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The Management of Major Insect Pests and Diseases that Affect Potatoes

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INTRODUCTION

Major insects:

1. Aphid (Myzus persicae): Aphids are transmitting viral diseases that reduce the production potential. Farmers used to spray broad spectrum pesticides at the emergence of the crop to control them which led to the development of red mite populations as predators were killed. Aphids drain plant sap, which causes leaves to become pale and dry. This bug also causes several viral infections in potato plants.

Management- Utilization of 5–10 yellow sticky traps or yellow funnel traps per hectare. Imidacloprid 17.8% SL @ 0.03% may be sprayed twice with a 12- to 15-day gap between applications.

2.Whiteflies (Bemisia tabaci): Adult whiteflies can be easily seen on the underside of the leaves. Sucking sap from plant tissue is associated with several physiological plant disorders, such as chlorosis of new foliage. Heavy infestations with hundreds of adult greenhouse whiteflies on the lower surfaces of potato plant leaflets produce whitish spots that subsequently turn dark. Whiteflies are tiny sucking insects with a white colour. They inject poisonous saliva into their host plants, which is linked to the spread of viruses.

Management- Plants with high whitefly tolerance, like Kufri Bahar, can be grown in whitefly-prone locations. Thiamethoxam 25WG @ 0.05% sprays are applied 15 days following crop emergence, while spiromesifen 240SC foliar sprays are applied at emergence @ 96 g a.i./ha (400 ml/ha).

3. Thrips (*Thrips palmi*): The adults are minute, delicate insects, less than 1 mm long and are light yellow in colour. Wings have fringe or hairs throughout and hence they are called fringed, winged insects. The nymphs are still smaller, minute and wingless. It damage the under sides of leaves by scrape the epidermis and such the oozing sap. They damage young and soft parts of plants such as new leaves and shoots. As a result, leaves curl downwards and change to a blackish- silver colour. Severe infestation causes young leaves to wilt and dry out.

Management –The most common and effective species for spreading stem diseases are thrips. Cultivating early-planting tolerant potato types including Kufri Sutlej, Kufri Badshah and Kufri Jawahar. Thrips can be efficiently controlled by treating seeds with Imidacloprid 17.8 SL at 5 ml/l of water for 10 minutes or by spraying the crop with the same pesticide at 3 ml/10 l of water just after it emerges. Regular watering lowers thrips activity on crops.

4. White grub (*Brahmina coriacea*) : White grubs are the larval form of beetles. Their heads are hard and ruddy-brown in colour, and they have strong mandibles. Tubers damaged by irregular holes. More than two holes are often found in one tuber. These holes are not so deep, as white grubs do not enter and live inside tubers. Severe infestations usually occur in fields previously covered with grasses. Larval grubs in their second and third instars cause the damage by drilling big, shallow, and round holes in the tubers. In endemic locations, potato tuber damage can reach 50% or more.

Management –The greatest technique to expose white grubs to high temperatures and natural predatory birds is to deep-plow after potato harvest. After earthing up, spray the crop (ridge section) with chlorpyriphos 20 EC @ 2.5 lt/ha to destroy the larvae.

5. Potato tuber moth (*Phthorimaea operculella*): This bug has been ruining potato fields and storage facilities. Young larvae burrow between two layers of leaf tissues as they feed. The larvae decimate the crop by withering the plants and damaging the leaves, petioles, and terminal shoots. After tuberization, the adults lay the eight eggs on the tuber eyes. Mines are created when the larvae feed on the tubers after entering them.

Management -Some of the cultural techniques include planting potatoes deeply at least 10 cm deep proper earthing up, lifting all tubers from the field before harvest, and destroying self-grown potato plants. The most PTM moths may be caught per trap while using water traps. The PTM tuber infestation can be prevented for up to 6 months by covering potato heaps with a 2.5 cm thick layer of chopped dried leaves of lantana (*Lantana camara*) or eucalyptus (*Eucalyptus globosus*), both in dry and powdered form. Spraying chlorpyriphos 20EC @ 2.5 ml/l in field

circumstances is another effective way to manage it.

Major Diseases

1. Late blight (*Phytophthora infestans*) : This disease is caused by a fungus *Phytophthora infestans*. The average annual losses due to this disease have been estimated to 15% of total production in the country. Late blight affects all plant parts especially leaves, stems and tubers. The initial symptoms appear on lower leaves as pale green water-soaked spots (2-10 mm) mostly on the margin and tips. In moist weather, spots may appear anywhere on the leaves, enlarge rapidly and turn necrotic and black, killing the entire leaf instantly. On the corresponding lower side of the leaves, whitish cottony growth forms around the dead areas. The temperature between 10-22°C for two-three consecutive days with relative humidity above 80 per cent coupled with cloudy weather and intermittent rain are most congenial conditions for the fast spread of the disease.

Management – Avoid using seed from a crop that had late blight the previous year. Choose cultivars with a moderate to high level of late blight resistance. Kufri Kanchan, Kufri Girdhari, Kufri Himalini and Kufri Megha. If the weather is conducive to late blight, begin spraying after an interval of 8–10 days with protectant fungicides copper ozychloride (0.3%), mancozeb (0.25%), and chlorothalonil (0.2%).

2. Early blight (*Altenaria solani*): The symptoms of early blight mainly appear on leaves and tubers. Initially the symptoms occur on the lower and older leaves in the form of small (1-2mm), circular to oval, brown spots. These lesions have the tendency to become large and angular at later stage. Mature lesions on foliage look dry and papery and often have the concentric rings, looking like 'bull's eye'. Under severe conditions, the entire foliage is blighted and field gives burnt appearance. The tuber symptoms comprise brown, circular to irregular and depressed lesions with underneath flesh turning dry, brown and corky. A temperature of 17-25°C and relative humidity of 75% are favourable for the spread of the disease. Intermittent dry and wet weather is more conducive for early blight.

Management– Field sanitation and crop rotation. Grow hardy plants such as Kufri chamatkar, Kufri Sinduri, Kufri Jyoti, Kufri Badshah, Kufri Lalima, Kufri Jeevan, Kufri Khasigaro, and Kufri Sherpa. Spray the crop three to four times with a 10 days intervals with 0.3% mancozeb, 0.1% bavistin, or 0.2% chlorothalonil when intermittent rains occur in dry weather.

3. Black scurf (*Rhizoctonia solani*): Black scurf is prevalent both in the plains and hills. The affected tubers look shabby, unattractive and fetch less price in market. Up to 35% of yield losses have been attributed to decreased crop stand. The disease affects tubers, sprouts, stems and stolons. The most common symptom is black-scurf comprising dark brown to black irregular lumps sticking on the tuber surface. Infected stolons give rise to deformed tubers. Soil temperature of 18-20°C and high moisture is conducive for the development of the disease, whereas high soil temperature (28-32^{o}C) and high soil moisture favour the development of sclerotia on tubers.

Management- Before cold storage, seed tubers should be treated with 3% boric acid (dip for 30 minutes/spray) or pencycuron (@ 0.25%) as a spray on tubers during planting. It has been claimed that bio-control agents like *Trichoderma viride* and *T. harzianum* are effective at controlling the illness.

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4. Bacterial soft rot (*Pectobacterium spp*.) :

Potato tubers can lose a lot of weight due to bacterial soft rot during harvest, transportation, and storage. Losses resulting from improper produce handling, inadequately ventilated storage, or transit might reach 100%. On tubers, the illness manifests as little spots around the lenticels that are absorbed in soft water and grow under conditions of high humidity.

Management- When developing tubers, avoid overwatering and ensure appropriate drainage. Only when the tuber skin has fully healed should the crop be harvested. Organize damaged or wounded tubers to prevent further damage to them. Before storing, apply 3% boric acid to tubers (meant for seed) for 30 minutes, then allow to dry in the shade.

5. Bacterial wilt (*Ralstonia solanacearum*): Bacterial wilt or brown rot is one of the most damaging diseases of potato worldwide. In India, the disease is prevalent in all potato growing areas except north western plains comprising of Rajasthan, Punjab and Haryana, north central part of Uttar Pradesh and north western high hills**.** The earliest symptom is slight wilting of leaves on top branch during clear sunny days. The leaves show drooping due to loss of turgidity followed by total unrecoverable wilt. In advanced stages of wilt, the basal cut end of the stem may show dull white ooze on squeezing. The illness results in the withering of standing crops as well as the rot of infected tubers in the field, storage and transportation.

Management- When planting, sprinkle stable bleaching powder (12 kg/ha) mixed with fertilizer in the furrows. It cuts the incidence of wilt by 80%. Utilize crops such as maize, grains, garlic, onions, and cabbage in a cycle of two to three years. Avoid rotating solanaceous crops like brinjal, ginger, chillies and other vegetables. Early crop planting in February avoids hillside wilt.

6. Potato Scab (*Streptomyces scabies*): A widespread tuber disease that can be found anywhere potatoes are cultivated. Dark brown, pithy spots that may be elevated and "warty" are one of the signs of potato scab. These lesions may cover the entire tuber surface or only a small section of it.

Management-Due of the pathogen's prolonged life on seed tubers and in soils, it is difficult to manage. The seed tubers are treated with organomercurial compounds (0.02% for 20 minutes) or boric acid (3% for 30 minutes) prior to planting, and they are then allowed to dry in the shade.