Tomato

Diseases

Damping Off (*Pythium aphanidermatum*):

This is one of the worst diseases of tomato occurring in the nursery. Damping off of tomato occurs in two stages, i.e. the pre-emergence and the post-emergence phase. In the pre-emergence the phase the seedlings are killed just before they reach the soil surface. The young radical and the plumule are killed and there is complete rotting of the seedlings. The post-emergence phase is characterized by the infection of the young, juvenile tissues of the collar at the ground level. The infected tissues become soft and water soaked. The seedlings topple over or collapse.

Control: Seed treatment with fungal culture Trichoderma viride (4 g/kg of seed) or Thiram (3 g/kg of seed) is the only preventive measure to control the pre-emergence damping off. Soil drenching of the affected seedlings with Dithane M45 (3 g/litre of water) helps to reduce the disease incidence.

Early Blight (*Alternaria solani*):

This is a common disease of tomato occurring on the foliage at any stage of the growth. The fungus

attacks the foliage causing characteristic leaf spots and blight. Early blight is first observed on the plants as small, black lesions mostly on the older foliage. Spots enlarge, and by the time they are one-fourth inch in diameter or larger, concentric rings in a bull's eye pattern can be seen in the center of the diseased area. Tissue surrounding the spots may turn yellow. If high temperature and humidity occur at this time, much of the foliage is killed. Lesions on the stems are similar to those on leaves, sometimes girdling the plant if they occur near the soil line. Transplants showing infection by the late blight fungus often die when set in the field. The fungus also infects the fruit, generally through the calyx or stem attachment. Lesions attain considerable size, usually involving nearly the entire fruit; concentric rings are also present on the fruit.

Control: Removal and destruction of the affected plant parts. Practicing crop rotation helps to minimize the disease incidence. Spraying the crop with Difolatan (0.2%), Dithane M-45 (0.2%) or Bavistin (0.1%) is recommended for effective disease control.

Buck Eye Rot (*Phytophthora parasitica*):

Fruit rot or buckeye rot is a serious disease in all the tomato growing areas. The disease causing the fruits to rot initially affects the fruits near the ground level. The pathogen does not affect the foliage and thus the disease is distinct from late blight. The disease appears as a greyish green or brown water soaked spot that usually occurs where the fruit touches the soil. As the spot enlarges, the surface of lesion assumes a pattern of concentric rings of narrow, dark brown and wide, light brown bands. When young green fruits are infected, they usually become mummified.

Control: In order to minimize infection, good drainage conditions should be maintained in the field. Staking plants and removing foliage and fruits upto a height 15-30 cm from ground level helps to control this disease. Spraying with Difolaton (0.3%) 4 times at an interval of 10 days effectively controls the disease.

Late Blight *(Phtophthora infestans):*

Late blight occurs when humid conditions coincide with mild temperatures for prolonged periods. If conditions are ideal for disease development, disease development is rapid causing severe economic losses. Lesions produced on the leaves are at first irregular, rather large, greenish-black and water-soaked. These areas enlarge rapidly, becoming brown, and under humid conditions, develop a white moldy growth near the margins of the diseased area on the lower surface of the leaves or on stems. The disease spreads rapidly under humid conditions, destroying quickly large areas of tissue. Lesions produced on the leaves are at first irregular, rather large, greenish-black and water-soaked. These areas enlarge rapidly, becoming brown, and under humid conditions, develop a white moldy growth near the margins of the diseased area on the lower surface of the leaves or on stems. The disease spreads rapidly under humid conditions, destroying quickly large areas of tissue.

Fruit lesions occur as large, green to dark brown lesions, mostly on the upper half of the fruit, but they may also occur on other parts. White moldy growth may also appear on fruits under humid conditions. The disease attacks the fruits a well as the leaves of the plant. Symptoms on the fruits usually begin on the shoulders of the fruit because spores land on fruit from above.

Control: Control practices include rotating fields so as not to follow potato or tomato; avoiding planting tomatoes near potatoes; using disease-free seeds and transplants.

Adopting certain prophylactic measures can also control the disease. Firstly, the seed material should be obtained from a disease free area. Before planting the seeds should be treated with Thiram (2-3 g/kg of seed). The plants must be sprayed with Captafol (2 g/litre of water) or Dithane M 45 (2 g/kg of seed) at 15 days interval, starting from 30 days after transplanting.

Fusarium Wilt (*Fusarium oxysporum f. sp. lycopersici*):

This is one of the worst diseases of tomato occurring mostly in the nurseries. The first symptoms of the disease are clearing of the veinlets and chlorosis of the leaves. The younger leaves may die in succession and the entire may wilt and die in a course of few days. Soon the petiole and the leaves droop and wilt. In young plants, symptom consists of clearing of veinlet and dropping of petioles. In field, yellowing of the lower leaves first and affected leaflets wilt and die. The symptoms continue in subsequent leaves. At later stage, browning of vascular system occurs. Plants become stunted and die.

Control: The nursery should be regularly inspected for wilt infected plants. The affected plants should be removed and destroyed. Prior to planting the beds should be drenched with Carbendazim (0.1%) and the seeds should be treated with the Thiram (2.5 kg/ha). Crop rotation with a non-host crop such as cereals helps to reduce the disease inoculum.

Septoria Leaf Spot *(Septoria lycopersici):*

The plant may be attacked at any stage of its growth. The disease is characterized by numerous, small, grey, circular leaf spots having dark border.

Control: Removal and destruction of the affected plant parts. Seed treatment with Thiram or Dithane M-45 (2 g/kg seed) is useful in checking seed borne infection. In the field spraying with Dithane Z-78 (0.2%) effectively controls the disease.

Powdery Mildew *(Leveillula taurica):*

The disease occurs severely during dry seasons. A white powdery coating of the fungal growth appears on the leaf surface. Infected leaves may be dwarfed, stiff, and narrow. The fungus progressively attacks new leaves, spreading over leaf stems, twigs, and even the fruit. Terminal growth of the affected shoot is stunted or killed. The fruit yield is reduced and the affected fruit are smaller in size.

Control: Spraying with Karathane (0.1%) or Wettable Sulphur (3 g/ litre of water) twice at an interval of 10 days helps to control the disease.

Bacterial Wilt *(Pseudomonas solanacearum):*

This is one of the most serious diseases of tomato crop. Relatively high soil moisture and soil temperature favour disease development. Characteristic symptoms of bacterial wilt are the rapid and complete wilting of normal grown up plants. Lower leaves may drop before wilting. Pathogen is mostly confined to vascular region; in advantage cases, it may invade the cortex and pith and cause yellow-brown discolouration of tissues. Infected plant parts when cut and immersed in clear water, a white streak of bacterial ooze is seen coming out from cut ends.

Control: Crop rotations, viz., cowpea-maize-cabbage, okra-cowpea-maize, maize- cowpea-maize and finger millet-egg plant are reported effective in reducing bacterial wilt of tomato.

Control: Seedling treatment with Streptocycline (1 g/40 litres of water) for 30 min protects the seedlings in the initial stages of growth.

Bacterial Leaf Spot (*Xanthomonas campestris pv. vesicatoria):*

Moist weather and splattering rains are conducive to disease development. Most outbreaks of the disease can be traced back to heavy rainstorms that occur in the area. Infected leaves show small, brown, water soaked, circular spots surrounded with yellowish halo. On older plants the leaflet infection is mostly on older leaves and may cause serious defoliation. The most striking symptoms are on the green fruit. Small, water-soaked spots first appear which later become raised and enlarge until they are one-eighth to one-fourth inch in diameter. Centers of these lesions become irregular, light brown and slightly sunken with a rough, scabby surface. Ripe fruits are not susceptible to the disease. Surface of the seed becomes contaminated with the bacteria, remaining on the seed surface for some time. The organism survives in alternatehosts, on volunteer tomato plants and on infected plant debris.

Control: Bacterial spot is difficult to control once it appears inthe field. Disease-free seed and seedlings should always be used and the crop should be rotated with non-host crops so as to avoid last years crop residue. Seed treatment with mercuric chloride (1:1000) is also recommended for control of disease. Spraying with a combination of copper and organic fungicides in a regular preventative spray program at 5 to 10 day intervals or Spraying with Agrimycin-100 (100 ppm) thrice at 10 days intervals effectively controls the disease.

Bacterial Canker *(Clavibacter michiganensis pv. michiganensis):*

Temporary and later on permanent wilting of leaflets of affected plants is observed the disease in the field. Light streaks appear at the juncture of petiole and stem extending down the internode and up the petiole. At a later stage canker like opening may appear in stem, petiole and midrib. When the stem of diseased plants is cut longitudinally, a creamy white, yellow or brown line follows the phloem. The disease appears on the green fruit as water soaked spots with a white halo. Halo is the distinguishing

character of bacterial leaf spot of tomato.

Control: Hot water treatment of seeds at 50°C for 25 minutes is effective. Seed treatment with mercuric chloride (1:1000) is also recommended for control of disease. Crop rotation with non-host crop helps in reducing the disease incidence. Soaking of seed in solution of Streptocycline (1g/40 litres of water) for 30 min protects the seedlings in the initial stages of growth.

Tomato Mosaic Virus *(TMV)*

The disease is characterized by light and day green mottling on the leaves often accompanied by wilting of young leaves in sunny days when plants first become infected. The leaflets of affected leaves are usually distorted, puckered and smaller than normal. Sometimes the leaflets become indented resulting in "fern leaf" symptoms. The affected plant appears stunted, pale green and spindly. The virus is spread by contact with clothes, hand of working labour, touching of infected plants with healthy ones, plant debris and implements.

Control: Seeds from disease free healthy plants should be selected for sowing. Soaking of the seeds in a solution of Trisodium Phosphate (90 g/litre of water) a day before sowing helps to reduce the disease incidence. The seeds should be thoroughly rinsed and dried in shade. In the nursery all the infected plants should be removed carefully and destroyed. Seedlings with infected with the viral disease should not be used for transplanting. Crop rotation with crops other than tobacco, potato, chilli, capsicum, brinjal, etc. should be undertaken.

Tomato Leaf Curl Virus *(TLCV):*

This disease is transmitted by whitefly (*Bemisia tabaci*). It is one of the most devastating diseases of tomato. Leaf curl disease is characterized by severe stunting of the plants with downward rolling and crinkling of the leaves. The newly emerging leaves exhibit slight yellow colouration and later they also show curling symptoms. Older leaves become leathery and brittle. The nodes and internodes are significantly reduced in size. The infected plants look pale and produce more lateral branches giving a bushy appearance. The infected plants remain stunted.

Control: The affected plants should be removed and destroyed. Alternate or collateral hosts harboring the virus causing this disease is removed at the time of weeding or earthing up operations to minimize the spread of the disease. Checking the white fly population can reduce the disease incidence. Soil application of granular insecticide like Furadan (1 kg a.i./ha) at the time of sowing seeds in the nursery bed checks whitefly population. Another dose of Furadan (1.5 kg a.i./ha) is given one week after transplanting. 2-3 foliar sprays with Dimethoate (0.05%) or Monocrotophos (0.05%) at 10 days intervals controls the white fly population.

The disease spread can be minimized by cultural practices like use of border or barrier cropping. Barrier crops like maize, jowar, bajra are good to protect the crop from TLCV infection. Five or six rows of these crops all around the main tomato plot should be sown at least 50-60 days before transplanting of tomato. These crops check incoming viruliferous whiteflies from entering into tomato crop.

TLCV incidence can be reduced drastically by the use of polythene mulching in the soil just before transplanting of tomato. Polythene sheets of white, blue, grey and black colours are effective. Combined application of polythene mulching and Furadan application in the soil is recommended.

Tomato Spotted Wilt Virus *(TSWV):*

The spotted wilt virus is transmitted through thrips (*Thrips tabaci*, *Frankliniella schultzi* and *F. occidentalis*). This disease is similar to streak in that it causes streaking of the leaves, stems and fruits. Numerous small, dark, circular spots appear on younger leaves. Leaves may have a bronzed appearance and later turn dark brown and wither. Fruits show numerous spots about one-half inch in diameter withconcentric, circular markings. On ripe fruit, these markings are alternate bands of red and yellow.

Control: The affected plants should be removed and destroyed. Alternate or collateral hosts harboring the virus causing this disease is removed at the time of weeding or earthing up operations to minimize the spread of the disease. Checking the population of thrips can reduce the disease incidence. 2-3 foliar sprays with Dimethoate (0.05%) or Monocrotophos (0.05%) at 10 days intervals controls the thrips population.

Tomato Bunch Top Virus *(TBTV):*

The infected plants show extensive abnormal growth with apical proliferation. The new leaves arising from the axillary buds give closely crowded bunchy appearance. The leaflet margins curl towards the tips and the surface show puckered conditions. Necrosis of leaves and stems are also characteristic symptoms. The diseased plants bear very few flowers and 1-2 very small fruit.

Control: The affected plants should be removed and destroyed. Alternate or collateral hosts harboring the virus causing this disease is removed at the time of weeding or earthing up operations to minimize the spread of the disease.

Tomato Big Bud *(TBB):*

The disease infects all the plant parts. The big bud of tomato is transmitted by leaf hopper (*Orosius argenatatus*). The first indication of infection appears at the tips of the actively growing shoots. The youngest fruit truss, instead of becoming recurved as in normal plants, assumes an upright position. The buds on the truss also point in a vertical direction, the calyx segments remain united almost to the tips, and the whole calyx enlarges to a form like a bladder with a toothed opening at the top. On pruned plants in the field, the growing points fail to develop normally.

After a short time, the axillary buds grow out, forming shoots affected in the same way as the main shoot. Simultaneously, there is a gradual thickening of the stems of the affected parts due to the formation of an abnormal tissue, In cases where the growth of the terminal buds completely ceases, the thickening of the stems may become very marked.

The disease appears initially on young developing. The affected leaves become yellow-green and roll along their margins. The size of the leaves reduces as the disease advances.

Fruit that is well developed but still green at the time of infection becomes hard and tough and colours extremely slowly or not at all.

Control: Removal and destruction of the affected plant parts is the only control measure.

Anthracnose *(Colletotrichum phomoides):*

At first, infected fruit show small, slightly sunken, water soaked spots. These spots enlarge, become darker in color, depressed and have concentric rings. Masses of the pink fruiting fungus can be seen on the surface of the lesions in moist weather. Under warm and humid conditions, the fungus penetrates the fruit, completely destroying it. The fungus persists on infected plant refuse in the soil. Fruit may be infected when green and small, but do not show any marked lesions until they begin to ripen. Fruit becomes more susceptible as they approach maturity.

Control: Control of this disease involves the use of well-drained soil, crop rotation and a preventative fungicide program is recommended.