily infested areas, such as perimeters, fence lines or calcareous outcrops.
- Where current label rates do not permit this, a repeat application should be considered.
- Pellet densities for registered rates of commercial products are available in the SARDI Snail and Slug baiting guidelines brochure at http://www.pir.sa.gov.au/__data/assets/pdf_file/0004/286735/Snail_and_slug_baiting_guidelines.pdf

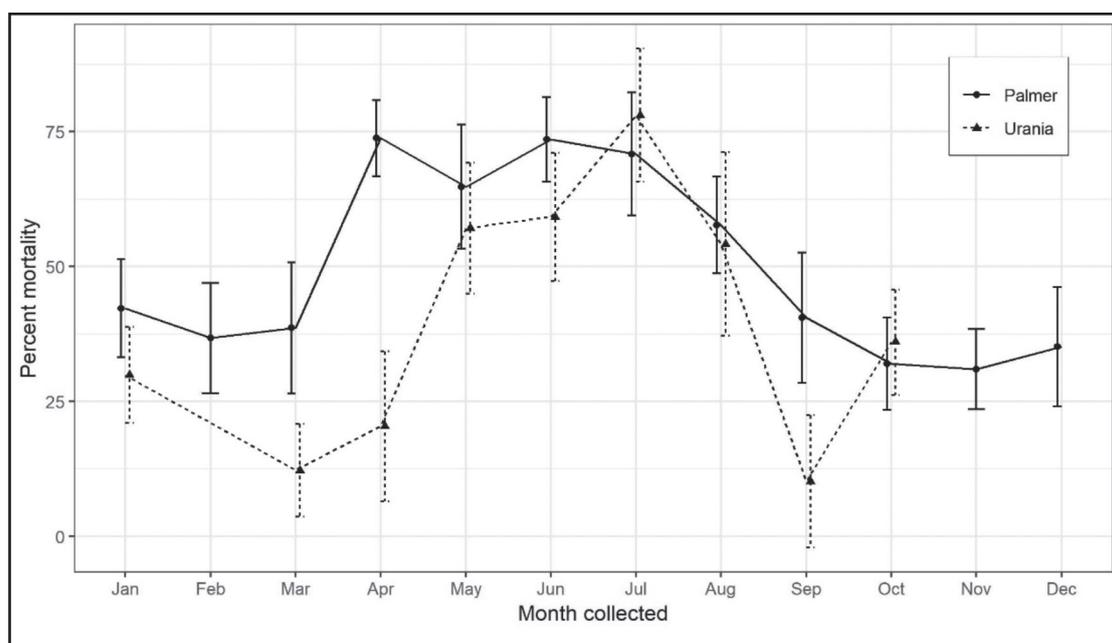


Figure 2 Mortality response of common white snails collected monthly from Palmer SA and Urania SA and exposed to Metarex baits in laboratory arena trials. Dots represent mean mortality + 95% confidence limits across ten replicate arenas (n=50 snails in total). For Palmer, the means include monthly averages of trial data across three years.

Bait spreader calibration

Research by the Yorke Peninsula Alkaline Soils Group and SARDI has shown:

- Spreaders calibrated for other applications (e.g. urea) may not broadcast baits as widely as expected.
- Single spinner ute spreaders generally perform poorly with limited spread widths and uneven bait distribution.
- Different bait products have different hardness and ballistic properties.

Therefore, for your preferred bait product:

- Have your spreader professionally calibrated to evenly broadcast the target pellet density over the entire spread width.
- Actively check pellet distribution across the entire spread width.

Other research and next steps

A number of GRDC-funded snail research initiatives are underway. A brief snapshot:

- Under a current GRDC project led by SARDI (DAS00160) in collaboration with DPIRD WA, the University of South Australia and farming systems

groups, fixed cameras are being used to track snail activity with respect to climate variables, which are also being collected. SARDI are presently modelling these data to determine environmental triggers (e.g. humidity, moisture etc.) for movement and hence baiting opportunities.

- A separate CSIRO-SARDI project, funded by GRDC aims to import, rear and release a new genetic strain of the parasitoid fly, *Sarcophaga villeneuveana*, in efforts to enhance biological control of the conical snail. This will involve releases of the fly on Eyre Peninsula.
- An updated version of the 'Bash em Burn em Bait em' snail management manual is due for release in late 2019. This version will incorporate recent research findings to provide revised management guidelines for growers.
- New initiatives are also underway - more details soon.

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