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Greg Baker, Sardi Entomology

SOUTH  
AUSTRALIAN  
RESEARCH &  
DEVELOPMENT  
INSTITUTE  
**PIRSA**

## Pea Weevil

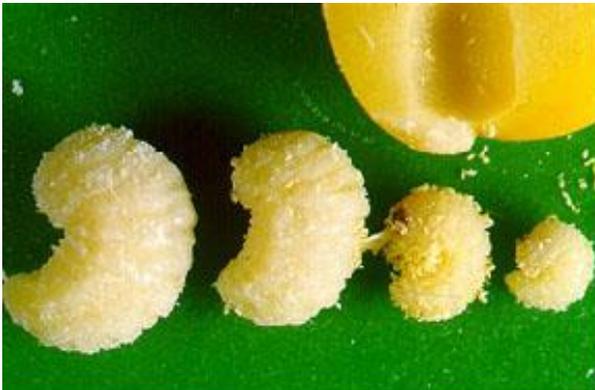
### IDENTIFICATION

Although this pest is called pea weevil, it is not a true weevil like the granary and rice weevils. Unlike them, pea weevil cannot reproduce in stored grain. Infestations of pea weevil can only occur if eggs are laid onto green pea pods in the field. The adult is a chunky beetle about 5 mm long, generally brownish flecked with white, black and grey patches. The tip of the abdomen extends beyond the wing covers and is white marked with two black oval spots. The egg is yellow, cigar-shaped and measures 1.5 mm by 0.6 mm. The larva is a legless, curled, cream grub which grows to about 5 mm long.

### DAMAGE

Heavily infested pea crops may have up to 15 to 20 per cent of the pea seeds attacked by pea weevil larvae. Infested seeds can lose up to 25 per cent of their weight from larval feeding, and are prone to shattering when harvested, so that the total yield of a heavily infested crop may be reduced by 5 to 10 per cent.

Live adults insects can result in rejected of grain at delivery.



5 mm

*Larvae*



*Adult*

## LIFE CYCLE

Adult beetles hibernate during summer, autumn and winter in sheltered positions, such as in and around sheds, silos and grain bins, under the bark of trees, particularly pines, and in cracks and crevices in posts. They resume activity when spring temperatures reach about 20°C and fly to the edge of the nearest pea crop. In the 10 years from 1986 to 1995, the pea weevil invasion of pea crops in SA commenced as early as August 15 and as late as September 8. In the majority of these year the invasion commenced within 7 days of September 1.

The incoming beetles settle at the crop edge (the outer 10 to 15 m), and then disperse further into the crop by a series of short flights.

The beetles will invade pea crops irrespective of whether the crop is flowering. They usually invade for about 3 to 4 weeks and lay eggs for a similar time. Most pea weevil remain near the edge of pea crops throughout the invasion period. Hence, pea weevil can be cost-effectively controlled with a well-timed border spray.



*Pea pods with pea weevil eggs.*

The female beetles are sexually immature when they leave hibernation and first arrive in the pea crop, and require a feed of pea pollen and further time for ovarian development to take place. On average, the time taken from the first arrival of pea weevil in flowering crops to the first egg laying is about 2 to 2.5 weeks. This delay in egg laying must be taken into account when determining the optimal date to spray pea weevil in early pea drops. Eggs are laid singly on the exterior of the young green pods.



*Pea weevil exit holes, not yet opened.*

Young larvae hatch about 14 to 28 days after the eggs are laid. They bore directly from the eggs into the pods and are never exposed to insecticide sprays. For this reason the adult pea weevil must be controlled before egg laying commences. The larvae feed near the surface of the seed initially and then move into the centre of the seed to feed extensively.



*Adult beetles emerging from exit holes*

After about 40 to 50 days of feeding, the fully grown larva prepares an exit hold. It eats its way out towards the seed surface and chews a circular hole, about 3 mm in diameter, partly through the seed coat. The larva then pupates, and after about two weeks changes into a new adult beetle.

When pea crops first mature and are ready for harvest, the pea weevil larvae infesting the grain are still immature, and have completed only one-fifth to one-third of their feeding.

The new generation of adult beetles emerges over several months, starting from mid to late December and fly to sheltered positions to hibernate. Some beetles may not emerge until the following spring or until the harvested seed is vibrated or shaken.

## **CONTROL**

### **CULTURAL CONTROL**

Early harvest and delivery of pea grain before the first pea weevil reach adulthood is strongly recommended to:

- reduce the carryover of pea weevil from one year to the next, by removing immature pea weevil from the field before they emerge and infest your property and the surrounding district.
- minimise the weight loss of grain from larval feeding.
- minimise contamination problems at delivery depots and the risk of pea loads being rejected at delivery.

Early harvest of peas also reduces pod shatter and pea splitting losses, grain bleaching and staining, reduces snail contamination and reduces black spot infection in peas retained to sow next year's crop.

Pea crops are ready for harvest when the seed moisture level has fallen to 12%. This has usually occurred when at least 39 of a random sample of 40 plants in the crop have all their pods dry and brown and their seeds hard and dry.

Sheep can be used to graze out crop residues, so eating many of the infested peas that remain after harvest. The remainder will be exposed to direct summer sunlight which causes high mortality of pea weevil larvae. Grazing also reduces the number of volunteer peas in subsequent years which would otherwise allow pea weevil to build up its numbers. However, a balance must be maintained between these benefits plus the livestock grazing value and the risk of erosion, especially on sandy soils.

Peas grown for hay are usually cut when they have partly finished flowering and have some pods containing small seeds. Pea weevils can complete their development in such seeds and so it is desirable to cut pea hay no later than the beginning of flowering.

## BIOLOGICAL CONTROL

No parasites, predators or diseases of pea weevil have been recorded in Australia.

## CHEMICAL CONTROL

The aim of chemical control is to kill the adult beetles in the crop before they lay their eggs.

Eggs on pods and larvae in pods are immune to available chemicals. At the temperatures that usually prevail early in the season, beetles feed on pea pollen for 14 to 18 days before they start to lay eggs. This interval is reduced to 4 to 5 days later in the season. Properly timed sprays kill those beetles already in the crop by direct contact, and insecticide residues on the foliage kill adults that fly in afterwards. Most chemicals have an effective life of less than seven days; if beetles continue to move into the crop, a further spray may be necessary.

It has been common practice in SA to apply one insecticide spray against both pea weevil and native budworm. This strategy is effective if pea weevil adults and the first native budworm larvae occur at the same time in spring. However, in some years, these two events do not coincide and a single spray strategy will fail.

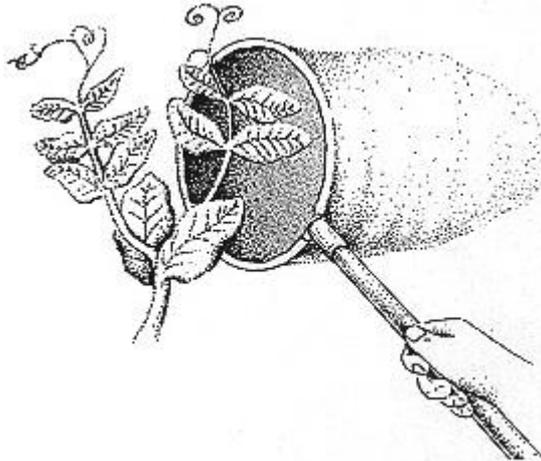
## CROP MONITORING

Monitoring insect pests is the key to effective control in pea crops. This is best done using a sweep net starting at the time of first flowering and continuing until the crop begins to dry. In seasons of low pest abundance careful monitoring may indicate that

the crop does not require treatment. In seasons of high pest abundance monitoring might indicate that more than one spray is necessary.

Sweep along the crop edge at 1 to 2 m into the crop, starting adjacent to any nearby hibernation sites such as tree-lines, sheds, etc. Sweep in a 180° arc while walking forward.

After every 25 sweeps count the number of weevils and repeat at 5 to 10 sites around the crop edge.



*Sweep netting for pea weevil*

Spraying is recommended if there is an average of 2 or more weevils per 25 sweeps.

## **SPRAY TIMING**

Correct spray timing is the key to achieving good control of pea weevil; often sprays are applied too late. The adult weevils must be controlled before they lay eggs on pea pods.

Therefore sweep-net monitor the crop, and if necessary, spray at the following times:

### **EARLY CROPS**

Pea crops in early districts often set pods well before pea weevil begin laying eggs. Each year in early spring, SARDI entomologists advise growers through the rural press of the date for spraying pea weevil in early podding crops. Crops that are podding should be sprayed at this suggested date and not before.

### **LATER CROPS**

All later crops (ie crops starting to pod after this date) should be sprayed as the first flowers wither and the first pods set.

## **BORDER SPRAYING**

A border spray to a width of 40m is the most cost-effective strategy to control pea weevil in pea crops. Infestation may also occur from hibernation sites within the paddock including contour banks, stone heaps, creek lines etc.

Growers will profit, or at least break even, from border spraying in most crops. Spraying the whole crop to control pea weevil alone is unlikely to be cost-effective.

Using their own boomspray, a border spray of a 25 ha crop will cost a pea grower about \$150 (\$6/ha). This cost includes the insecticide and the yield loss from tracking once around the crop.

A correctly timed border spray will help ensure that:

- the peas meet the quality requirements of the various markets, allowing buyers to retain existing markets and compete for new ones.
- pea weevil do not increase to unmanageable densities in the following year.
- the incidence of contamination of other grains with pea weevil adults at silo facilities receiving peas does not increase.
- the incidence of belt-stoppages at loading terminals from detection of live pea weevils does not increase.

### **Is one spray always adequate?**

Most pea weevil insecticides provide good knockdown of adult beetles for 4 to 7 days after spraying. Pea weevil that invade the crop after this time have a good chance of surviving and laying eggs.

It has been estimated that in 7 out of 10 years, the invasion period is short (3 to 3.5 weeks) and one well-timed border spray will provide good control of pea weevil in most crops.

In the other years (3 out of 10) the invasion period is longer (up to 6 to 8 weeks) and a second spray may be needed to adequately control pea weevil, particularly where the peas are intended for quality markets.

The SARDI Entomology Unit has developed a method of estimating the day-by-day progress of the pea weevil invasion. In those years when the pea weevil invasion extends well beyond 3.5 to 4 weeks, pea growers will be advised through the rural media of the need to apply a second border spray to ensure good pea weevil control.

## POST-HARVEST FUMIGATION

Up to 70 percent of the weight loss of infested peas occurs in the two months after harvest because pea weevil larvae continue feeding during this period. This weight loss can be prevented by fumigating the crop immediately following harvest. This fumigation also renders the peas acceptable to processors because peas containing dead larvae can be handled more easily than unfumigated peas containing live beetles. In fact, the latter may not be accepted by industry because they are very difficult to process. Fumigation also ensures seed does not contain live beetles at sowing in the next season.

Fumigate each bag; place them on an impervious surface, treat and seal with gasproof sheeting for 7 to 10 days. Then air the bags for five days after the sheeting has been removed.

All peas exported to Tasmania must be fumigated.

*Table 1: Action calendar for pea weevil management*

<b>Crop Stage</b>	<b>Suggested Action</b>
<i>Flowering</i>	
Early crops	Watch rural press from mid-August for advice on best spray date. Sweep-net monitor before this date to decide whether to spray.
Later crops	Sweep-net monitor during early flowering. If necessary, spray as the first flowers wither and the first pods set.
<i>Harvest</i>	
	For good pea weevil and grain quality management harvest as early as possible, ie when the seed moisture level first falls to 12%. A ready visual reckoner for harvest is when at least 39 of 40 plants randomly selected from the crop have all their pods dry and brown and their seeds hard and dry.
<i>Post-Harvest</i>	
Grain for sale	Deliver as soon as possible following harvest. Fumigate if grain to be held for more than 1-2 weeks.
Grain for on-farm storage	Fumigate as soon as possible following harvest.