

# Integrated Management of Potato Tuber Moth (PTM) *Phthorimaea Operculella*

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## Keywords

ETL, Potato Tuber Moth (PTM), Botanicals, Damage of PTM, Insecticides.

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## ABSTRACT

The potato tuber moth is a serious pest that affects potato production and storage. Since the market value of the infected tubers has been completely reduced, it is more significant in the stores. Attract-and-kill was highly effective at reducing male flight activity and significantly reduced daily moth catches in pheromone-baited water traps (by 51.8–99.9%) in comparison with untreated plots. Botanicals are especially efficient in the form of antifeedant, repellent, protectants, and growth-disrupting hormones. They are also sources of secondary metabolites that are safer than synthetic insecticides.

## INTRODUCTION

Potato (*Solanum tuberosum* L.) belong to family Solanaceae or nightshades and is a root vegetable. Potato (*Solanum tuberosum* L.) popularly known as ‘The king of vegetables’, has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. Because, the dry matter, edible energy and edible protein content of potato makes it nutritionally superior vegetable as well as staple food not only in our

country but also throughout the world. Now, it becomes as an essential part of breakfast, lunch and dinner worldwide. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals like rice and wheat. Consequently, potatoes may prove to be a beneficial instrument for ensuring the country's nutritional security. Potato is a major food crop, grown more than 100 countries in world.

During 2020-21, potato cultivation in India was 22.48 lakh ha and production was 542.3 lakh tons, while the same was 20.51 lakh ha and 485.62 lakh tons during 2019-20. In India, Uttar Pradesh, West Bengal, Bihar, Punjab and Gujarat are the major producing states. Varieties like Kufri, Chipsona-1, Kufri Chipsona-2, Kufri Jyoti, Kufri Chandramukhi have been released recently by different research organizations for processing purposes.

### Origin:

The potato was first cultivated in South America between three and seven thousand years ago. The most probable place of origin of potatoes is located between the south of Peru.

It was introduced in India by the Portuguese sailors during early 17th century and its cultivation was spread to North India by the British. Potato is one of main commercial crop grown in the country. It is cultivated in 23 states in India.

**Potato Tuber Moth:** The potato tuber moth is a major pest of potatoes, and can also attack other crops of the Solanaceae family.



**Scientific Name:** *Phthorimaea operculella*

### Taxonomic position:

- **Kingdom:** Animalia
- **Phylum:** Arthropoda
- **Class:** Insecta
- **Order:** Lepidoptera
- **Family:** Gelechiidae
- **Genus:** *Phthorimaea*

- **Species:** *operculella*

**Host Plants:** In addition to being the host of plants in the Solanaceae family, it feeds mostly on potato crops.

**Distribution:** The moth occurs in almost all tropical and subtropical potato production systems in Africa and Asia, as well as those in North, Central, and South America.

**Identification:** The potato tuber moth measures approximately 10 mm in length and 12 mm in width. The bodies of adult moths are thin and light brown, and their wings are greyish brown with numerous tiny dark dots. Two pairs of wings are present on the moth, both of which have ragged edges.

- **Egg:** Laid singly on the ventral surface of foliage and exposed tubers
- **Larva:** Yellow coloured caterpillar with dark brown head
- **Pupa:** In a field of rubbish and soil clods, pupation takes place inside a cocoon.
- **Adult:** Small, narrow-winged moth with dirty white back wings and forewings that are greyish brown in colour.

**Nature of damage:** The larvae cause damage in the form of mines in the leaves and weakening of the stem, which can break. Caterpillar feeding paths in tubers can only be seen when the potato is cut open. The galleries in the tubers make them unsellable and allow pathogens to enter. It is a pest of field and storage. Galleries are formed near tuber eyes.



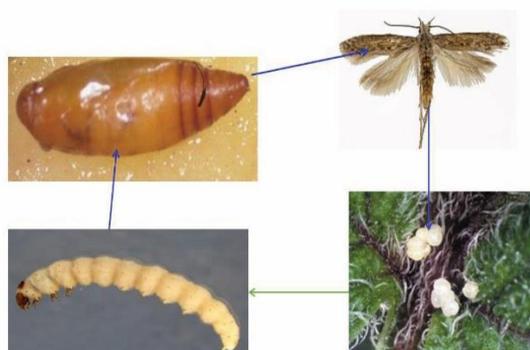
**Life cycle:** The life cycle of Potato Tuber Moth, *Phthorimaea operculella* is completed in four stages viz. egg, larva, pupa and adult. The stem of the plant or the underside of the leaves are

where adults lay their eggs. If there are still no leaves to be found, potato females oviposit close to the eye buds of the potatoes, where they then look for tubers through soil fissures.

**Eggs:** The eggs are pearly white and spherical. They turn yellowish to brown before hatching. After 4-6 days, the larvae emerge.

**Larvae:** The larvae are white or light brown with a brown head, and as they mature, their coloration changes to pink or green; the larval cycle lasts 13 to 33 days depending on temperature and other factors. **Pupa:** Pupation takes place in the soil surface or in debris under the plant. The pupal stage lasts 10 to 33 days. The pupae have a yellowish or reddish-brown colour, and are about 0.84 cm long.

**Adults:** The adults are about one centimetre long and pale brown with a dark mottled and thin body. The forewings have dark spots, and both pairs of wings have fringed edges. The wingspan is 13-15 mm. Their lifespan is approximately 10 days.



### Integrated Pest Management:

- Select healthy tubers.
- Avoid shallow planting of tubers. Plant the tubers to a depth at 10 - 15 cm deep.
- Install pheromone traps at 15/ha.
- Collect and destroy all the infested tubers from the field.
- Adopt intercropping with chilies, onion or peas.
- Do earthing up at 60 days after planting to avoid female moths laying eggs on the exposed tubers.
- Cover the upper surface of potato tubers with the branches of Lantana and Eupatorium to deter the ovipositing moth in the godown.
- Release egg larval parasitoids: *Copidosoma koehleri* or *Chelonus blackburnii* @30,000/ha twice at 40 and 70 days after planting.
- Spray NSKE @5% or quinalphos 25 EC @2ml/lit of water to manage foliar damage.
- Apply *Bacillus thuringiensis* (B.T) spray at 1 kg/ha every 10 days.
- Entomopathogens used broad spectrum like insecticides for management of this pest. The fungus *Muscodor albus*, which produces a mixture of antimicrobial volatile organic chemicals, was tested for its insecticidal activity against PTM.
- Under low to moderate population pressure, both of the advised insecticides, azinphos ethyl and endosulfan, were effective against foliar mining; however, under high to extreme population pressure, only azinphos ethyl was consistently effective.

### CONCLUSIONS:

Production was 542.3 lakh tons of potato during 2020-21 in India and tuber damage in storage has been stated to range from 1 to 72.5% in the endemic states. In Karnataka and Himachal Pradesh, up to 100% losses in storage have been reported. PTM has been found to cause 30-70% infestation in country stores in India where modern cold storage facilities are inadequate.

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