

FACT SHEET | SEPTEMBER 2021



POTATO LINK
AUSTRALIAN POTATO INDUSTRY
EXTENSION PROJECT

POTATO TUBER MOTH

(*Phthorimaea operculella*)

- By **Dr Paul Horne**, IPM Technologies P/L



Potato tuber moth 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.

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, and so can also be serious pests of eggplants and tomatoes; in Queensland it 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.



PTM leaf mine

- P. Horne

Larvae of PTM feed either on tubers of potato or within the leaves of potato plants. This leaf-mining makes them difficult to kill with many insecticides and control failures have been frequently reported. 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 that hatch out can move onto tubers through cracked soil.



PTM larvae developing inside a tuber and emerging to pupate

- S.I. Rondon, Oregon State University

During the warmer months of the year potato moth eggs develop into adults in about 4 weeks. That means that 3 generations can develop in the life of a crop. Where there are plantings made over several months, then there can be many generations over the course of the year.



Adult PTM

- P. Horne

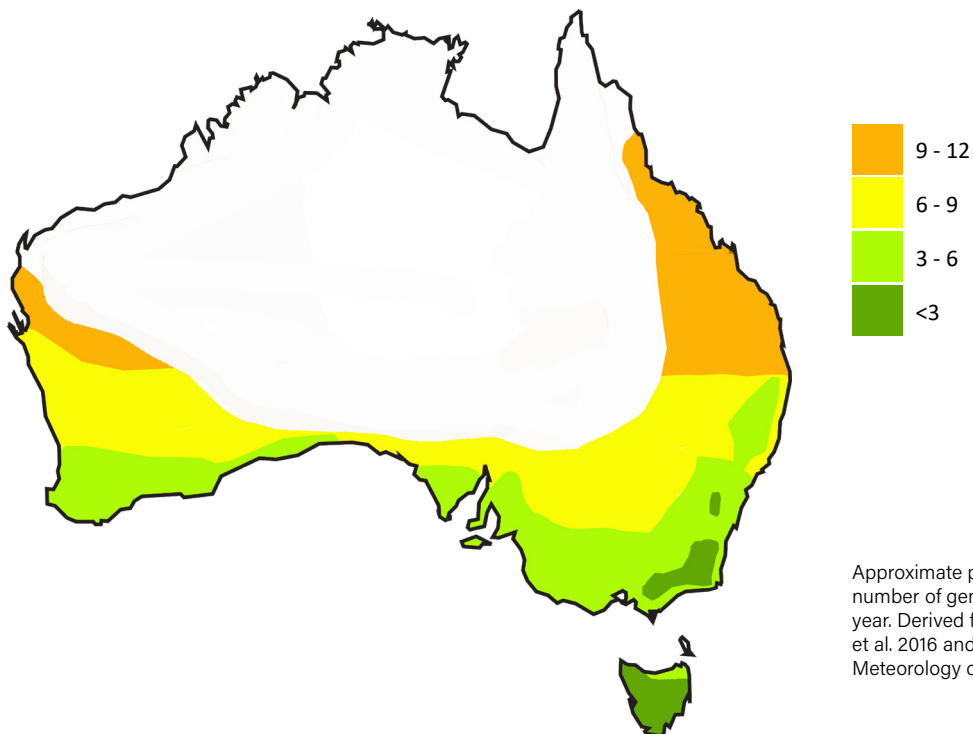
Instead of relying on insecticides, a better way to deal with this pest is to use its natural enemies (parasitic wasps and predatory insects) and some important cultural (management) methods. If necessary, selective insecticides may be used during the growing period that don't kill the beneficial species. 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 3 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.

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 produce an intact soil barrier over the top of the tubers to prevent access by caterpillars. So, a fine tillth without clods or cracks is the aim. 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 be needed.

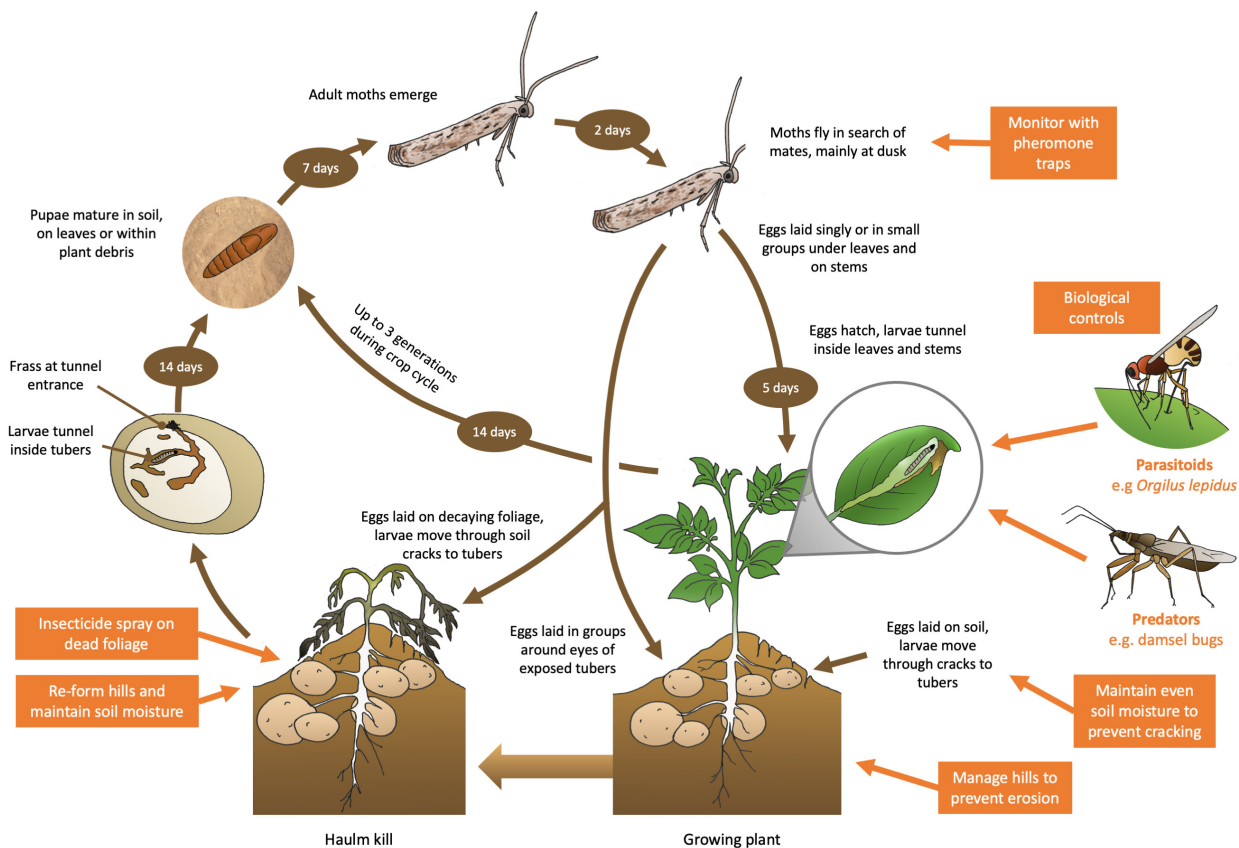


Approximate potential number of generations per year. Derived from Kroschel et al. 2016 and Bureau of Meteorology climate maps.

Where cultural methods are not used (for whatever reason) and the biological controls are killed by insecticides targeting PTM or other pests, then damage to tubers is likely. This is the situation in other countries, such as parts of New Zealand. It 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 a cover-spray approach. 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.



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

FURTHER READING/REFERENCES

Gill HK, Chahil G, Goyal G, Gill AKJ. 2020. Potato tuberworm. Featured creatures, University of Florida. https://entnemdept.ufl.edu/creatures/veg/potato/potato_tuberworm.htm

Hamilton JT., 2003. Potato moth. Agfact H8.AE.5 NSW Agriculture. https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0008/126629/Potato-moth.pdf

Kroshchel J, Sporleder M, Carhuampoma P. 2016. Potato tuber moth, *Phthorimaea operculella*. In "Pest distribution and risk atlas for Africa". International Potato Center <https://cipotato.org/riskatlasforafrica/phthorimaea-operculella/>