

1.6 General symptoms of plant diseases :

Symptoms of diseases are observed on the plant either due to some peculiar characters and appearance of the visible pathogen or its structure or organs, or due to some effect as a result of interaction between the host (plant) and the parasite (pathogen).

Symptoms of plant diseases may be grouped into three categories such as *necrotic*, *atrophic* and *hypertrophic*.

I. NECROTIC SYMPTOMS—The term necrosis is used to indicate the condition in which death of organs, tissues and cells occurs as a result of the activities of parasitic and non-parasitic causal agencies. The characteristic appearance of the dead area differs with different hosts, host organs and even with different causal agencies—hence different types of necrotic symptoms are observed, such as—

(a) *Spots* : In many plant diseases, circular or angular or irregular diseased areas (lesions) develop—the tissue of such affected area dies, turns brown and dries—often the central dead area becomes surrounded by a zone of brownish, reddish or yellowish tissue. Spots are very common in leaves ; but may also occur on stems, flower-petals, fruits etc.

In many cases, the diseased area often shrinks and separates from the surrounding healthy tissues forming depression—this condition is called *shot-hole*.

(b) *Streaks or Stripes* : In some disease, the symptom appears in the form of an elongated and relatively narrow lesions on stems or leaf-veins. Such streaks or stripes are yellow or brown in colour.

(c) *Blight* : Blight means a burnt appearance—it results to sudden death of a plant or its parts (stem, leaves, blossoms etc.). The dead organ turns black or brown and may disintegrate very rapidly. The dead tissue often, becomes a slimy mass which emits bad odour. Late blight and early blight diseases of potato are good examples of blight.

(d) *Burn or Scorch, Scald* : The term burn or scorch means the rapid death and browning of large areas in the succulent organs (leaves and fruits) of plants due to effect of high temperature.

Scald is the injury to the skin of fruits and leaves of plants by scalding water ; example—sun scald of apple.

(e) *Rot* : It is the condition in which affected tissues die, decompose to greater extent and turn brown. In most cases this condition is brought about by fungi and bacteria—they dissolve the cell walls more or less completely by the help of enzymes. Rot may be regarded as a gangrene of plant tissues which affects flesh or woody plant-parts like stems, roots, fleshy leaves, flowers, buds, fruits etc. Depending upon the type of dissolution brought about by the pathogen, the rots may be grouped into soft rot, wet rot and dry rot. Rots may also be designated according to the plant organs attacked and as such rot may be called root-rot, foot-rot, leaf- or stem-rot, fruit-rot etc.

(f) *Canker* : Canker is a sunken necrotic lesion formed in the bark or cortex of the stem, specially of woody plants. Lesions in this disease are mostly large and often margined. The surface may be smooth or rough and is usually sunken or slightly swollen. In some cases only the superficial cell-layers are affected, in others all the tissues except fibres are destroyed. The dead bark, in many cases, splits and peels away leaving the wood exposed. The affected part or the entire plant may be killed finally.

(g) *Damping off* : It is a disease, in which rapid rotting of the stems of seedlings near the soil surface takes place, so that upper portions topple down and die.

(h) *Die-back* : It is a symptom resulting from the dying of stem or branches from the tip backwards.

(i) *Wilt* : Here the entire plant dies or wilts. Wilting may be the result of injury to the root system, to the partial or complete blocking of vascular system or to toxic substances secreted by the pathogen and carried to delicate cells with water. Owing to wilting disease, the leaves and other succulent plant parts lose their turgidity, become flaccid and droop.

(j) *Blotch* : This symptom consists of a superficial discolouration of fruits or leaves ; here a slight necrotic injury of the epidermal cells is observed by the presence of the pathogen.—Example—Sooty blotch disease of apple.

(k) *Exudations* : Viscid masses—composed mainly of bacteria (in bacterial diseases) or the spores of fungi combined with the juices from the hosts forms drops of various size and colour or as thin smears over the surface of the lesion.

(l) *Colour changes* : Change of colour from the normal i.e. discolouration of host plants is one of the most common symptoms due to the effect of a disease. Some common examples are :—yellowing of plant parts (stems, leaves, fruits etc.) containing chlorophyll which occurs in the form of streaks, rings or spots ; different shades of browning of plant organs ; silvery green or ash grey luster developed on the surface of leaves and other plant organs etc.

(m) *Anthracnose* : It is a symptom where elongated and somewhat angular spots appear near the veins on the lower surface of the leaf—next those spots spread into adjacent tissue and ultimately appear on the opposite i.e. upper surface. Petioles, stems and fruits are also attacked.

II. ATROPHIC OR HYPOPLASTIC SYMPTOMS—In many diseases, the growth and development of the entire plant or the affected plant-parts become very slow due to either abnormal cell division (*hypoplasia*) or degeneration of the cells. Hence stunting or dwarfing symptom owing to inhibition of growth is the ultimate result of the disease. Atrophic symptoms may be grouped into following types :

(a) *Variiegation*—Variegated i.e. patterned white areas in leaves and other plant-organs are formed due to failure in chlorophyll synthesis in some cells. But this symptom is often hereditary.

(b) *Vein-clearing* : This symptom is observed in case of virus infection. The leaf-veins become transparent due to the failure of the green colour.

(c) *Chlorosis* : The plant as a whole or partially become pale green in colour than normal green. In this type, yellowing is due to disturbances caused by fungal, bacterial and viral diseases.

(d) *Mosaic* : This symptom is commonly found in leaves, but also noted in other plant-parts. Here the light green areas alternate with darker green areas in various patterns forming mosaic appearance.

(e) *Abortion* : In this symptom, the development of organs is checked after partial differentiation.

(f) *Rosetting* : In this case, the internodes of stem or branch fail to elongate normally so that leaves become crowded into a rosette structure.

(g) *Dwarfing* : Due to subnormal development, the plant or plant-organs become undersized.

(h) *Wrinkling* : In this symptom, the mosaic structure appears which is due to the failure of the chlorotic areas to develop normally and at the same time due to overgrowth of green areas.

III. HYPERTROPHIC OR HYPERPLASTIC SYMPTOMS—The most apparent effect in some diseases is the overgrowths of one or more plant-organs or of some parts of them—this is due to the result of stimulation of the host tissue to excessive growth. The overgrowth may be brought about by either or both of the two processes such as *hyperplasia* and *hypertrophy*; the former is the abnormal increase in the size of a plant-organ due to increase in number of cell as a result of excessive cell division, while in hypertrophy the increased size of the organ is due to increase in the size of cells. In some cases hyperplasia and hypertrophy take part in abnormally increased size of plant organs. There are different symptoms of disease caused by both parasitic and non-parasitic causal organisms and which are known by different terms such as :

(a) *Galls* : These are fleshy or woody and more or less globose, elongated or irregular-shaped malformation. Smaller galls are generally termed tubercles, warts etc. while larger galls are termed knots, exoescences etc.

(b) *Curl* : Abnormal arching, curling, twisting or distorting of shoots or leaves—this is due to overgrowth in tissues in localised areas of such plant organs.

(c) *Scab* : This term refers to roughened, slightly raised, more or less circular or crust-like lesions developed in fruits, leaves, stems, tubers etc.

(d) *Pocket or Bladder* : In this type of symptom, fruits are usually enlarged, distorted, often hollowed and mummified considerably.

(e) *Witches' Broom* : In this type, numerous slender branches arise parallelly from an enlarged axis in close clusters like a broom.

(f) *Hairy root* : This is the development of numerous abnormal fine fibrous roots in compact clusters.

(g) *Intumescence* : These are small, wart-like epidermal swelling or eruption consisting of parenchyma cells.

(h) *Alteration* : This symptom is exhibited by the entire floral axis or by the flowers only. In case of sugar-cane smut disease, the floral axis of sugar-cane plant is transformed into a black, dusty and whip-like structure.

(i) *Restoration* : In this case complete development of normally rudimentary organs into fully developed organ takes place when attacked by parasitic fungi.

(j) *Heterotrophy* : It is the development of normal organs or tissues in an abnormal location. Example—the transformation of flowers into green leafy structures (*phylloidy*) in green ear disease of bajra, the development of potato tubers on the stems above the ground etc.

(k) *Blisters* : Numerous white blister-like pustules are formed on the leaves of cruciferous and other plants—such pustules break open and expose powdery masses of spores.

(l) *Proliferation* : A rapid and repeated production of new cells, tissues or organs after they have reached the stage at which their growth normally stops.

(m) *Restoration of plant disease control* :