MANAGING SMALL CONICAL SNAILS FACT SHEET

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

WESTERN REGION
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Options for removing small conical snails from harvested canola and barley grain in WA

KEY POINTS

- Small conical snails (*Prietocella barbara*) are an emerging pest in southern Western Australia and can downgrade harvested grain
- Snail-crushing grain rollers in conjunction with rotary grain cleaners have been successfully used for less than 10 years on the Yorke Peninsula, South Australia, to remove snails from harvested grain
- In a WA trial, rolling grain barley reduced small conical snail numbers by 70 per cent on average without damaging grain quality
- In the same trial, using a rotary grain cleaner with 2.2 millimetre screens removed 95 per cent of small conical snails from canola seed, but canola losses could be up to 5.5 per cent
- Snail rollers with a gap between rollers of 0.7mm or less reduced the number of snails in canola seed by 43 to 91 per cent
- As the gap between rollers decreased, the percentage of damaged seeds and admixture increased

Photo: Evan Collis

Small pointed snail (*Prietocella barbara*) in canola leaves.

Background

Small conical snails are an emerging pest in southern WA. They can damage crops at germination, reduce pasture biomass and downgrade harvested grain if not managed carefully.

Snail management requires a strategic approach and can include removing the green bridge, burning windrows and timely baiting early in the season to prevent snails from breeding. However, even with a good control program, snails can be a problem at harvest.

In WA, grain receival standards for snail numbers in barley and canola have tightened. Snails in canola seed and barley grain can result in a discount or even in the seed or grain being undeliverable.

Options to address snails in grain

Snail-crushing grain rollers and rotary grain cleaners have been used successfully for more than 10 years on the Yorke Peninsula, SA, to remove both conical and round snails from grains such as canola, wheat, barley, lentils and beans. Snail rollers, however, have not been extensively used for small conical snails in WA.

Work with snail rollers in south-eastern Australia has shown that various snail roller adjustments, such as to roller clearance, hopper opening and PTO speed, are integral to ensuring the maximum number of snails is crushed with minimal damage to grain.

Recent trial work

A series of trials were conducted over the 2018-19 and 2019-20 harvests to remove small conical snails from barley grain and canola seed in the south coastal region of WA.

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Table 1: Cost comparison per tonne of cleaning small conical snails from grain barley and canola seed for volumes between 300t and 1000t.

	Barley (tonnes processed)							
Cost ($/t)	300	400	500	600	700	800	900	1000
Discount	**$30**	**$30**	**$30**	**$30**	**$30**	**$30**	**$30**	**$30**
Rotary cleaner	$31	$26	$22	$20	$18	$17	$16	$15
Hire single roller	$20	$17	$16	$14	$14	$13	$12	$12
Hire double roller	$20	$17	$16	$14	$14	$13	$12	$12
Buy Single roller	$25	$20	$17	$14	$13	$12	$11	$10
Buy double roller	$33	$25	$21	$17	$15	$14	$12	$11
	Canola (tonnes processed)							
Cost ($/t)	300	400	500	600	700	800	900	1000
Discount	**$35**	**$35**	**$35**	**$35**	**$35**	**$35**	**$35**	**$35**
Rotary cleaner	$54	$46	$41	$38	$36	$34	$33	$31
Buy single roller	$31	$24	$20	$17	$15	$14	$13	$12
Buy double roller	$36	$27	$22	$19	$16	$15	$13	$12
Rotary cleaner & roller	$85	$70	$61	$55	$51	$48	$45	$43

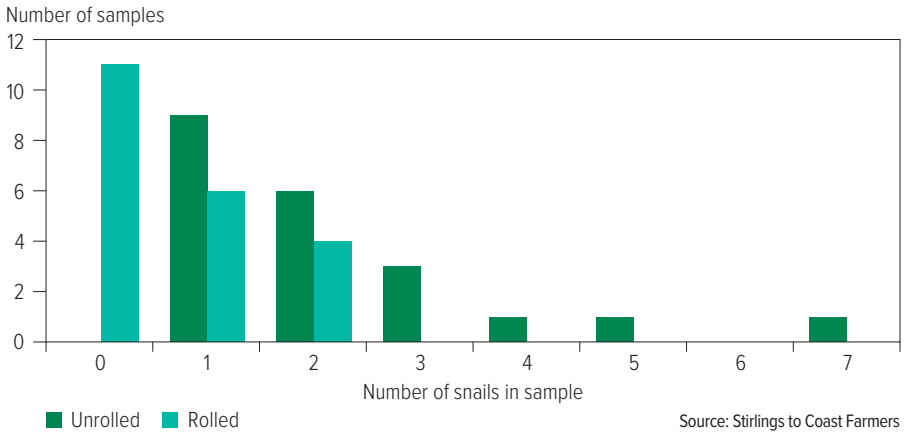
Source: Stirlings to Coast Farmers

Table 2: Grain quality of unrolled and rolled barley, *n*=21

Receival standard	Unrolled	Rolled
Number of snails	2.19	0.67
Std. error	0.34	0.17
Number of live snails	1.00	0.10
Std. error	0.14	0.07
Hectolitre weight (g)	316.9	317.8
Std. error	1.05	1.39
Protein %	11.33	11.54
Std. error	0.09	0.06
Moisture %	12.02	12.00
Std. error	0.03	0.03
Colour	55.8	56.1
Std. error	0.12	0.09
Screenings (g)	33.4	35.0
Std. error	0.76	0.88
Skinned grains/100	6.29	6.86
Std. error	0.64	0.43
Broken grains/100	4.00	3.85
Std. error	0.52	0.36

Source: Stirlings to Coast Farmers

Figure 1: Number of snails per sample in unrolled and rolled barley.



Source: Stirlings to Coast Farmers

An economic analysis conducted as part of this trial took into account capital costs of equipment; machinery depreciation; labour and fuel costs; estimated grain/seed losses; changes to grain/seed quality; and change in costs with increasing grain/seed volumes.

A snail roller with a combination of rubber and metal rollers and modified hopper shape and auger was used to roll 70 tonnes of barley grain (variety – RGA Planet$^{\phi}$). The roller speed was set at 620 revolutions per minute and a gap of 0.8mm was maintained to ensure roller temperatures did not exceed 50°C.

For the 150 tonnes of canola seed (classified CANS) used in the trial, a rotary grain cleaner with both 2.5mm and 2.2mm slotted screens was used in conjunction with a snail roller (metal and rubber rollers).

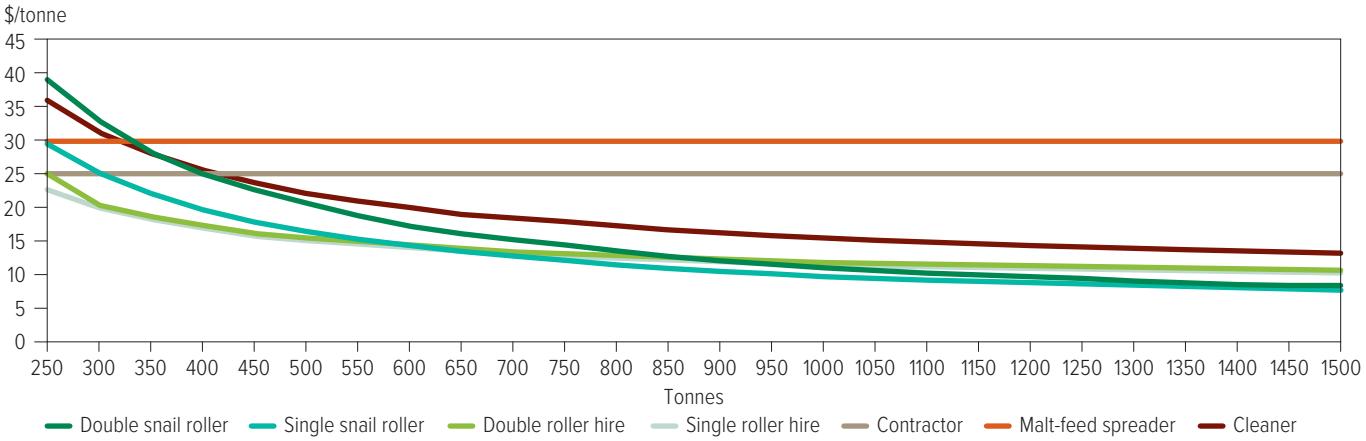
Before rolling, the barley had on average 2.2 small conical snails per ½ hectolitre, and before screening and rolling, the canola had on average 30 small conical snails per 500 gram sample.

An economic analysis conducted as part of this trial took into account capital costs of equipment, machinery depreciation, labour and fuel costs, estimated grain/seed losses, changes to grain/seed quality, and change in costs with increasing grain/seed volumes.

Photo: Stirlings to Coast Farmers

The barley flowing between the rollers during sampling. The roller temperature may need to be monitored to make sure it does not exceed 65°C. When a 0.8mm gap was selected, the roller temperature remained between 48-50°

Figure 2: Cost of cleaning small conical snails from barley.



Source: Stirlings to Coast Farmers

Table 3: Cost of cleaning small conical snails from barley

	Tonnes processed												
Cost ($/t)	250	300	350	400	450	500	550	600	650	700	750	800	850
Double snail roller	$39	$33	$28	$25	$23	$21	$19	$17	$16	$15	$14	$14	$13
Single snail rollerr	$30	$25	$22	$20	$18	$17	$15	$14	$13	$13	$12	$12	$11
Double roller hire	$25	$20	$19	$17	$16	$16	$15	$14	$14	$14	$13	$13	$13
Single roller hire	$23	$20	$19	$17	$16	$16	$15	$14	$14	$14	$13	$13	$13
Contractor	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25
Malt-feed spread	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
Cleaner	$36	$31	$28	$26	$24	$22	$21	$20	$19	$18	$18	$17	$17

	Tonnes processed												
Cost ($/t)	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
Double snail roller	$12	$12	$11	$11	$10	$10	$10	$9	$9	$9	$9	$8	$8
Single snail roller	$11	$10	$10	$10	$9	$9	$9	$9	$8	$8	$8	$8	$8
Double roller hire	$12	$12	$12	$12	$12	$12	$11	$11	$11	$11	$11	$11	$11
Single roller hire	$12	$12	$12	$12	$12	$12	$11	$11	$11	$11	$11	$11	$11
Contractor	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25	$25
Malt-feed spread	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
Cleaner	$16	$16	$15	$15	$15	$15	$14	$14	$14	$14	$14	$13	$13

Source: Stirlings to Coast Farmers

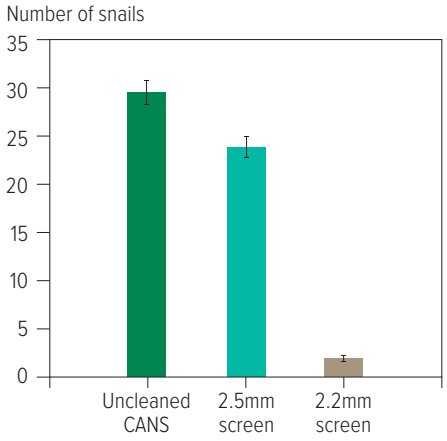
Small pointed snail (*Prietocella barbara*) in barley leaves.

Photo: Evan Collis

Barley results

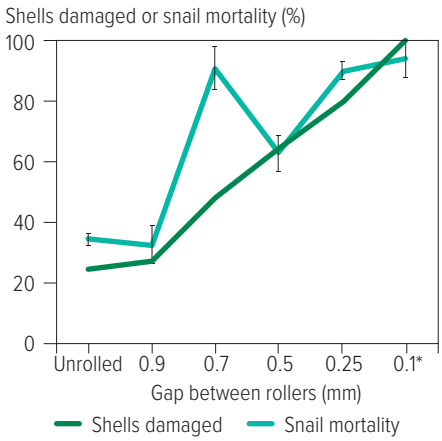
The snail roller removed on average 70 per cent of snails from the barley grain while having no significant impact on the following grain quality measurements: hectolitre weight, protein, moisture, colour, screenings, skinned or broken grains. Of the barley grain used in the trial, approximately 50 per cent achieved malt grade, 30 per cent was classified as feed and 20 per cent remained undeliverable as it still contained one or two snails

Figure 3: Canola: Rotary grain cleaner.



Source: Stirlings to Coast Farmers

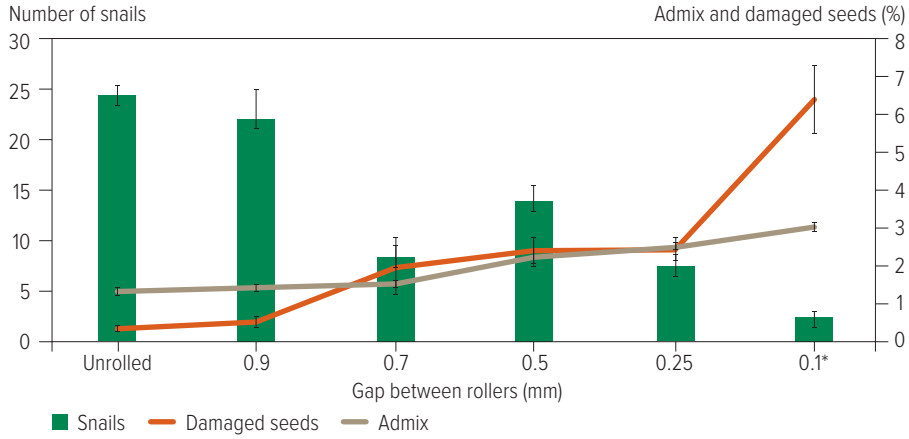
Figure 5: Shell damage and snail mortality caused by rolling in canola.



*Gap width is estimated to be 0.1mm but it is impossible to measure gap when it is this tight.

Source: Stirlings to Coast Farmers

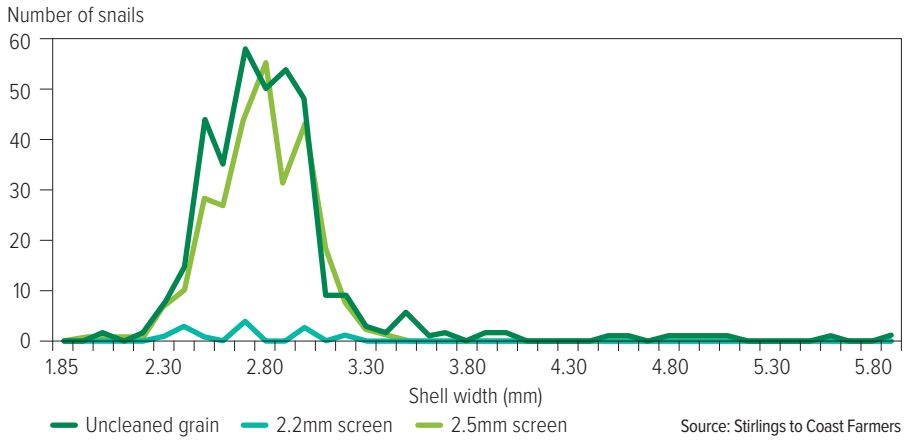
Figure 4: Effect of rolling on snails, admix and damaged seeds in canola.



The green columns represent the number of small conical snails per 500gm sample of unrolled and rolled canola according to width between the rollers. The lines show the percentage of admixture (brown line) and damaged seeds (orange line) with tightening of the rollers.
Number of samples: Unrolled = 52, 0.9mm = 7, 0.7mm = 12, 0.5mm = 17, 0.25mm = 33, 0.1mm = 11.
*Gap width is estimated to be 0.1mm but it is impossible to measure gap when it is this small.

Source: Stirlings to Coast Farmers

Figure 4a: Size range of snails in canola trial.



Source: Stirlings to Coast Farmers

Photo: Stirlings to Coast Farmers

A pile of small conical snails removed from canola using a 4-barrel rotary grain cleaner with 2.5mm slotted screens.

per ½ hectolitre. Cleaning grain prior to rolling, or rolling the grain more slowly with a smaller roller gap may alleviate this.

The economic analysis showed that at a $30 discount/tonne for contaminated grain barley, it was economical to roll grain with a roller (hired or purchased) or clean the grain (professionally or with a rotary grain cleaner) in most cases. The exception to this was with grain volumes under 350 tonnes.

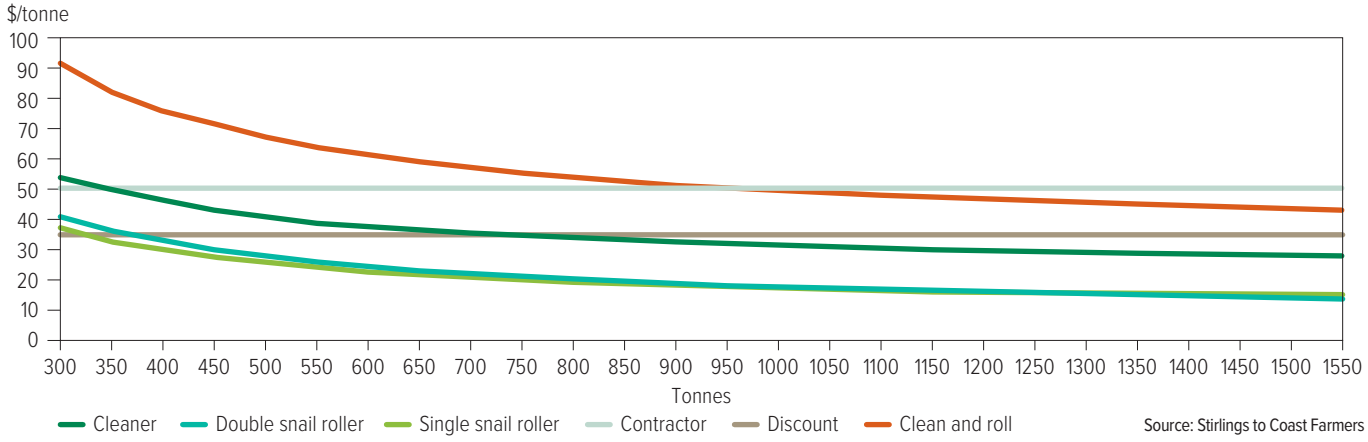
In this case, the $30 discount did not justify the cost of purchasing a double roller (which are more expensive than single ones) or using a rotary grain cleaner. See Figure 2.

Canola results

With an average canola seed size of 1.85mm, the reduction of snails in seed using the rotary grain cleaner with 2.5mm screens was 19 per cent, with no canola seed losses. With the 2.2mm screens there was a 95 per cent reduction of snail numbers, with 5.5 per cent seed losses.

At a roller gap of between 0.7mm and 0.1mm, the snail roller removed approximately 43 to 91 per cent of snails

Figure 6: Cost of cleaning small conical snails from canola.



Source: Stirlings to Coast Farmers

Photo: Stirlings to Coast Farmers

The snail roller processing canola during the trial.

Table 4: Economics of rolling and rotary cleaning of canola.													
	Tonnes processed												
Cost ($/t)	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Single snail roller	$31	$24	$20	$17	$15	$14	$13	$12	$11	$11	$10	$10	$9
Discount	$35	$35	$35	$35	$35	$35	$35	$35	$35	$35	$35	$35	$35
Double snail roller	$36	$27	$22	$19	$16	$15	$13	$12	$11	$10	$10	$9	$9
Contractor	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
Cleaner	$54	$46	$41	$38	$36	$34	$33	$31	$31	$30	$29	$29	$28
Clean + roll	$85	$70	$61	$55	$51	$48	$45	$43	$42	$40	$39	$38	$38

Source: Stirlings to Coast Farmers

Snails on the left were removed from the canola shown (centre) using a rotary grain cleaner with 2.5mm slotted screens. The snails on the right could not be removed using the same screens.

Photo: Stirlings to Coast Farmers

in seed. Before rolling, the canola seed contained on average 25 snails or fewer per 500g sample. Reducing the gap between the rollers increased admixture and seed damage. See Figure 3.

The economic analysis based on a $35 discount/tonne for contaminated canola seed showed that it was not economical to both clean and roll grain at this discount rate, but it would become economical if the seed was undeliverable (as it was in the 2019-20 harvest). Rolling the grain alone was economical for a volume of more than 300t and using a rotary grain cleaner was economical for a volume of more than 750t. See Table 4, on page 6.

Summary

The trial has demonstrated that small conical snails can be successfully removed from barley grain and canola seed using either snail rollers, rotary grain cleaners or a combination of both. However, care needs to be taken to reduce damage to the grain/seed, particularly with canola.

ACKNOWLEDGEMENTS

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Cooperative Bulk Handling and **Svetlana Micic** (DPIRD) for providing expertise and testing facilities.

Rod Grieve for performing the economic analysis.

FURTHER RESOURCES

'Snail management' GRDC Fact Sheet (2012)

Mitigating snails, slugs and slaters in southern Western Australia (2019)

SARDI Snail and slug baiting guidelines (2016)

PROJECT CODE

SCF1906-003 – Investigating snail rollers to clean small conical snails out of barley and canola

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