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Diseases of Potato

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Introduction

Potato (*Solanum tuberosum*) is one of the most important food crops of the world. Potato is a crop which has always been the poor man's friend-. Potato is being cultivated in India for last more than 300 years. For vegetable purpose, it has become one of the most popular crops in the country.

Potato is the most useful and important member of the family *Solanaceae* and it belongs to the genus *Solanum*. Genus *Solanum* consists of 7 cultivated and about 154 wild species but the commercially viable potato has only two species: *Solanum andigenum* and *S. tuberosum*. The latter is the most commonly cultivated species. The edible portion of potato is its tuber which is morphologically an underground stem.

The probable centre of origin of potato is in South America in the Central Andean region. These are evidence that potatoes were cultivated for centuries by South American Indians and tubers were used as common article of the food. Potato plants were brought into continental Europe very soon after the discovery of America.

Following its introduction into European agriculture, potato became an important food crop of Italy, France and Ireland. Potato was introduced to India from Europe in the beginning of the seventeenth century, probably by the Portuguese, who were first to open trade routes to the East.

Potato is one of the important food crops of the world, cultivated over an area of 18.4 million hectares with a total production of 284 million tons. The important potato growing countries are the USSR, Poland, the USA, China, India, Germany and Spain. In India, potato is cultivated in about 8 lakh hectares with a total production of a little over 10 million tons. It is cultivated in a large scale in Uttar Pradesh, West Bengal, Bihar and Punjab. Uttar Pradesh alone produces nearly 43% of India's total production of potatoes.

Diseases

Potato is subject to about 90 diseases which are caused by different pathological agencies such as fungi, bacteria, virus, mycoplasma, etc. Besides, there are certain physiological disorders too. These diseases cause considerable loss in the potato yield.

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The important diseases along with control measures are described here.

1. Late blight

This disease is caused by a fungus called *Phytophthora infestans*. It is the most serious disease of potato crop in the North Indian hills, Nilgirihills, and also in North Indian plains, where it occurs in mild to severe form depending upon the season. The disease affects the foliage, stem and tubers of the potato plant. The disease appears on the leaves as brown water-soaked patches which ultimately turn brownish black.

The growing fungus attack the area very fast and soon starts sporulating. On the under surface of infected leaves,' a white cottony growth of the fungus develops at the juncture of infected and healthy tissues. The lesions on the stem are purple coloured and sometime 3.5 cm long. The stems get soft and weak at infected points. The affected tubers show light brown patches on the surface and rusty brown necrosis of the underneath flesh.

The disease rapidly multiply under cool temperature (10-25°C) and high humidity (above 80% relative humidity) and the entire crop of susceptible variety may be destroyed .in about a week.

Control

1. Use' potato tubers for seed from disease free areas to ensure that the pathogen is not carried through seed tuber.
2. The infected plant material in the field should be properly destroyed.
3. Grow resistant varieties like Kufri Navtal.
4. Fungicidal sprays can be effective, if given properly and timely. Sprays should start a few days before the anticipated time of occurrence of the disease or on the appearance of, the initial symptoms. 0>01 humid atmosphere favourS the disease and such weather can be an indication of disease. in a short time ahead. Spraying should be done with Dithane M-45 or Dithane Z- 78 (2.5 kg per 1000 litres of water per hectare). Spraying should be repeated at 10-12 days \ interval.

2. Early blight

Early blight, caused by *Alternaria solani*, is another fungal disease of potato prevalent throughout the country. In dry weather with intermittent rain, the disease may appear in an epidemic form both in mid-hills as well as plains and cause severe damage to the foliage. It has been reported to be particularly serious in Maharashtra and in the late planted Katwa (cut seed) crop in Bihar, Uttar Pradesh and Punjab.

The disease first appears on the older leaves of potato plants as necrotic spots of angular, oval or circular shape. These spots are dry and brittle as compared with those caused by late blight. They rarely exceed one centimetre in diameter. A number of these

spots can, however, fuse to cover the entire leaf. Under humid conditions, the disease spreads rapidly from the lower leaves to those at the top and may cause premature death of plants.

Control

Spraying the crop with Bordeaux mixture (5:5:50) or Dithane M-45 (2 kg/ha) or Dithane Z- 78 (2 kg/ha) in the plains before the appearance of the disease checks its spread and prolongs the life of the crop. Once the disease has spread, the spraying may not be effective. Crop debris should be invariably destroyed by burning after harvest.

3. Black scurf

This disease is caused by fungus *Rhizoctonia solani* and is of common occurrence both in hills as well as plains. It is a soil and tuber-borne disease. It attacks many hosts in different stages of growth. In potato, it causes black scurf on tuber, stem canker, aerial tuber and top rosette. The infected tuber bear on the skin chocolate coloured hard I body called sclerotia. When the infected tubers are planted, the fungus attacks the growing sprouts or young shoots which may be killed, resulting in gapping stand. Older plants may get diseased near the ground level, producing brown cankers at the collar. This girdling effect results, in wilting and early death of plant. Checking the downward flow of food manufactured in the leaves results in purpling of the foliage and stunting of the plant.

Control

1. Good drainage, shallow planting, weed eradication and inclusion of grain crops in long rotation are some of the cultural practices which reduce the I chance of infection.
2. The seed tubers (after harvest/before sprouting) should be treated with Agallol 3 (0.5% solution) for 10 minutes before planting or before keeping in the I. storage. The chemical is highly poisonous and should be used with care.
3. Soil application of Brassicol (PCMB) at the rate of 20-30 kg/ha has been found to he highly effective.
4. Only healthy tubers should be used for planting.

4. Powdery scab

This disease is caused by the fungus *Spongospora subterranea*, mostly in hills. It first appears as small brown spots on young developing tubers. These spots later become raised as pimples and ultimately break open the skin releasing a black brown powdery mass.

Control

Tuber treatment with Agallol 3 (0.5% solution for 10 minutes before planting or keeping in cold storage helps to reduce the infection.

5. **Common scab**

This disease is caused by *Streptomyces scabies* and is present in the plains of Maharashtra and some areas in Punjab. The disease mostly affects the tuber, which may show mere rosetting or deep spots up to about 1-2 cm in diameter. These spots or lesions may be differentiated from those of powder scab by the absence of powdery mass released from the ruptured skin.

Control

Since the pathogen is both tuber as well as soil borne, it is necessary to use disease free seed tubers to reduce the incidence. Green manuring before planting potatoes reduces the disease. Irrigation of the crop at regular intervals to keep the soil moist, starting from tuberization can effectively check the disease.

6. **Charcoal rot**

Charcoal rot of potato is common during the hot dry months in late season crops in Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Orissa and parts of Maharashtra. High soil temperature during March-April (late season crop) is conducive for the development of the pathogen. The causal organism of this disease is a fungus *Acrophomina phaseoli*.

The disease may appear as charcoal tuber rot, dry tuber rot or as stem blight. The tuber symptoms resemble those of late blight, although the lesions are darker in colour and less moist. Most infection centres are at the lenticels but some tubers may show stem end rot. Around the lenticels, black areas appear and slowly spread allover the tuber surface. Inside the tuber also the flesh shows blackening. After heavy rains the entire tuber may decay as a result of invasion by soil saprophytes which cause soft rot. In dry rots black lesions on the surface are sunken and underneath them a: cavity is formed due to destruction of tissues.

Control

Only disease-free tubers should be used as seed. Seeds obtained from hills are free from this pathogen. Early maturing varieties such as Kufri Alankar, Kufri Chandramukhi are less prone to this disease. Whenever the soil temperature rises (above 20"C), the field should be irrigated to bring down the temperature. Seed tubers may be treated with organo-mercurial fungicides such as Agallol or Aretan before storage. However, such treated tubers should not be eaten.

7. **Bacterial wilt and brown rot**

This disease is caused by bacterium *Pseudomonas solanacearum*. This is a dreaded disease of potato in many areas of India. It is endemic in the mid hills, plateau region and West Bengal. The disease has been reported on potato, tomato, brinjal and chilies. Losses due to this disease range from 10 to 70 per cent. Very often it is associated with root knot nematode and the~ the losses are very severe.

The characteristics symptom of the disease is stunting, yellowing of foliage, wilting and finally collapse of the entire plant. The brown rot refers to the browning of vascular bundles. This browning is often visible from the surface of the infected stems as dark patches or streaks. A brown ring is formed in the tubers due to discolouration of vascular bundles: The skin of the infected tubers is often discoloured. In severely affected tubers, the eyes are blackened. If the infected stem or tuber is cut across and squeezed, grayish white bacterial ooze comes out of the vascular ring.

Control

Seed from brown-rot free crop should be used. The plots which show the Incidence of brown rot may be put under maize or cereal cultivation preferably for three subsequent seasons. Rain or irrigation water should not be allowed to flow from infested plots to the non-infested or mildly infested plots. In the plots where only isolated plants show wilting, the soil in the radius of 1.0 metre around the infected plant should be treated with 10% Formaline or 0.5% copper sulphate or 0.5% Streptocycline solution upto a depth of 30 cm just after the harvest. Infected plant material or rotten tubers should never be left in the plots. Collect such material carefully and burn in an isolated comer of the field. The seed tubers should be selected only from healthy plants and treated in 0.02% Streptocycline solution for 30 minutes.