

Pigeon Pea Pod – Borers and their control

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A GUIDE TO PIGEON AND THEIR

The pigeon pea (*Cajanus cajan*) is a woody, shrubby legume, grown throughout the Caribbean for its green and dry seeds. It can also be used as a browse for ruminant livestock. Pigeon peas are short-lived perennials but are often grown as annuals, planting every year. Local varieties are tall and indeterminate - they flower and bear pods over a period of two months or more, so that at any one time they may have flower buds, open flowers, young pods and mature pods. They are usually planted in June and July and bear pods from late November through to February or early March. The variety UW17, developed by the University of the West Indies in Trinidad, has recently been released. This variety is shorter and is determinate: flowering and pod production occur over a much shorter period of time, and pods are borne in clusters at the tips of the branches. This habit simplifies reaping - by hand or mechanically - and pest control. UW17 can be planted year round - given adequate rains - and flowers within three to four months.

Pigeon peas are sometimes grown in pure stand, but are often intercropped with corn and/or other crops or grown around the borders of fields or cultivated plots. In Barbados, they can be seen around the borders of sugar cane fields. They are also widely grown in backyards. Traditionally, pigeon peas receive little crop care other than a few weedings.

In Barbados and the Eastern Caribbean the most damaging pests of pigeon peas are the pod-borers. The caterpillars of these bore or burrow into the pods, feeding on the immature developing seeds. The loss of yield can be serious, and a heavily infested crop may not be worth reaping!

THE MAJOR PESTS ARE:

- Tobacco budworm (*Heliothis virescens*)
- Pod-borers (*Fundella pellucens*) and (*Ancylostomia stercorea*)
- Seed weevil (*Callosobruchus chinensis*)

THE TOBACCO BUDWORM (*Heliothis virescens*) - (Fig. 1)

This pest attacks many other crops including tobacco, cotton, tomato, beans and sweet potato.

LIFE HISTORY:

The eggs are laid singly on buds, flowers and young pods by the adult moths (Fig. 2). They hatch in 3 days and the newly hatched larvae (caterpillars or "worms") feed on the leaves, flowers, buds and pods. They later bore into the pods (Fig. 3) and feed on the developing seeds. A single larva can damage most of the seeds in a pod. The fully grown larvae leave the pods, fall to the ground and pupate in the soil. The larval period lasts for about 22 days, and the pupal period averages about 18 days. Adult moths emerge from the pupae. The total life cycle is about 43 days.

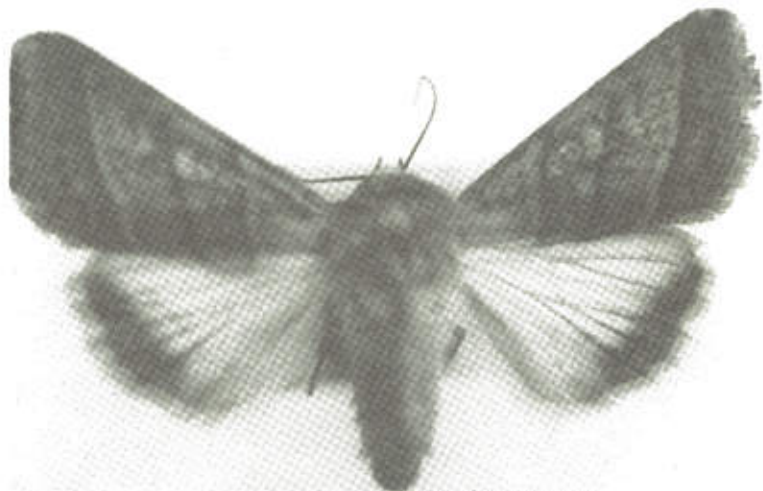


Fig. 1. Adult female of Tobacco Budworm (*Heliothis virescens*)



Fig. 2. Eggs of Tobacco Budworm (*Heliothis virescens*) laid on pigeon-pea pod.



Fig. 3. Larva of Tobacco Budworm (*Heliothis virescens*) feeding on pigeon-pea pod.

PEA POD – BORERS CONTROL.

CONTROL METHODS:

When planted in backyards or on field plot borders there are usually no control measures attempted. In pure stands or when grown inter-cropped, Malathion, Ambush (R), Belmark (R), Decis (R) or Perfekthion (R) can be used at the recommended rates and frequencies (Table 1).

Tobacco budworm has several indigenous natural enemies which attack the eggs, larvae and pupae.

- an egg-parasite (*Trichogramma exiguum*) destroys a number of eggs: the parasitic females deposit their eggs inside those of *H. virescens*, and these hatch to feed on the egg contents.

- three parasitic wasps (two *Bracon spp.* and a *Parasierola sp.*) first paralyse the caterpillars of tobacco budworm and then lay their eggs on the surface of the moribund caterpillars. The parasitic grubs suck the body fluids of the caterpillar before pupating in silken cocoons alongside the dead hosts.

- two Tachinid flies (*Archytas spp.*) lay their eggs on tobacco budworm caterpillars. The maggots penetrate into the larvae and feed on their body fluids, pupating inside the hosts. They complete their pupal stage in the host pupa.

- several predators feed on the eggs, larvae and pupae of *H. virescens*. Lacewing larvae feed on the eggs and young caterpillars, ladybird beetle larvae and adults feed on the caterpillars, as do "jack spaniard" wasps. A ground beetle destroys the caterpillars and pupae.

Because these indigenous natural enemies give inadequate control of tobacco budworm, CARDI has introduced some parasites from Asia, the U.S.A. and other parts of the Caribbean. One of these - a wasp (*Bracon sp.*) - has shown great adaptability and has killed over 40% of *H. virescens* caterpillars in some locations (Fig. 4, 5 and 6).



Fig. 4. A female parasite wasp (*Bracon sp.*) attacking the host larva.



Fig. 5. A Tobacco Budworm larva (*Heliothis virescens*) paralyzed by the female parasite wasp (*Bracon sp.*)



Fig. 6. Grub of the parasite wasp (*Bracon sp.*) feeding on Tobacco Budworm (*Heliothis virescens*) larva.

THE POD BORING CATERPILLARS (*Fundella pellucens*) and (*Ancylostomia stercorea*) (Fig. 7.).



Fig. 7 Adult of Pod Borer (*Fundella pellucens*)

The larvae bore into the pods of pigeon peas and feed on the seeds (Fig. 8). They also attack the pods of other legumes, including cowpea and bonavist.



Fig. 8 Larva of Pod Borer (*Fundella pellucens*) feeding on pigeon-pea seeds.

LIFE HISTORIES:

The eggs of *F. pellucens* are laid singly on buds, flowers and young pigeon pea pods (Fig. 9). The eggs hatch within 5 to 8 days. The larvae are creamy-white, often tinged with pink, with a dark-brown head. The young larvae feed outside the pod for a day or two before boring into it and feeding on the seeds. The larval stage lasts for 15 to 21 days. Pupation occurs inside the pod in a tough silken cocoon that projects slightly outside the pod, but the exposed part is concealed by debris. The pupal period lasts for 12 to 15 days, so that the total life cycle is between 32 and 44 days.

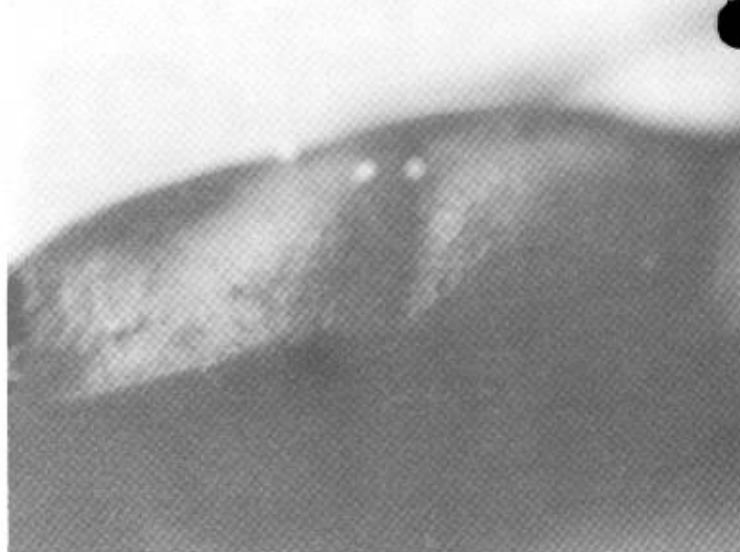


Fig. 9. Eggs of the Pod Borer (*Fundella pellucens*) laid on pigeon-pea pod.

The eggs of *A. stercorea* are laid singly on buds, flowers and young pigeon pea pods and hatch within 5 to 7 days. The larvae which are similar to those of *Fundella*, (Fig. 10) feed initially outside the pods and then bore into these, feeding on the seeds. The larval stage lasts for 17 to 25 days. Pupation occurs inside the pods and the pupal period is about 2 weeks. The total life cycle is 37 to 47 days.



Fig. 10. Larva of the Pod Borer (*Ancylostomia stercorea*) in pigeon-pea pod.

CONTROL METHODS:

These two pod borers can be controlled by insecticide sprays. Table 1 gives recommended rates and frequencies. Since a pigeon pea crop may be attacked by both these pod-borers and by the tobacco budworm, a regime of insecticide sprays as recommended, will control all these pests. It is important to remember that insecticides will only kill larvae feeding outside the pods: once they have burrowed into the pods they are protected and will not be killed.

BIOLOGICAL CONTROL:

The same indigenous parasites and predators that attack the eggs and larvae of tobacco budworm also attack those of *F. pellucens* and *A. stercorea*. Several wasps (Fig. 11) and ichneumon flies have been introduced from Trinidad, St. Vincent and India and released.

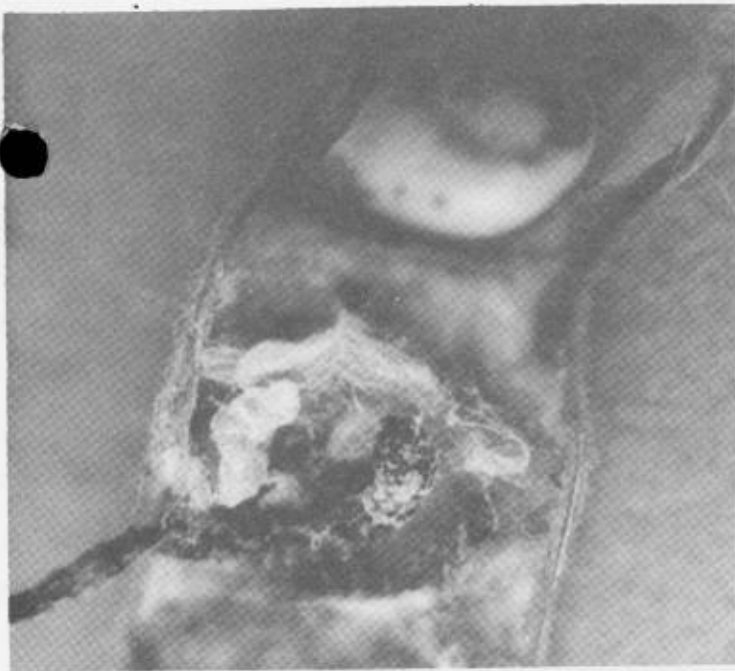


Fig. 11. Cocoons of the parasite wasp (*Bracon* sp.)

THE SEED WEEVIL (*Callosobruchus chinensis*)

The weevil is a serious field and stored (dry) seeds pest of both pigeon pea and other legumes. It is widely distributed in the Caribbean.

LIFE HISTORY:

The adult is about 3mm long, greyish-black with white markings (Fig. 12). Eggs are laid on pods in the field and on seeds in storage. The eggs hatch in 4 to 6 days and the larvae bore into the seeds (Fig. 13). There may be more than one larva in a single seed. They feed within the seeds creating a "chamber" which is often invisible from the outside (Fig. 14). The larvae feed for about 21 days before pupating inside the seed. The pupal stage lasts between 7 and 10 days. The adult weevil may remain in the seed for 3 days or longer before "breaking out". Adults live for 12 to 15 days.

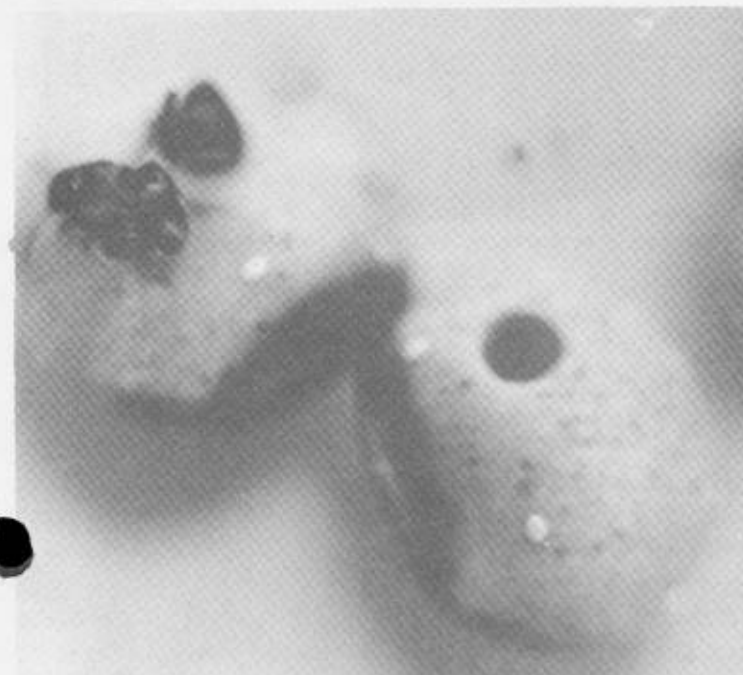


Fig. 12. Adult of the Seed Weevil (*Callosobruchus chinensis*) emerged from pigeon-pea seed (Note the big holes cut by it for emergence).



Fig. 13. Eggs of the Seed Weevil (*Callosobruchus chinensis*) laid on pigeon-pea seeds.



Fig. 14. The Seed Weevil grub (*Callosobruchus chinensis*).

CONTROL METHODS:

In the field, the crop can be sprayed at flowering and early pod formation with Malathion, Belmark (R), Decis (R), or Perfekthion (R) at the recommended rates (Table 1.) Before storage, dry seeds can be heated to 60 °C (140 °F) to kill larvae, pupae and adults. This temperature may reduce germination, and is more suited to seeds being stored for food. Stored seeds can be fumigated with Actellic (R), or Phostoxin (R) tablets, but this is *not* suitable for use by farmers: it should be done *only* in large seeds stores by *trained* personnel. Seeds intended for planting should be treated with Malathion dust to control the infestation without damaging viability. Some farmers store seeds in sealed drums with ground black pepper, clove and cinnamon. This apparently controls weevils effectively. Edible oils mixed with the seeds prevent the development of the bruchid eggs and may be toxic to adults.

In Barbados and the Eastern Caribbean, this seed weevil is attacked by two wasps, but these have little effect on control. Two wasps have been introduced from India but have so far proved ineffectual in control.

(Table 1.) Recommended insecticides, rates and frequencies of applications for the control of tobacco budworm, pod borers and seed weevils on pigeon-peas.

Pest	Prod./Recommended rate	Recommended frequency	Notes
Tobacco budworm	Belmark 1 1/2 ts/4l (US gal)	One treatment every two weeks from onset of pods	Spraying should commence once pods begin to form. Green pods can be harvested about 3-4 days after treatment with all except Orthene.
	Ambush 1 ts/4l (US gal)		
	Sherpa 1 1/2 ts/4l (US gal)		
	Decis 1 ts/4l (US gal)		
	Padan 1 1/2 tsp/4l (US gal)		
	Orthene 1 1/2 ts/4l (US gal)		
Pod borers and seed weevils	Same as above	Once every two weeks	Spraying should commence about 4 weeks after pods begin to form and should continue until a week before harvesting.

ts = teaspoon tsp = tablespoon.

Insecticides should be applied in sufficient water to adequately wet the flowering and bearing branches. Calibrate the sprayer first using 4 litres (or 1 US gallon) of water: that is measure the area that these volumes of water will adequately wet at the normal speed of walking. The volume rate is given by the following formulae:

If working in litres and hectares, the volume rate is: $10,000 \text{ (sq m. in 1 ha)} \times \text{volume used for calibration (litres)} \div \text{area sprayed (sq m.)}$

If working in gallons and acres, the volume rate is: $4840 \text{ (sq yd in 1 ac)} \times \text{volume used for calibration (gal)} \div \text{area sprayed (sq yd)}$

EXAMPLE:

if 4 litres wets 80 sq metres, the volume rate is:

$$\frac{10,000 \times 4}{80} = 500 \text{ litres}$$

And if 1 gal wets 90 sq yd the volume rate is:

$$\frac{4840 \times 1}{90} = 54 \text{ gallons}$$

Then calculate the amount of insecticide product needed for each sprayerful from the formula:

Recommended rate of product x capacity sprayer

Volume rate per ha (ac)

For example, if the recommended rate is 2 litres of product per ha, the volume rate is 500 litres, and your sprayer holds 15 litres, then you need:

$$\frac{2 \times 15}{500} = 0.068 \text{ litres or 60 ml insecticide for each sprayerful}$$

or if the recommended rate is 1.5 pints per acre, the volume rate is 54 gallons, and your sprayer holds 3 gallons, then you need:

$$\frac{1.5 \times 3}{54} = 0.083 \text{ pints or 1.7 fluid ounces for each sprayerful}$$

(There are 16 fluid ounces in a US pint). The same calibration procedure should be used for mistblowers.

Remember that walking speed largely determines volume rate, so it is important to calibrate on the crop to be sprayed. It may be necessary to calibrate more than once, since the tall indeterminate pigeon pea varieties continue to grow, so the volume needed for adequate wetting will increase with time.

Pod-borers and seed weevils are more easily controlled in the shorter, determinate varieties, where the flowering and podding periods are shorter. The tall indeterminate varieties will require more applications to achieve good control, because of their extended flowering and podding period.

Use solid cone and hollow cone nozzles - **do not use** flood jets or flat fan jets - for applying insecticides.

PROPER USE OF INSECTICIDES:

Insecticides are toxic and dangerous to people, so it is essential to handle them, and use them properly.

- Store them in a secure, cool, dry place, preferably under lock and key, but certainly away from children.
- Wear protective clothing when mixing insecticides.
- Read the label *before* mixing and using. Note whether a spreader sticker is needed or not.
- Do not exceed recommended rates - this wastes money and does not give better control. Calibrate the sprayer.
- Wear protective clothing for spraying, including a mask and goggles.
- Avoid spray falling on the body and avoid contact with sprayed foliage.
- Wash arms and any part of the body wetted by spray. Remove any wet clothing.
- Wash out sprayers after use: the wash water can be poured onto the soil.
- Dispose of insecticide containers properly - in the garbage or by burial. Do not re-use.
- Do not spray into the wind: allow the wind to carry the spray into the crop, but do not spray on very windy days.

Disclaimer

Mention of a herbicide in this Factsheet does not constitute recommendation or endorsement, nor does omission constitute an adverse criticism. Names are cited solely as examples.



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