Diseases of Potato :-

1. Late blight of potato: Phytopthora infestans

Introduction:

Usually infection starts in 6 weeks old plants

First reported from Andes mountains of South America

In India, the disease was first reported in Darjeeling district in India (1880)

Symptom:

It affects leaves, stems and tubers. Water soaked spots appear on leaves, increase in size, turn purple brown& finally black colour White growth develops on under surface of leaves. This spreads to petioles, rachis and stems. It frequently develops at nodes. Stem breaks at these points and the plant topples over. In tubers, purplish brown spots and spread to the entire surface on cutting, the affect ed tuber show rusty brown necrosis spreading from surface to the center.

Pathogen (etiology):

The mycelium is endophytic, coenocytic and hyaline which are inter cellular with double club shaped haustoria type. Sporangiophores are hyaline, branched intermediate and thick walled. Sporangia are thin walled, hyaline, oval or pear shaped with a definite papilla at the apex. The sporangium may act as a conidium and germinate directly to form a germ tube. Zoospores are biflagellate possess fine hairs while the other does not.

Mode of spread and survival (perpetuation):

The infected tubers and the infected soil may serve as a source of primary infection.

The diseased tubers are mainly responsible for persistence of the disease from crop to crop.

The air borne infection is caused by the sporangia.

Collateral host: Tomato (Lycopersicon esculentum), Pepper and egg plant.

Favourable conditions (epidemiology):-

RH->90% , Temp.-10-25°C and Night temperature:10°C. Cloudiness on the next day. Rainfall at least 0.1mm, the following day.

Management :-

Cultural method -

Regulatory measures

Select healthy tubers for planting

Delayed harvesting

High ridging to about 10-15cm height reduces tuber infection

The resistant varities recommended for cultivation are Kufri Naveen, Kufri Jeevan, Kufri Alenkar, Kufri Khasi Garo, Kufri Jyothi, Kufri Malar and Kufri Thangam and Kufri Moti.

Resistant sources: Solanum demissum and S. phureja

Tuber contamination is minimized if injuries are avoided at harvest time and storing of visibly infected tubers before storage.

Chemical method

Metalaxyl (0.1%) or Mancozeb (0.25%) or chlorothalonil (0.2%) or Bordeaux mixture (1%) can be applied at 7 to 10 days intervals in the hills and 10 to 15 days intervals in plains.

Dip sprouted tubers in 0.2% metalaxyl for 30 min.

2. Early blight: Alternaria solani

Symptoms

It is present in both hills & plains. Brown-black necrotic spot-angular, oval shape characterized by concentric rings .Several spot coalesce & spread all over the leaf. Shot holes on fruits.

Pathogen (etiology)

Hyphae are light brown or olivaceous which become dark coloured with age. The hyphae are branched, septate and inter and intra cellular. The coniophores emerge through the stomata or between the epidermal cells. The conidia are club shaped with a long beak which is often half the long of the whole conidium. The lower part of the conidium is brown while the neck is colorless. The body of the conidium is divided by 5 – 10 transverse septa and there may or may not be a few longitudinal septa.

Favourable condition (epidemiology)

Dry warm weather with intermittent rain. Poor vigor.

Temperature: 25-30°C. Poorly manured crop.

Mode of spread and survival (perpetuation):-

The conidia and the mycelium in the soil or in the debris of the affected plants can remain viable for more than 17 months. These conidia or the new conidia found on the overwintered mycelium bring about the primary infection of the succeeding potato crop.

Secondary infection is more important in the spread of the disease. The conidia formed on the spots developed due to primary infection are disseminated by wind to long distances.

The conidia from the affected plant may also be disseminated to the adjoining plants by rain and insects.

Management :-

Cultural method-

Disease free seed tubers should be used for planting.

Removal and destruction of infected plant debris should be done because the spores lying in the soil are the primary source of infection. The variety Kufri Sindhuri possesses a fair degree of resistance.

Chemical method

Spray hexaconazole 2% SC @ 0.06% or mancozeb @ 2 g/l or chlorothalonil @ 2 g/l at 45, 60 and 75 days after planting

3. Wart – Synchytrium endobioticum

Losses seen in temperate regions

In India, the disease is restricted to Darjeeling.

Symptoms :-

Host cells at the point of infection are hypertrophied

White granular swellings form on the eyes of tubers

White tumour like outgrowths, called as warts, develop on stems and tubers

As the crop matures, warts become black and rot

Infected auxillary bud or the leaf is transformed into cock’s comb like greenish yellow outgrowth.

Etiology :-

Potato wart is a serious disease, caused by a soil-borne fungus, Synchytrium endobioticum. It is an obligate parasite, which does not produce mycelium but an abundance of dissemination sporangia which are responsible for tumour formation on underground potato organs. These sporangia produce zoospores, organs of dissemination and infection.

This fungus can survive for many years (up to 30 years) in the soil in the form of a cyst (survival spores).

Mode of spread (perpetuation)

Primary Infection: Resting sporangia in soil

Secondary Infection: Zoospores dispersed by water

Favourable conditions (epidemiology)

High soil moisture

Optimum temperature of 210 C (12 to 28°C)

Slightly acidic to neutral pH

Management

Strict quarantine measures

The use of healthy certified seed tubers;

Avoiding the introduction of soil or planting material from infected areas and careful examination of introduced potato tubers;

Grow resistant varieties such as kufri Jyoti, kufri Jeevan and kufri Muthu

4. Common scab or corkey scab – Streptomyces scabies

Important in Punjab and Himachal Pradesh

Symptoms:-

Corkiness of the tuber periderm is the characteristics symptoms. 1/4 inch into the tuber surface are russette appearance. Slightly pitted on the infected tuber. Light brown to dark brown lesion appears on the infected tuber. Affected tissue will attract insects.

Small brownish and slightly raised spots on tubers

Spots enlarge, coalesce and become corky

Lesions typically possess a raised margin and slightly depressed center

Characteristic symptoms have descriptive names:

Russet scab appears on tubers as superficial tan to brown corky lesions

Pitted scab is characterized by lesions with depressions beneath the tuber surface

Raised scab appears as cushion like warty lesions

Pathogen enters through unsuberized lenticels or wounds

Pathogen (etiology)

Aerial mycelium in pure culture has of prostrate branched threads. Sporogenous hyphae are spiral in form. Conidia are produced by the formation of septa at intervals along the hyphae, which contract to form narrow isthmuses between the cells. Conidia are roughly cylindrical and hyaline.

Favourable conditions (epidemiology)

The conidia can germinate even at higher temperatures. The growth of the organisam is good in slightly alkaline medium and is checked at pH 5.2.

Mode of spread and survival

It attacks cabbage, carrot, egg plant, onion, radish, spinach and turnip. The causal organism perpetuates in soil and infects the crop every year. Infected potato tubers serve as the main source of long distance spread of the disease. The pathogen may survive passage through digestive tract of animals and hence it may spread with farm yard manure.

P.I: Soil and infected tubers

S.I: Soil, water, wind blown soil and infected tubers

Management :-

Use of disease free tubers

Crop rotation with wheat-oat or potato-onion-maize (4yrs)

Hold the soil pH at about 5.3 by addition of sulphur

Green manuring before planting potato

Dipping of infected tubers in 3% boric acid for 30 min

Soil application of PCNB

5. Bacterial ring rot of potato

Bacterial ring rot of potato, caused by the bacterium Clavibacter michiganensis subsp. sepedonicus, is a serious issue for seed potato production. The presence of the disease is one of the main reasons for rejection of seed potatoes from certification programs. This disease, if left unchecked, can spread quickly through an operation leading to severe losses.

Symptoms

Ring rot symptoms may not be noticed until later in the growing season. Affected plants stems and leaves will wilt, start yellowing, and die. Ordinarily the lower leaves will be affected first with rolled margins and a pale yellow color appearing between the leaf veins. However, the most diagnostic characteristic appears in the tubers.

The disease gets its name from the characteristic breakdown of the vascular tissue ring in the tuber. Splitting tubers in half toward the stem end reveals a yellow to brown discoloration of the vascular tissue, located approximately ¼ inch below the surface of the tuber. The discolored area often has a cheesy appearance and when squeezed a milky ooze leaks from the discolored area.

Not all tubers will show outward symptoms; however, some will have slightly sunken, dry surface cracks. The surface cracks allow the entry of other bacteria, which cause soft rots and impart the foul odor to the rotting potato. Under some conditions the potatoes may remain show no symptoms externally, especially under cool, wet growing conditions. The disease may recur during storage of infected tubers and can cause extensive losses.

Symptoms are sometimes more subtle than those described above. Splitting the tuber in half may reveal only a broken, sporadically appearing dark line or a continuous, yellowish discoloration inside the tuber. If there is any doubt, laboratory tests can be performed to confirm diagnosis of ring rot.

Disease Cycle

The bacterium, Clavibacter michiganensis subsp. sepedonicus, survives mainly in infected tubers but can also survive up to 5 years in dried slime on machinery, sacks, and other equipment even if exposed to temperatures below freezing. The ring rot bacterium does not overwinter in fields from unless infected volunteer tubers survive.

Spread of Infection:-

The bacterium enters tubers through wounds. This is important when cutting seed pieces since a contaminated knife can result in the inoculation of a large number of potatoes.

Favorable conditions:- Disease development is favored by temperatures ranging from 64 degrees to 72 degrees Fahrenheit.

Control

The only practical methods of control are to grow certified, disease-free, tested seed tubers and follow strict sanitation procedures. To eradicate the disease, the grower must follow specific plant quarantine regulations.

While cutting tuber seed pieces, frequently disinfest cutting tools in a 10 percent solution of bleach or some other disinfectant.

Disinfest all other equipment on a regular basis including planters, harvesters, grading machinery, etc.

Destroy all culled tubers. Do not leave these tubers in the field.

If ring rot was a problem in a previous year, do not replant into same ground.

6.a) Mild mosaic/Interveinal mosaic – (Potato virus X) PV X

Symptoms

Often referred as latent potato mosaic

Light yellow mottling with slight crinkling on potato plants

Interveinal necrosis of top foliage

Stunting of diseases plants

Leaves may appear slightly rugose where strains of PV Y combines

Spread

Spreads mechanically through rubbing of leaves, contact of infected plants, seed cutting knives, farm implements.

Root clubbing of healthy and diseased plants in field

Management

Disease free seed tubers for planting

Rouging of diseased plants

b) Severe mosaic – Potato virus Y (PV Y)

Also called potato leaf drop streak

Symptoms

Chlorotic streaks on leaves which become necrotic

Necrosis of leaf veins and leaf drop streak

Interveinal necrosis and stem/petiole necrosis

Plant remain stunted in growth

Rugosity and twisting of the leaves occurs in combination with PV X and PV A

Survival and spread

Infected tubers

Spread by aphids, Myzus persicae and Aphis gossypii

Management

Disease free seed tubers for planting

Rouging of diseased plants

Aphid control

c) Leaf roll – Potato leaf roll virus

Symptoms

Upward rolling of leaves, which have a stiff leathery texture

Plants stunted and have a stiff upright growth

Phloem necrosis of tubers in some varieties

Spread

Infected seed tubers or by aphids

Management

Disease free seed tubers for planting

Aphid control

Management for Viral diseases

Use virus free potato seed tubers

Rogue out the virus affected plants regularly

Control the aphid vectors by application of carbofuran 3CG @ 17 kg /ha or drench with thiamethoxam 25 WG @ 200 g in 500 lit of water per ha or dimethoate 30% EC 1.0 ml/ l or thiamethoxam 25 WG @ 2 g/10l or methyl demeton 25 EC @ 2.0 ml/l

d) Rugose mosaic of Potato- PVX+PVY

Symptoms:-

• Foliage is mottled and also severely wrinkled, puckered and markedly reduced in size.

• The margins of leaflets are rolled downwards and the entire plants is severely dwarfed.

• Lower leaves generally have black necrotic veins.

Virus : Potato virus X+ . Potato virus Y

Transmitted : Aphides (Myzus persicae)

Control measures:-

Use certified virus free tubers .

Infected plant should be removed and destroyed.

Always keep tools and equipments as clean as possible, practice crop rotation, keep the area around the plants weed free.

Control of aphids with suitable insecticides.

Crinkle of Potato - PVA+PVX

Symptoms:-

• Yellowish patches on the foliage are bigger and more prominent.

• Rusty brown spots.

• Foliage is brittle and easily broken.

Cause:-

It is caused by combination of potato virus X (PVX) and potato virus A (PVA).

Spread:-

• The disease is tuber borne.

• Sap inoculation transmits only one component PVX and aphid transmit PVA.

Control measures:-

Use of disease free tubers

Control of aphids with the use of granular insecticides eg phorate, carbofuran.

Removal of diseased plants as and when located.

De-top plants in 3rd or 4th week of December.