

PLANT DISEASE SYMPTOMS

ENDEMIC: a disease that exists permanently in a particular region or population.

Malaria is a constant worry in parts of Africa.

EPIDEMIC: An outbreak of disease that attacks many peoples at about the same time and may spread through one or several communities.

PANDEMIC: When an epidemic spreads throughout the world.
e.g. Covid-19 caused by Corona virus



Symptoms of disease include

1. Death and destruction of host tissue
2. wilting, abnormal growth
3. Differentiation and discoloration of host tissue.

NECROTROPHS

1. Secrete enzymes that kill host tissue,
2. Extract nutrients from the cells and then live in the dead tissue
3. The necrotic lesions caused by pathogens can be localized or extensive.
4. Local necrotic [the death of cells, often accompanied by black or brown darkening of the tissue] **lesions** appear as discrete necrotic areas, while extensive, or spreading lesions spread until the whole organ or plant is killed.

Wilting

1. Occurs when water loss is greater than water intake.
2. It results from either:
 - a. Interference with water and nutrient absorption at the roots.
 - b. Interference with water conduction within the plant (i.e. infection of the vascular tissue), or loss of control of transpiration.

Abnormal growth and differentiation:

1. Results from deviation from the complex balance of interrelated reactions that take place in plants.
2. Parasites can alter the **hormonal balance** in plants causing an abnormal increase in the size or number of cells, resulting in abnormal growth and differentiation, for example, the formation of galls.

Discoloration

1. Tissue is most commonly by **chlorosis** or mosaics of leaves, both of which can have a number of causes.
2. Anything that interferes with the production of chlorophyll causes leaves to turn yellow, or chlorotic.
3. Mosaicism is a symptom of many virus infections and is characterized by alternating light and dark green areas on the leaves.

COMMON SYMPTOMS OF PLANT DISEASES

Blight

A



disease characterized by widespread death of plant tissue.

A general, extensive and rapid killing of leaves flowers and twigs

Canker

A sunken necrotic lesion often of a main stem, branch or root.










Damping-off

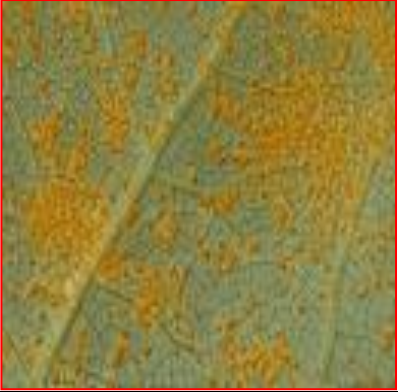



Collapse and rot of seedlings near soil level before emergence or soon after emergence caused by *Pythium* spp., *Phytophthora* spp., *Fusarium* spp., and *Rhizoctonia* spp.



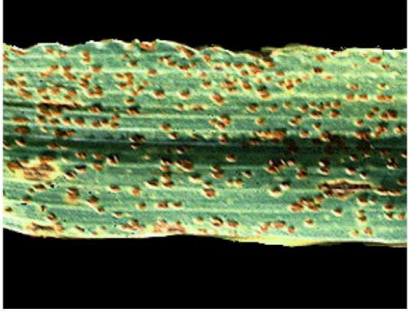




Seedlings die suddenly and fall on the ground

<p>Dieback</p>	<p>1. Partial defoliation, twig and branch death and even complete death of plants.</p> <p>2. Progressive death of shoots, branches and roots, sometimes even leading to complete death of the plant.</p> 
<p>Downy mildew</p>	<p>a serious plant disease, characterized by yellowish patches on the undersurface of the leaves, caused by the parasitic fungi of the family <i>Peronosporaceae</i>, such as <i>Peronospora destructor</i>: affects onions, cauliflower, lettuce, etc</p> 
<p>Gall</p>	<p>An abnormal growth or swelling produced as a result of pathogenic invasion.</p> <p>An abnormal growth or swelling produced as a result of PATHOGENIC invasion.</p> 

Mosaic	<p>Patchy variation of normal green color in leaves, usually light and dark green mosaic, symptomatic of many VIRAL diseases.</p>	
Powdery mildew	<p>White powdery 'bloom' on the plant surface caused by the production of fungal mycelium, conidiophores and conidia by members of the Erysiphales (powdery mildew fungi).</p>	
Pustule	<p>A blister-like SPORE mass breaking through a plant epidermis.</p> <p>Small blister-like elevations of dead host epidermis as spores of the pathogen emerge. They may be white (white rusts) or yellow, orange, brown or black (true rusts</p>	
Rot	<p>Disintegration of tissue, often caused by enzymes or toxins produced by pathogens.</p>	

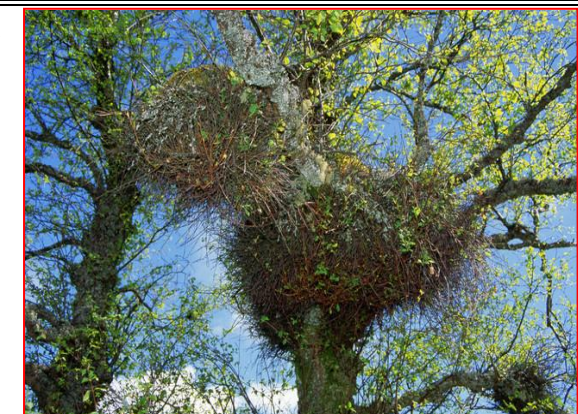
Rust	Rust-colored pustules formed by members of the Uredinales (rust fungi).	
Scab	A discrete, superficial roughened lesion.	
Smut	A disease characterised by black spore masses on leaves, stems or inflorescences, caused by members of the Ustilaginales (smut fungi).	
Vascular wilt	A disease in which the pathogen is confined to the vascular system of the host and in which wilting is a characteristic symptom; plants lose their turgidity and become flaccid, leaves collapse.	
<p style="text-align: center;">Necrosis</p> <p style="text-align: center;">Death of plant tissue, which often becomes blached, and brittle</p>		


Leaf spots	Well defined lesions of limited extent.	
Shot holes	When the dead tissue of a leaf spot falls away as a characteristic feature of disease.	
Stripe	Narrow elongated lesion	<p>Barley leaf rust (<i>Puccinia hordei</i>)</p> 
Blotch	Large, irregular spots or blots on leaves, shoots and stem	




Wilting	<p>Drooping of foliage and tender shoots of plants caused by interference with the normal movement of water within the plants. In pathological wilts, the lower leaves generally wilt first.</p>	
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ABNORMAL ENLARGEMENT IN PLANT TISSUES

This results from increase in size (hypertrophy) and/or number of cells (hyperplasia).

Witches' broom:	<p>Broome like growth caused by dense clustering of branches of woody plants.</p>	
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Galls	<p>Swelling produced on plants as a result of infection by certain pathogens.</p>	
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Canker	<p>The area of necrosis caused by a pathogen becomes surrounded by successive layers of cork cells.</p>	
Scab	<p>Roughened, crust like diseased area on the surface of a plant organ. The development of cork layers is less conspicuous than in canker.</p>	
Root Knots	<p>Galls caused by nematodes in roots especially of vegetable crops</p>	

REDUCTION IN SIZE**Stunting:**

The whole plant becomes smaller than the normal due to disease

**Smalling of leaves**

The leaves of affected plants remain smaller than the normal ones




UNUSUAL DEVELOPMENT OR TRANSFORMATION OF ORGANS**Smut:**

Plant parts especially grains are replaced by soot like spore masses.

**Ergot:**

Grains are replaced with dark hard bodies of fungus hyphae.



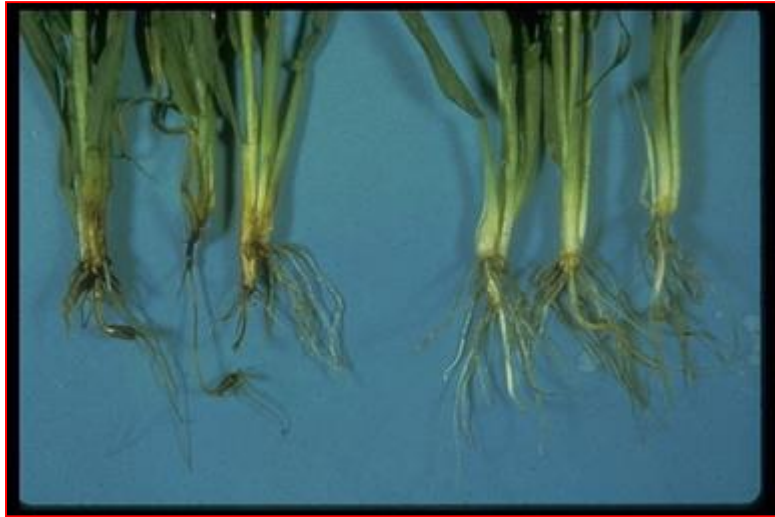
Fruit mummies	Diseased fruits dry out rapidly and become hard or mummified due to fungus growth.	
DISINTEGRATION OF TISSUE		
Wet rot:	Disintegration of diseased tissues, especially succulent parts, accompanied by a release of cell fluid.	
Dry rot	Disintegration of plant tissues, which crumble to a dry mass.	

Wood rot

Wood or trees are rotted by the fungus. When lignin component of the wood is broken down by the fungus, it results into a **white rot** and when the cellulose component of the wood cell walls is broken



down, it results into a **brown rot**.

Root and Foot rot

Rotting and shredding of cortical tissue of the roots and lower part of the stem. First signs of root and foot rot appear in the form of wilting of shoot. Plants with root rot can generally be pulled out of the soil very easily.

GUMMOSIS:

In certain diseases of trees, there is an excessive gum formation.



	description and causes	examples
pre necrotic	symptom expression that precedes the death of cells or the disintegration of tissues	
water-soaking	a water-soaked, translucent condition of tissues caused by water moving from host cells into intercellular spaces	late blight lesions on potato and tomato leaves; bacterial soft rot of fleshy vegetables
wilting	temporary or permanent drooping of leaves, shoots, or entire plants from lack of water	bacterial wilt of cucumber; <i>Fusarium</i> wilt of tomato
abnormal coloration	yellowing, reddening, bronzing, or purpling in localized areas of leaves where chlorophyll has been destroyed; may be due to a variety of causes	cabbage and aster yellows; halo blight of beans; potassium or phosphorus deficiency
	the presence of two or more colours in leaves and flowers due to a genetic abnormality is called variegation; viral infection results in "flower breaking"	tulip mosaic
necrotic	localized or general death of cells or disintegration of tissues	
blast	sudden blighting or death of young buds, flowers, or young fruit; failure to produce fruit or seeds	<i>Botrytis</i> blight of peony buds; oat blast
bleeding	flow of sap, often discoloured, from a split crotch, branch stub, or other wound; usually	bleeding canker of beech, dogwood, and maple

	accompanied by an odour of fermentation	
blight	sudden or total discoloration and killing of large numbers of blossoms, leaves, shoots, or limbs or the entire plant; usually young tissues are attacked; the disease name is often coupled with the name of the host and the part attacked—blossom blight, twig blight, tip blight	fire blight of pome fruits; <i>Diplodia</i> or <i>Sphaeropsis</i> tip blight of conifers
canker	a definite, dead, often sunken or swollen and cracked area on a stem, limb, trunk, tuber, or root surrounded by living tissues	anthracnose of sycamore and brambles; <i>Nectriac</i> canker of hardwoods; fire blight of pome fruits
damping-off	decay of seed in soil, rapid death of germinating seedlings before emergence, or emerged seedlings suddenly wilting, toppling over, and dying from rot at or near the soil line	preemergence damping-off and postemergence damping-off; both are common in seedbeds
dieback	progressive browning and death of shoots, branches, and roots starting at the tips	winter injury; wet soil; excess soil nutrients; girdling cankers; stem or root rots; nematodes
firing	drying and dying of leaves	nitrogen or potassium deficiency in corn; <i>Verticillium</i> wilt of eggplant
fleck	a small, white to translucent spot or lesion visible through a leaf	ozone injury to many plants; necrotic fleck of lily
mummification	final stage in certain fruit rots, in which the dried, shriveled, and wrinkled fruit is called a "mummy"	brown rot of stone fruits; black rot of apple
net necrosis	an irregular crisscrossing of dark brown to black lines giving a netted appearance	in potato tubers of plants with virus leaf roll

pitting	small dead areas within fleshy or woody tissue that appears healthy externally; definite sunken grooves or pits are formed	virus stem-pitting in apple and peach trunks; stony pit of pear fruit
rot	decomposition and putrefaction of cells, later of tissues and organs; the rot may be dry, firm, watery, or mushy and is characterized by such names as hard rot, soft rot, dry rot, black rot, and white rot	bacterial soft rot; berry rot; bud rot; bulb rot
scald	blanching of young fruit, foliage, and shoot tissue; generally superficial	sunsald; apple and pear scald
scorch	sudden death and "burning" of large, indefinite areas in leaves and fruit	toxicity from pesticides and air pollutants; drought; wind; lack or excess of some nutrient
shot hole	dead spotting of leaves with diseased tissue dropping out, leaving small holes	bacterial spot; <i>Coryneum</i> blight of peach
spot	a definite, localized, round to regular lesion, often with a border of a different colour, characterized as to location (leaf spot, fruit spot) and colour (brown spot, black spot); if numerous or if spots enlarge and merge, a large irregular blotch or blight may develop	gray leaf spot of tomato; black spot of rose; tar spot of maple
staghead	an advanced form of dieback applied to a tree in which large branches in the upper crown are killed	oak wilt on bur oak; dwarf mistletoe on Douglas fir; <i>Armillaria</i> root rot of oak
streak	narrow, elongated, somewhat superficial necrotic lesions, with	virus streak of pea, raspberry, and tomato; Stewart's wilt of sweet corn

	irregular margins, on stems or leaf veins	
stripe	narrow, elongated, parallel, necrotic lesions especially in leaf diseases of cereals and grasses	<i>Helminthosporium</i> stripe of barley; <i>Scolecotrichum</i> brown stripe of forage grasses
hypoplastic	the underdevelopment of plant cells, tissues, or organs	
abortion	halting development of an organ after partial differentiation	ergot of rye and other grasses
chlorosis	yellowing or whitening of normal green tissue due to partial or complete failure of chlorophyll to develop	strawberry and aster yellows; genetic variegation in corn; iron deficiency of azalea
stunting or dwarfing	the underdevelopment of the plant or some of its organs	dahlia stunt or mosaic; curly top of beans; little-leaf disease of pines
rosetting	shortening of internodes of shoots and branches, producing a bunched growth habit	peach and lily rosette
hyperplastic or hypertrophic	an overdevelopment or overgrowth of plant cells, tissues, or organs; hyperplastic has come to mean an increase in number of cells, hypertrophic an increase in cell size	
abscission or cast	early dropping of leaves, flowers, or small fruits; usually associated with premature formation of an abscission (separation) cell layer	black spot of rose; early blight of tomato; apple scab
callus	overgrowth of tissues, often at margins of a canker or wound	<i>Nectria</i> canker of hardwoods; stem pitting of peach

curl	distortion and crinkling of leaves or shoots resulting from unequal cell growth of opposite sides or in certain tissues	tobacco and tomato mosaic; leaf roll of potato; peach leaf curl
epinasty	downward or outward curling and bending of a leaf or petiole	2,4-D injury to broadleaf plants; <i>Fusarium</i> wilt of tomato
fasciation, or witches'-broom	a distortion that results in a dense, bushy overgrowth of thin, flattened, and sometimes curved shoots, flowers, fruit, and roots at a common point; usually due to adventitious (abnormally located) development of organs	witches'-broom of hackberry; hairy root of apple; leaf gall or fasciation of geranium (see also <i>Rosetting</i> under <i>Hypoplastic</i> in this table)
metamorphosis or transformation	development of more or less normal tissues or organs in an abnormal location	crazy-top of corn and sorghum; formation of aerial potato tubers
proliferation	continued development of an organ after it would normally stop growing	adventitious shoots in China aster and chrysanthemum from aster yellows mycoplasma
russeting	usually a brownish, superficial roughening or corking of the epidermis of leaves, fruit, tubers, or other organs; often due to suberization (cork development) of cells following injury	spray or weather injury to apples; sweet potato scurf
scab	roughened to crustlike, more or less circular, slightly raised or sunken lesions on the surface of leaves, stems, fruit, or tubers	apple, peach, and cucumber scab; common scab of potato
gall, knot, or tumefaction	formation of local, fleshy to woody outgrowths or swellings; the outgrowth is	crown gall; black knot of plum; <i>Fusiform</i> gall rust of pine; nematode galls

often composed of
unorganized cells

Signs

Besides symptoms, the diagnostician recognizes signs characteristic of specific diseases. Signs are either structures formed by the pathogen or the result of interaction between pathogen and host—e.g., ooze of [fire blight](#) bacteria, slime flux from wetwood of elm, odour of tissues affected with bacterial soft [rot](#). See the table for the most frequently encountered signs of pathogen presence and examples of organisms producing them.

*The structures listed are formed by the pathogen.

sign	description	examples
acervulus	a shallow, saucer-shaped fungal structure that bears asexual spores (conidia); it is usually formed below the cuticle or epidermis of leaves, stems, and fruits, later rupturing the surface and exposing its spore-bearing surface	anthracnose of muskmelon and tomato; <i>Marssonina</i> leaf spot and twig blight of poplar
apothecium	a disk-, saucer-, or cup-shaped fungal structure that produces sexual spores (ascospores); it is often stalked and fleshy	brown rot of stone fruits; <i>Sclerotinia</i> white mold of fleshy vegetables
cleistothecium	a speck-sized, black fruiting body completely enclosing sexual spores	many powdery mildew fungi
conidiophores	asexual fungal structures of various colours that bear conidia and appear powdery, velvety, or downy en masse; they often cover lesions of leaf, stem, or fruit	<i>Botrytis</i> blight or gray mold of many flowers; <i>Penicillium</i> mold of citrus fruit; downy mildew of grape
conk or punk	fruiting body (sporophore) of wood-rotting fungi that produces tremendous numbers of spores (up to 100 billion per day); conks are usually large and woody and are found on tree stumps, branches, or trunks	<i>Fomes</i> and <i>Polyporus</i> wood rots of hardwoods and conifers
mushrooms (toadstools)	fleshy, umbrella-shaped fruiting bodies of wood-decay fungi	<i>Armillaria</i> and <i>Clitocybe</i> root rots

mycelium	the vegetative body of a fungus, which is composed of a mass of branched filaments (hyphae) often interwoven into a feltlike or woolly mass	<i>Rhizopus</i> soft rot of sweet potato and leak of strawberry; <i>Sclerotinia</i> white mold of beans
nematode cysts	round to lemon-shaped, speck-sized bodies, white to brown in colour, are diagnostic for cyst nematodes; they are often evident on the root surface	sugar beet, soybean, and clover cyst nematodes
odours	the process of host colonization and many pathogens give off characteristic odours	bacterial soft rot; stinking smut or bunt of wheat; slime flux of elm
ooze or exudate	droplets of bacteria or fungal spores, usually mixed with host cell decomposition products, found on surfaces of lesions	ooze from fire blight; scab on cucumber fruit; cut stem of cucumber affected with bacterial wilt
perithecium	speck-sized fungal fruiting body that produces large numbers of sexual spores; perithecia are dark-coloured, round to flask-shaped, usually partially buried in diseased tissue; they resemble pycnidia	apple and pear scab; <i>Gibberella</i> stalk and ear rot of corn
powdery mildew	white, powdery to mealy, superficial growths of mycelia and conidiophores on surfaces of leaves, stems, flowers, and fruit	powdery mildew diseases of bluegrass, phlox, zinnia, and rose (see also <i>Cleistothecium</i> , this table)
pycnidium	speck-sized fungal fruiting body that produces large numbers of asexual spores (conidia); pycnidia are dark-coloured, round to flask-shaped, usually partially buried in diseased tissue; they resemble perithecia	<i>Septoria</i> leaf spots; <i>Diplodia</i> stalk rot of corn
rhizomorphs	cordlike or rootlike strands, composed of a bundle of closely intertwined hyphae, by which certain fungi make their way through soil and over or under bark of woody plants	<i>Armillaria</i> and <i>Clitocybe</i> root rots; <i>Sclerotium rolfsii</i> stem rot of peanuts

sclerotium	brown to black, compact, hard resting body of certain fungi with a rindlike covering; the size varies from a fly speck to a large sweet potato depending on the fungus forming it	ergot of rye; onion white rot; <i>Verticillium albo-atrum</i>
seed	dodder seed is a sign of this parasitic flowering plant when found in clover or alfalfa seed	dodder (<i>Cuscuta</i> , about 170 species)
sorus (pustule)	a compact mass of spores, or a cluster of sporangia (spore-bearing structures), produced in or on the host by fungi causing such diseases as white rust, smut, and true rust; before rupturing, the sorus is normally covered by host epidermis	white rust of crucifers; corn and bluegrass smuts; black stem rust of cereals
spores	microscopic, usually single- or few-celled reproductive bodies of fungi corresponding in function to seeds of higher plants; spores vary greatly in size, shape, and colour; they are asexually produced or result from sexual processes; asexual spores may be formed directly from vegetative hyphae but often are produced in special fruiting structures (e.g., acervulus, coremium, pycnidium, and sporodochium)	
sporodochium	a cushion-shaped stroma covered with conidiophores bearing asexual spores; found scattered in leaf, stem, and fruit lesions	<i>Cercospora</i> leaf spot of celery and sugar beet; brown rot of stone fruits; <i>Fusarium</i> blight of bluegrass
stroma	a crustlike or cushionlike mass of fungal hyphae often intermingled with host tissue on or in which spores are produced—usually in reproductive bodies	tar spot of maple and sycamore
synnema or	a tight cluster of erect	Dutch elm disease; oak wilt;

coremium

conidiophores forming an
elongated column on which
asexual spores are borne

black rot of sweet potato