



**Food Resilience through Roots and
Tubers in Upland and Coastal
Communities in the Asia Pacific
(FoodSTART+)**



**and
Livelihood and Access to Markets
Project (LAMP)**

**FIELD GUIDE FOR
IDENTIFICATION OF MAJOR
POTATO PESTS AND DISEASES IN
MEGHALAYA, INDIA**



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Cut worm

Agrotis ipsilon, *A. segetum*



Cut worm larvae



Cut worm pupa

Photo: Ontario CropIPM



Adult cut worm

Photo: Giri *et al.*, NARC, Nepal

- ❖ Cut worm is one of the most damaging pest of potato in Meghalaya which damages not only potato but also affects all types of plants including weeds.
- ❖ The caterpillars feed during night on newly emerged branches and underground stem.
- ❖ The caterpillars feed on tubers therefore affecting both tuber yield and marketing value.
- ❖ It is rather easy to identify caterpillars, when picked up, they will curve themselves into a characteristic C-shape.

White grub

Brahmina coriacea; *H. longipennis*; *Melolantha* sp., *Anomala* sp.



White grub larva



White grub pupa

Photo: Giri *et al.*, NARC, Nepal



Adult white grub (beetle)

Photo: Giri *et al.*, NARC, Nepal

- ❖ White grub is a common pest of potato in Meghalaya.
- ❖ The caterpillars feed on roots as well as tubers by making large, circular and shallow holes which affects potato yield and render them unfit for marketing.

Potato Tuber Moth (PTM)

Phthorimaea operculella



PTM larva



PTM pupae

Photo: Giri *et al.*, NARC, Nepal



Adult PTM

Photo: Mr.Goutham



PTM damaged tuber

- ❖ PTM is known as field as well as storage pest.
- ❖ The PTM larvae are known for feeding on the tubers, roots, and foliage of potato plants.
- ❖ The larvae feed on the tubers and form tunnels which make tubers vulnerable to attack by other fungal and bacterial diseases which affects productivity and marketing.

Taro caterpillar

Spodoptera litura



Larva feeding on leaf



Larva and pupa



Crop damaged by Taro caterpillar

- ❖ The taro caterpillar is one of the most important insect pests of agricultural crops and widely distributed throughout tropical and temperate Asia.
- ❖ The caterpillars are night feeders and sometimes cause huge damage to potato crop.
- ❖ The older larvae are usually found in the soil around the base of plants during the day time.

Green peach aphid

Myzus persicae



Colony of Green peach aphids



Green peach aphid

- ❖ Green peach aphids are small, soft and green-yellow in colour.
- ❖ Aphids are always found together and form colonies especially on lower part of leaves shaded from direct sunlight.
- ❖ Aphids are also hazardous because they act as vectors for virus transmission.

Nematode

Potato Cyst Nematode (PCN) *Globodera* spp. (*Globodera rostochinensis* & *G.pallida*)

Root Knot Nematode (*Meloidogyne* spp.)



Potato field infected with Nematode



Nematode galls in the root of potato



Potato tubers showing nematode infection

- ❖ Potato Cyst nematodes are an important potato pest and have substantial potential to cause yield losses.
- ❖ Eggs in the cysts can remain viable for several years even in the absence of its hosts.
- ❖ Nematodes feed on sap and plant nutrients. They cause growth retardation and root damage leading to early senescence of potato plants and reduced yield.

Early blight

Alternaria solani



Concentric rings on potato leaf
Photos: Plant Research International



Potato tubers infected with Early blight

- ❖ Early blight is more common than the late blight on potato and causes about 20-30 per cent yield loss every year.
- ❖ Initially the symptoms appear on the older leaves in the form of small, circular to oval, brown to black spots with concentric rings which coalesce into larger and angular at later stage.
- ❖ Spores are universally present in the fields where host plants are present.
- ❖ In case of heavy infestation leaves fall off after drying which results into yield reduction.
- ❖ Disease severity is highest when potato plants are injured by hail/physical damage, under stress (physiological ageing, drought etc.) or lack of proper nutrition (nutrient deficiencies).

Late blight

Phytophthora infestans



White sporulation under the leaf



Black water soaked lesion on leaf and stem



Reddish-brown tissue in tuber

- ❖ Late blight is the most dreaded fungal disease and causes significant yield loss to summer and autumn potato in Meghalaya.
- ❖ Blackish water soaked lesions occur on the leaves and whitish sporulation of the pathogen can be seen around the margin of the lesions, particularly on the underside of the leaf.
- ❖ The pathogen causes purplish-brown lesions on the surface of tubers render them unfit for consumption and marketing.

Leaf spots (Phoma blight)

Phoma exigua, *P. sorghina*



Leaf spots (black dots) symptom on leaves



Leaf showing angular necrotic lesions



Dried lesion on the leaf

Photo: RJ Raynolds

- ❖ Symptoms of Phoma blight is only visible on older leaves.
- ❖ Yellow to brown, angular necrotic lesions of various shapes and sizes scattered over the entire lamina.
- ❖ The pathogens can survive in soil and plant debris particularly in temperate climate.
- ❖ During the crop season, infection initially appears on the older leaves near the ground level and results in the infection of young immature tubers if not covered by the soil properly.
- ❖ The affected tubers, when used as seed, serve as potential source for disease in the subsequent season.

Black scurf

Rhizoctonia solani



Plant root infected by the pathogen
Photos: Phillip Wharton and Elisabeth Wood



Potato stem infected by the pathogen



Potato tubers showing black scurf symptoms

- ❖ **Black scurf causes stem canker, black scurf, damping off, skin netting and tuber distortions.**
- ❖ **Black scurf disease is initiated from soil-borne or seed-borne sources that infect developing sprouts, stolons and roots.**
- ❖ **The pathogen can survive several years as mycelium or dormant resting structures (sclerotia) in soil, organic matter and plant debris.**
- ❖ **Black scurf disease reduces tuber marketability, seed quality and may also reduce potato yield.**

Powdery scab

Spongospora subterranea



Powdery appearance on tuber

Photos: www.unece.org



Tuber infected with powdery scab

- ❖ Powdery scab is a soil borne disease which tends to be favoured by cool, moist conditions and heavy soils.
- ❖ The above ground parts are not affected by the fungus but affected roots can develop distinctive light-colored irregular lobed galls.
- ❖ The powdery mass is comprised of spore balls that can be released into the soil and survive for up to ten years.
- ❖ This fungus also acts as a virus vector causing Potato Mop-top Virus.
- ❖ The defect on the tubers are superficial which affect marketing value but could be cooked and eaten after properly peeling off the infected skin.

Bacterial wilt (Brown rot)

Ralstonia solanacearum



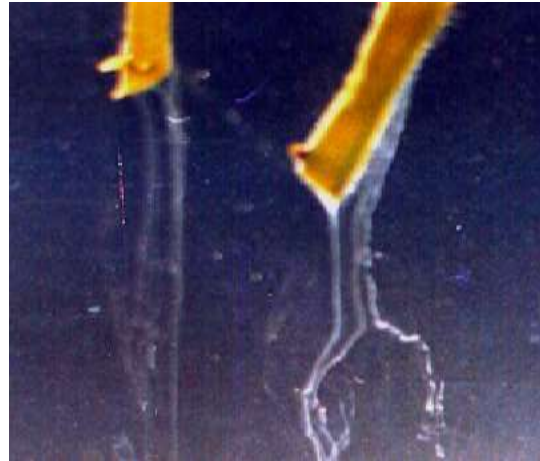
Wilted plants



Vascular ring in potato tuber



Bacterial ooze from potato tuber



Milky bacterial thread coming out from stem

- ❖ The bacteria enter the plants through roots and multiply within the vascular system and block the sap translocation from root to above ground part causing wilting of the plants.
- ❖ In case of heavy infestation, the tubers show vascular ring, oozing followed by rotting of the tubers.
- ❖ If plants are infected at later stages of vegetative development, the bacteria will infect the tubers and carry the disease to next season.
- ❖ Potato plants infected with bacterial wilt droop down affecting the potato yield significantly.

Potato scab

Streptomyces scabies



Tubers showing symptoms

- ❖ Potato scab is a common tuber disease that occurs wherever potato is grown.
- ❖ The organism can survive indefinitely in slightly alkaline soils, but is relatively scarce in highly acid soils even in absence of potato crop.
- ❖ It is transmitted to plants by infected seed tubers, wind and water.
- ❖ This organism attacks the stems, stolons and roots of the potato, and more importantly, young, rapidly growing tubers, stimulating the growth of unsightly corky tissue.
- ❖ Tubers infected with scab are unfit for marketing

Viruses

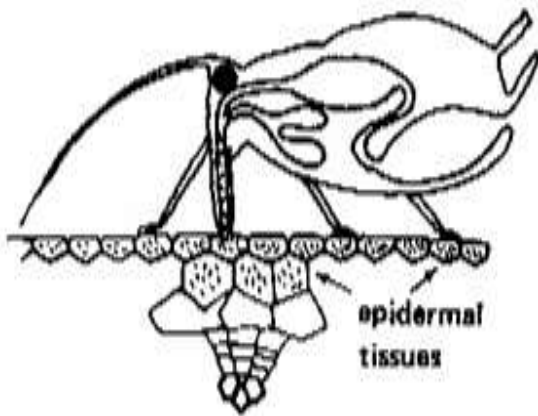
Potato Virus Y (PVY) & Leaf Roll Virus (PLRV)



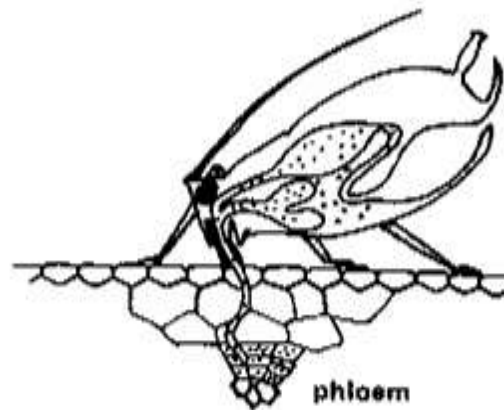
Leaf showing PVY infection



Plant showing leaf roll virus symptom



Aphid feeding on epidermal tissue



Aphid feeding deep on phloem tissue

- ❖ Viruses are very small particles and not visible by naked eyes.
- ❖ The most important viruses are transmitted through aphid vectors by feeding on plant sap.
- ❖ The aphids carrying virus particles will infect other healthy plants in the vicinity.
- ❖ Viruses do not kill the plants but make the plants sick, sick plants produce sick tubers.
- ❖ The virus particles get into tubers which will carry the disease and cause seed degeneration in subsequent crop cycles.