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Snail investigations : a progress report

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Experimental baits and sprays have given promising control of snails in cereals and pastures in the Geraldton-Dongara districts. The problem of harvesting infested wheat crops has been overcome by attaching a specially designed rake in front of the header comb to remove snails from the plants.

THE White Italian snail* has for some time been a serious problem to wheat growers in the Dongara-Geraldton area.

Although infested crops usually show only minor leaf damage during the growing period the harvesting of the mature crop may present some problems. The inactive oversummering snails accumulate on the heads of standing crops and are taken into the harvesting machinery. In past seasons growers have been forced to leave considerable areas unharvested.

An equally serious aspect is the pasture damage done by the snails. With populations reaching 400 per square yard extensive denudation can occur and stock may reject the fouled grasses remaining.

Occurrence
The original surveys started in November, 1964, showed a considerable area to be affected. A belt of infestation runs from Greenough to about five miles south. General infestation extends from Dongara for 12 to 14 miles northwards, and there is also a considerable area south and east of Dongara.

This problem has not been encountered elsewhere in Australia and enquiries to overseas authorities have failed to reveal any practical means of control. The same snail is currently controlled in the high yield Israeli citrus areas with pelleted arsenical baits.

A series of brief descriptions of experiments and trials follows. These have been undertaken to determine whether economic control measures, without stock risks, can be developed for broad acre application.

Summary of trial and experimental work
Mandurah experiment, 1966
An experiment was laid out on pasture plots on October 5, 1966, to evaluate materials generally available for snail control. The following treatments were applied:

1. Metaldehyde spray at 4 lb. per acre.
2. Metaldehyde calcium arsenate baits at 100 lb. per acre.
3. Sodium pentachlorphenate at 10 lb. per acre. Spray application.
4. Cuprox at 10 lb. per acre. Spray application.
5. Sevin at 4 lb. per acre. Spray application.

* Theba pisana Muller
Bayer 37344 had not previously been used for snail control and was chosen because of its close chemical similarity to a carbamate known as Isolan, which had shown promise in Israeli work. Unfortunately Isolan possessed a high mammalian toxicity and was withdrawn from sale by the manufacturers.

In this experiment both the metaldehyde calcium arsenate bait and the Bayer 37344 spray gave effective control. The sodium pentachlorphenate treatment was highly toxic to leguminous plants. Use of metaldehyde-calcium arsenate baits is limited because this formulation is poisonous to stock.

**Mandurah trial, 1966**

Following the above experiment a trial was laid out on one acre plots to examine the performance of Bayer 37344 on larger areas. The treatments tested were. Bayer 37344 at 4 lb. and 2 lb. active ingredient per acre, as a spray application, compared with an untreated control area. Sampling was carried out by counting snails in 25, 18-inch squares along the diagonal of each plot. The counts recorded were—

<table>
<thead>
<tr>
<th></th>
<th>4 lb.</th>
<th>2 lb.</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before treatment 5/12/66</td>
<td>359</td>
<td>170</td>
<td>224</td>
</tr>
<tr>
<td>After treatment 20/12/66</td>
<td>8</td>
<td>49</td>
<td>181</td>
</tr>
</tbody>
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**Mandurah experiment 1967**

An experiment was laid out on pasture plots on May 12 and 13 to further evaluate Bayer 37344 and examine a new experimental carbamate, Schering T58. Treatments tested were—

- Bayer 37344 at 1 lb. and 2 lb. active ingredient per acre, as a spray application.
- Schering T58 at 1 lb. and 2 lb. active ingredient per acre, as a spray application.
- Bayer 37344 as a metaldehyde carbohydrate bait containing four per cent. active ingredient at 10 lb. per acre.
- Control—nil treatment.

This experiment was laid out during a period of high snail activity and sampling was stopped one month after treatment application.

All treatments gave significant control and there were indications that a Bayer 37344 bait could have economic potential for snail control in this sort of situation.

**Dongara Trial, 1967**

A trial was laid out on October 31, 1967, on the margin of a highly infested wheat crop. Bayer 37344 was applied over a one chain swathe with a Solo misting machine. The rates used were from 1 to 5 lb. per acre. On the untreated control plots the numbers remained high in spite of high summer temperatures during the experimental period.

The time of application of the treatments (late October) was too late to expect much snail activity; nevertheless, a degree of control was obtained. Although the trial showed substantial reductions snail numbers due to the chemical applications the sprays could not be considered of practical value.
Dongara trial, 1967

In an attempt to overcome the immediate harvesting problem experimental rakes were constructed to investigate the possibility of removing snails from the heads of infested crops before harvest. These were constructed to mount on a Massey Ferguson 585 machine in front of the comb, as illustrated on the photographs.

The most successful design consisted of a series of 4 in x \( \frac{1}{2} \) in. tubes spaced \( 1\frac{1}{2} \) in. apart to form a series of forward-projecting fingers. These were flattened and pointed at the free ends and mounted on a 2-inch diameter base tube. The distance of the rake from the comb was adjustable.

In the crop chosen for evaluation a working distance of 3 ft. was found satisfactory.

In a heavily-infested section of crop chosen for the trial almost complete removal of snails was achieved.

Reasonable care was taken to check any choking of the rake by weeds. The trial was conducted on December 12, 1967, in temperatures of 80-82 degrees F., and relative humidity of 35 per cent. Loss of grain was negligible.

Mandurah bait experiment, 1967

As the May, 1967 Mandurah experiment had demonstrated the economy of using a Bayer 37344 bait formulation over a spray application, further work was started in November, 1967, to formulate baits containing this experimental carbamate.

A series of pelleted baits was prepared in the laboratory, using ground wheat as the carbohydrate substitute. The standard attractant, metaldehyde, was used. Two per cent. starch was added as an additional bonding agent. The baits were pelleted by extrusion under pressure.

An experiment using these baits was laid out at Mandurah on December 11, 1967, on a low-lying pasture containing green areas.

Bait treatments applied, at the rate of 10 lb. of bait per acre, were 2 and 4 per cent. Bayer 37344; 2 and 4 per cent. Bayer 37344 plus \( 1\frac{1}{4} \) per cent. metaldehyde; 4 per
cent. Bayer 37344 plus 3 per cent. metaldehyde; Control—nil treatment.

Although all bait treatments gave a fair mortality of snails the overall results were well below the performance expected following the results of the bait treatment in the May experiment. Snail activity had generally ceased during the experimental period, spasmodic movement only being noticed.

This experiment was regarded largely as a bait weathering trial.

**Dongara bait experiment, 1968**

Following indications that bait treatment could have economic value, a large-scale experiment was carried out in a pasture paddock at Dongara in May, 1968.

In this experiment the materials Bayer 37344 and Schering T58 were tested in baits at 2 and 4 per cent., both with and without metaldehyde at 1½ per cent. Each treatment was applied over 10 acres, giving a total area of 80 acres.

The pelleted baits were applied at 10 lb. per acre using a conventional super spreader, just after the break of the season.

Almost complete mortality of snails on the treated areas was achieved within two weeks of application of the baits. However, by the end of the season re-infestation had taken place from surrounding areas.

Although results from the baiting trials have been promising it is clear that further evaluation is needed before firm recommendations can be made for the use of baits in the broad-acre control of snails can be made. Large scale trials are being continued.

**Ecological investigation**

The snail population on a 1,700 acre property in the Dongara area has been mapped in detail as the basis of an ecological study to investigate population trends and rates of spread.

Biological studies in the area are also under way.

**Biological control**

No predators or parasites have as yet been observed working in the field in West Australia.

Israeli workers have recorded a predatory beetle (*Ablattaria arenaria* Kr.) attacking the white Italian snail in semi-arid areas. They also report a calliphorid fly (*Sarcophaza pumilia* Meig.) parasitising snails and populations showing 23 per cent. parasitisation have been located. Other reports of biological control appear to be of little economic significance.

**Control in young crops**

Heavy infestations of snails can almost wipe out emerging cereal crops and where severe damage seems likely it is suggested that the following measures will give reasonable control:

- Graze heavily and/or burn so that the area to be planted is as bare as possible before the break of the season.
- Spray with a solution of 3 lb. of 50 per cent. Bayer 37344* per 100 gallons of water as the crop emerges.

**Acknowledgments**

The design and construction of the header attachment described in this report was carried out by Mr. W. M. O’Donnell of the Entomology Branch, Department of Agriculture, South Perth.

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* Commercially available as 50 per cent. wettable powder under the trade name of “Mesurol.”
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