

BRINGING BALANCE TO POTATO TUBER MOTH MANAGEMENT

Potato tuber moth (*Phthorimaea operculella*) is a pest of potatoes in many potato production regions around the world, including Australia and New Zealand. It has proved difficult to control with insecticides alone but can be effectively managed using biological and cultural controls with support from strategic use of insecticides.

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Potato tuber moth (*Phthorimaea operculella*) (PTM) is an important pest of potatoes in many countries, including Australia. The caterpillars can feed on a wide range of solanaceous plants, so can be serious pests of eggplants and tomatoes; in Queensland PTM is also known as tomato leafminer. Although there is a

wide host range, potato (followed by eggplants), are the preferred hosts on which the female moths lay their eggs.

Larvae of PTM feed either on tubers of potato or within the leaves of potato plants (Figures 2 and 3). Leaf-mining activity makes them difficult to control

with insecticides and control failures have been reported frequently. This is in part because of where they feed but also because of insecticide resistance.

Moreover, spraying the foliage may kill caterpillars but damage to tubers can still be serious. This is because moths can lay eggs on or near the soil surface, and the tiny caterpillars

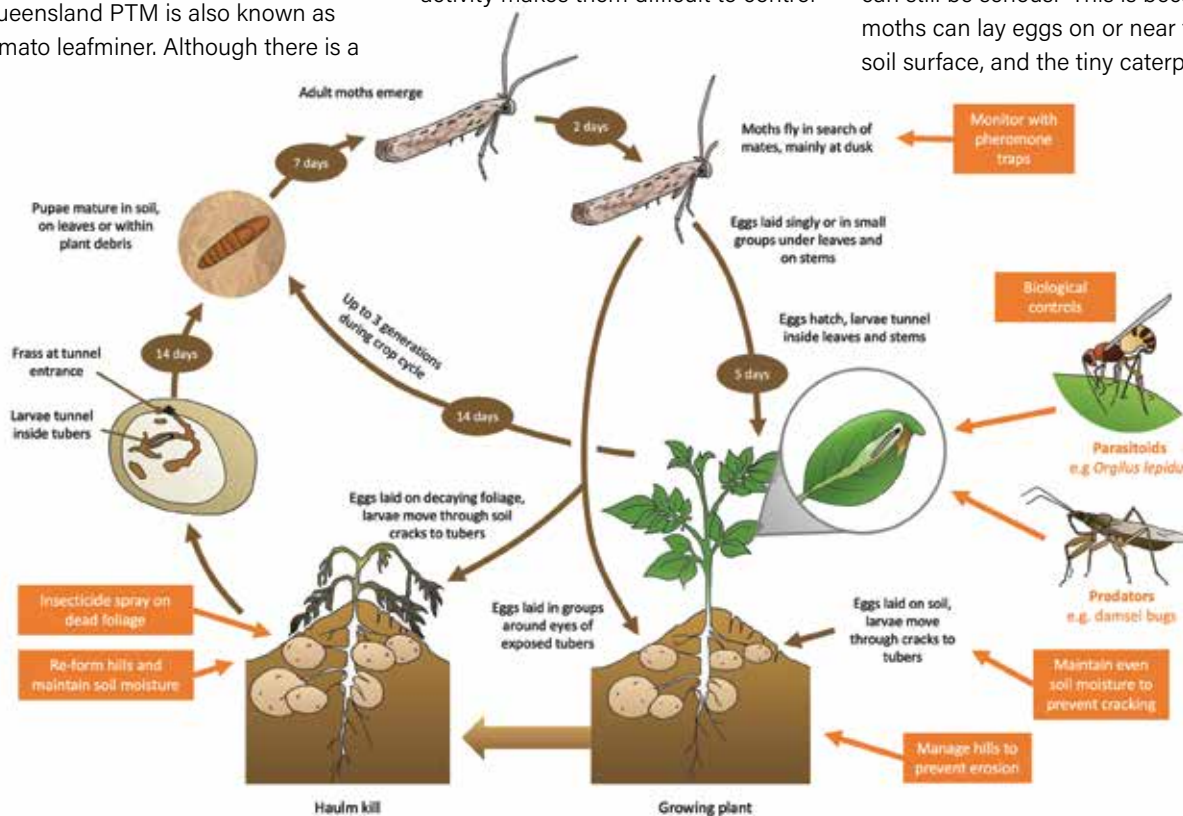


Figure 1. PTM lifecycle, indicating the approximate number of days for each stage under close to optimal conditions and potential control strategies (orange) at each lifestage. Note that speed of development and fecundity are highly temperature dependant. - Illustration J. Ekman

that hatch out can move onto tubers through cracked soil.

During the warmer months of the year potato moth eggs develop into adults in about four weeks. That means that three generations can develop in the life of a crop (Figure 1). Where plantings are made over several months, there can be many generations over the course of the year.

MANAGING THE MOTH

Instead of relying on insecticides, a better way to deal with this pest is to use its natural enemies (parasitic wasps and predatory insects) and some important cultural (management) methods.

If necessary, selective insecticides may be used during the growing period that don't kill the beneficial species. Broad-spectrum insecticides can be used at or after crop senescence to provide a chemical barrier over the tubers, as the beneficial species will no longer be present.

There are three species of wasps in Australia that parasitise and kill PTM caterpillars. Two species (*Orgilus lepidus* and *Apanteles subandinus*) produce one wasp from one caterpillar whereas the third (*Copidosoma koehleri*) produces around 50 wasps per caterpillar. Levels of parasitism on farms that have been using IPM for years are often above 80%.

The main predator of PTM caterpillars is the damsel bug, *Nabis kinbergii*. Other predators of importance in Australian potato crops are brown lacewings, *Micromus tasmaniae*, and hoverflies of several species. All these species occur naturally in potato growing regions of Australia and develop at the same rate as their caterpillar hosts.



Figure 2. PTM leaf mine - P. Horne



Figure 4. Adult PTM - P. Horne

A range of cultural control options to minimise damage by PTM are available to potato growers. Two key options are overhead irrigation and soil management. The aim here is to maintain an intact soil barrier over the top of the tubers, preventing access by caterpillars. So, a fine tilth without clods or cracks is ideal. Irrigation can be used to keep the soil barrier intact and to wash fine soil particles into centre-line cracks that might develop.

Related to this is variety selection. Deeper setting varieties will naturally have a potentially thicker layer of intact soil over the tubers. In some circumstances growers might want or need to plant a shallow setting variety. In this case they need to be aware that the risk of damage by PTM is greater and additional control measures may



Figure 3. PTM larvae developing inside a tuber and emerging to pupate - S.I. Rondon, Oregon State University

be needed.

Where cultural methods are not used and the biological controls are killed (by insecticides targeting PTM or other pests), then damage to tubers is likely. This is the situation in many other countries, including parts of New Zealand. Loss of control also occurs in hot conditions in Australia, where cracks in the soil or erosion of the hills allows larvae to access the developing tubers.

Using an IPM approach, which incorporates biological and cultural control options together with selective insecticides, is much more effective than cover-sprays alone. With less reliance on insecticides, the onset of insecticide resistance is reduced, so growers will have sustainable control options.

Most Australian potato producers are controlling PTM without over-reliance on cover sprays. With care it will remain so.

REFERENCES

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