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Index of Nursery Pests

This index lists the pests mentioned in the numbered chapters. It includes scientific names of the pathogens and insects, as well as common names of diseases; insects; other biotic pests such as mammals; and environmental factors, such as frost. The number(s) after the name of the pest refers to the **chapter(s)** where information can be found.

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red (<i>P. resinosa</i>).....	3, 8, 16, 17, 21, 22, 32, 37
rough-barked Mexican (<i>P. montezumae</i>)	8
sand (<i>P. clausa</i>)	8, 14, 46, 48
Scots (<i>P. sylvestris</i>)	1, 3, 5, 8, 16, 21, 22, 35
shortleaf (<i>P. echinata</i>).....	1, 5, 6, 8, 14, 21, 22, 49
slash (<i>P. elliotii</i>)	1, 6, 8, 14, 15, 21, 22, 31, 36, 39, 44, 46, 49
Sonderegger (<i>P. palustris</i> x <i>P. taeda</i>)	1
Southern yellow (<i>P. echinata</i> , <i>P. elliotii</i> , <i>P. palustris</i> , and <i>P. taeda</i>).....	47
southwestern white (<i>P. strobiformis</i>)	19
spruce (<i>P. glabra</i>).....	1, 8, 14
sugar (<i>P. lambertiana</i>).....	18, 19, 49
Table Mountain (<i>P. pungens</i>).....	8
Virginia (<i>P. virginiana</i>).....	1, 5, 8, 14, 21
western white (<i>P. monticola</i>).....	2, 4, 18, 19, 49
whitebark (<i>P. albicaulis</i>)	2, 18, 19
Poplar (<i>Populus spp.</i>).....	25, 26, 27, 29, 30, 48
balsam (<i>P. balsamifera</i>).....	25
white (<i>P. alba</i>).....	25
Quaking aspen (<i>Populus tremuloides</i>).....	25
Redbud (<i>Cercis Canadensis</i>)	32
Redwood (<i>Sequoia spp.</i> and <i>Sequoiadendron spp.</i>).....	35, 40, 50
coast (<i>Sequoia sempervirens</i>).....	40
giant sequoia (<i>Sequoiadendron giganteum</i>)	9, 35
Spruce (<i>Picea spp.</i>).....	3, 17, 18, 20, 22, 34, 35, 37, 48, 49, 50, 51, 56
black (<i>P. mariana</i>).....	18, 32
Colorado blue (<i>P. pungens</i>).....	17, 18
Engelmann (<i>P. engelmannii</i>).....	11, 18, 35
Norway (<i>P. abies</i>).....	18
red (<i>P. rubens</i>).....	18, 32
Sitka (<i>P. sitchensis</i>)	13, 17, 18
white (<i>P. glauca</i>)	18, 32
Sweetgum (<i>Liquidambar styraciflua</i>)	32, 47
Sycamore (<i>Platanus occidentalis</i>)	23, 28, 46, 50
Tanoak (<i>Notholithocarpus densiflorus</i>).....	40
Willow (<i>Salix spp.</i>)	24, 29, 30
Yellow-poplar (<i>Liriodendron tulipifera</i>)	23, 28, 32, 47
Yew (<i>Taxus spp.</i>).....	18, 37, 40
European (<i>T. baccata</i>).....	40
Pacific (<i>T. brevifolia</i>)	18, 40

Glossary

abiotic. Of or pertaining to the nonliving; inanimate.

abiotic disease. Disease resulting from nonliving agents.

abscise. Leaves or buds are shed following the formation of a separation layer of cells (abscission layer) in response to injury, disease or senescence.

acervulus (pl., acervuli). A small cushionlike asexual fruiting body, without a covering of fungus tissue, which produces conidia spores in a moist mass on the host tissue.

adulticide. A chemical that kills only adult insects.

aeciospore. A nonrepeating, asexual spore, usually orange or yellow, produced by some rust fungi. Aeciospores are incapable of infecting the host on which it is produced.

anaerobic. Process or microorganism that occurs in the absence of oxygen.

alpha-spore. A fertile asexual spore (conidia) of fungi in the Diaporthaceae family. Spores are fusoid to oblong and can be produced with beta-spores.

anamorph. A mitotically reproducing form of a fungus, usually an asexual state of an ascomycete or basidiomycete.

anthracnose. A leaf, twig or fruit disease characterized by necrotic spots or lesions and generally caused by fungi that produce spores in an acervulus.

apothecium (pl., apothecia). A sexual fruiting body that are shaped like a cup, saucer, or wineglass that produces ascospores.

appressed. Flattened or pressed closely against a surface.

arbuscular mycorrhiza. An association between a plant root and a mycorrhizal fungus; the fungus invades the cortical cells of the root and increases the plants nutrient and water uptake in exchange for carbon.

ascomycete. A large group of fungi characterized by the formation of spores, usually eight in number, in a saclike structure called an ascus.

ascus (pl., asci). A saclike cell of an ascomycete fungus, in which ascospores are produced.

asymptomatic. Without symptoms.

ascospore. A spore produced in the sexual fruiting body of an ascomycete.

asexual state. A vegetative state or a reproductive state in the life cycle of a fungus in which nuclear fusion is absent and in which reproductive spores are produced by mitosis or simple nuclear division.

Baermann funnel. A funnel with rubber tubing; used for isolating nematodes from the soil.

basidiomycete. Member of a large group of fungi characterized by the production of external spores, usually four, on a basidium.

basidiospore. A spore produced by the sexual state of the basidiomycetes.

basidium (pl. basidia). A cell, usually terminal, in which nuclear fusion and meiosis occur and on which haploid spores (usually four) are produced.

beta-spore. An infertile spore produced together with alpha-spores by certain fungi in diaporthaceae. Beta-spores are long, slender and usually curved or bent.

binucleate. A cell with two nuclei.

biological control. The use of natural enemies to reduce or mitigate pests and their damage.

biotic. Of or pertaining to a living organism.

blastospore. A fungal spore that is produced by budding.

blight. A plant disease that causes rapid death or dieback of a plant or part of a plant.

blotch. A large, irregular necrotic area on a leaf or fruit.

borer. Insect or insect larva that tunnels within the wood of trees.

brood. All individuals that hatch at approximately the same time from eggs laid by one set of parents.

broom. An abnormally dense mass of host branches and foliage, in which the typical growth pattern is replaced by a disordered cluster of foliage at the branch tips.

bug. Any insect of the order Hemiptera characterized by sucking mouthparts and two pairs of wings.

callus. A protective tissue of thin walled cells developed around the edges of wounds or necrotic lesions.

cambium. The layer of cells that lies between and gives rise by cell division to the secondary xylem(wood) and the secondary phloem (inner bark).

canker. A well defined, relatively localized necrotic lesion primarily of the bark and cambium.

casting. Premature loss of leaves or needles.

caterpillar. The elongated wormlike larva of a butterfly or moth.

causal agent. An organism, such as a fungus, bacterium, or virus, which produces a disease.

chasmothecia. A spherical ascocarp that produces ascospores.

chlamydo-spore. A thick-walled asexual resting spore formed directly from hyphal cells; typically formed by many soilborne fungi.

chlorosis. An abnormal yellowing of the foliage.

chlorotic. Abnormal yellowish.

clone. All descendents derived from a single individual by asexual reproduction, or parthenogenesis.

cocoon. An envelope, often largely of silk, which an insect larva forms around itself as protection for the pupal stage.

coelomycetes. A fungus that produces conidia within a fruiting structure. Are anamorphs of ascomycetes, or have no known sexual state.

coenocytic. A mycelium where the hyphae lack septa.

Glossary

collar rot. Rotting of the stem at or near the ground or soil line.

colonize. To establish an infection within a host or part of a host.

complex diseases. A disease caused by the interaction of two or more pathogens.

conidiophore. A specialized hypha that produces asexual spores called conidia.

conidium (pl., conidia). An asexual spore of a fungus typically produced at the end of a specialized hypha called a conidiophore.

cortex. The primary tissue found between the epidermis and the stele of a stem or root.

cotyledon. The food-storing portion of an embryo; also known as the seed leaf.

cover crop. A crop, natural or introduced, that is grown alternately with the main crop. Used to prevent erosion and to improve soil characteristics.

cull. A seedling that is rejected because it does not meet certain specifications.

cultural practices. A general term for those routine nursery operations required to help seedling growth, such as irrigation, weeding, plowing, etc.

cuneate. Wedge-shaped and more narrow at one end.

cuticle. A thin, waxy layer on the outer wall of epidermal cells.

damping-off. A disease of germinating seed and seedlings characterized by mortality prior to emergence (preemergence) or the collapse of the seedling stem at ground level immediately after germination (postemergence).

decay. The decomposition of plant tissue by fungi and other microorganisms.

decline. The gradual reduction in health and vigor of a plant.

desiccation. An excessive loss of moisture; drying out.

dieback. The progressive dying of the stem and branches from the tip downward.

disease. An unfavorable change in the function or form of a plant, caused by pathogenic agents, environmental factors, or a complex of factors.

disease cycle. The chain of events involved in disease development, including the stage of development of the pathogen and effect of the diseases on the host.

distal. Near or toward the free end of any appendage; that part of a segment farthest from the body.

DNA. Deoxyribonucleic acid: a nucleic acid that makes up chromosomes; contains genetic information.

echinulate. Having many small spines.

ectomycorrhizae. A type of mycorrhizal association in which the fungal component grows between and/or external to the cortical cells of the plant root.

ectoparasite. A parasite that occurs and feeds outside its host.

ELISA. Enzyme-linked immunosorbent assay used to identify a specific protein, especially an antigen or antibody; used in diagnostic tests.

emergence. The escape of a winged adult from its cocoon, pupal case or nymph.

endemic. Native to the country or region; existing at low stable population levels.

endomycorrhizae. A type of mycorrhizal association in which the fungal component invades the cortical cells of the root (syn. arbuscular mycorrhizae).

endoparasite. A parasite that lives within its host.

entomophagous. Feeding on insects.

epidemic. Pertaining to a disease that has built up rapidly and reached injurious levels.

epidemiology. Factors influencing initiation, development and spread of disease.

epidermis. The outermost layer of cells on the primary plant body.

ellipsoid. Shape of an object with cross-sections that are either oval or circular.

exotic. Introduced from another country or area.

exudate. Matter that oozes out or is secreted.

facultative parasite. An organism that is normally saprophytic but that is capable of living as a parasite.

fallow. Cultivated land allowed to lie idle or unplanted during the growing season.

field capacity. The maximum amount of water a soil can hold against the force of gravity.

filiform. Long and slender; threadlike.

flaccid. Limp or nonturgid.

flag. On a living plant, a conspicuous dead branch with the foliage attached.

frass. Insect excrement and refuse.

fruiting body. Fungal reproductive structures that produce spores.

foci. Central points from which a disease develops or in which it localizes.

forma specialis (pl., formae speciales). An intraspecific population of plant pathogenic species distinguished by host preference, but not morphologically distinguishable from other members of the species.

fumigation. Application of vapor or gas, especially for the purpose of disinfecting or destroying pests.

fungus (pl., Fungi). An undifferentiated plant that lacks chlorophyll and conductive tissues.

Fungi Imperfecti. A group of miscellaneous fungi that lack a known sexual state.

fusiform. Spindle-shaped; tapering toward each end.

gall. An abnormal swelling on a plant caused by certain fungi, bacteria, insects, or nematodes.

gallery. Passage made in wood by an insect.

gametophyte. Stage in the life cycle of an organism bearing or producing the sexually reproductive structures.

geniculate. Bent abruptly at an angle, like a knee.

genotype. The genetic composition of an organism.

germ tube. The hypha produced by a germinated fungus spore.

girdle. To destroy or remove the tissue in a ring around a stem, branch, or root, causing a disruption of the xylem and the phloem.

globose. In the shape of a globe or ball.

glomalin. A sticky glycoprotein produced by arbuscular mycorrhizae.

host. The plant or animal that affords nourishment to a parasite.

host range. All hosts that a particular pathogen or insect attacks.

host-specific. A term used to describe pathogens or insects that attack only certain species of hosts.

hyaline. Transparent; having no color.

hypha (pl., hyphae). One of the filamentous threads that make up the fungus body.

hypocotyl. That part of the axis of a developing embryo just below the attachment of the cotyledons.

imperfect state. The anamorph or asexual stage in the life cycle of a fungus.

incite. To cause a disease.

infect. To invade and cause a disease.

infest. To attack, inhabit, or populate a thing or place.

inoculate. To place a pathogen on or in a host.

inoculum. The spores, mycelium, sclerotia, or other propagules of a pathogen that initially infects a host.

instar. The period or stage between molts in larvae, numbered to designate the various periods. The first instar, for example, is the period between the egg and the first molt.

intercellular. Occurs or grows between the cells.

intracellular. Occurs or grows within the cells.

lancet. Any piercing mouth structure.

larva (pl., larvae). The immature stage between the egg and pupa of an insect, which undergoes complete metamorphosis (egg, larva, pupa, and adult).

latent infection. An established infection without visual symptoms.

leaf spot. A leaf disease characterized by distinct lesions.

lesion. A well-defined, localized area of diseased tissue.

longicorn. An insect having antennae as or longer than the body; specifically belonging to the family Cerambycidae.

macroconidia. The larger of two types of conidia produced by certain fungi, such as *Fusarium* species.

maggot. A white to creamy larvae without legs or a well developed head capsule; in the order Diptera (flies).

mandible. Anterior pair of jaws on an insect.

microconidia. The smaller of the two types of conidia produced by certain fungi.

micron. A unit of measurement; 1/1,000 millimeter, 1/25,400 inch.

microsclerotium. Small, dense aggregate of darkly pigmented, thick-walled hyphal cells, which serve as resting structures.

mildew. A plant disease characterized by a coating of mycelium or spores or both on the surface of the affected parts.

moribund. At the point of mortality.

morphology. The external form and structure of organisms.

motile. Having the power of motion.

mycelium (pl., mycelia). A mass of hyphae that forms the vegetative, filamentous body of a fungus.

mycoflora. The fungi characteristic of a region or environment.

mycoplasma. A wall-less prokaryotic microorganism.

mycorrhiza (pl., mycorrhizae). A symbiotic association between a fungus and the roots of higher plants that aids in the uptake of nutrients by the plant.

necrosis. Death of plant cells, usually resulting in darkening of the tissue.

needle cast. A disease of conifer needles that usually results in premature needle drop.

nymph. Immature stage of certain insects having incomplete metamorphosis, (egg, nymph, and adult).

obligate parasite. An organism that can survive only in living tissue.

oospore. The sexual resting spore produced by certain fungi in the class oomycetes.

oviposit. The act of depositing eggs.

ovipositor. An external egg-laying apparatus of female insects.

parthenogenesis. Reproduction by growth of egg cells without male fertilization.

pathogen. An organism that causes a disease.

pathogenic. Capable of causing a disease.

parasite. An organism living on or nourished by another living organism.

perfect state. The teleomorph or sexual stage in the life cycle of a fungus.

periderm. The outer, protective layer of stems, consisting of the phellogen, phellum, and phellogen.

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perithecium (pl., perithecia). A closed, flask-like sexual fruiting body in which ascospores are produced. Formed by certain ascomycetes.

phellum. The suberized tissue produced by the cork cambium in the bark.

pheloderm. Secondary tissue produced by and to the inside of the cork cambium.

phialide. A cell that develops one or more open ends from which a succession of conidia emerge without increasing the length of the cell itself.

phloem. The tissues of the inner bark responsible for the transport of photosynthates.

phytotoxic. A chemical that is toxic to plants.

pionnotal. A degenerate cultural variant; a flat slimy culture with abundant conidia.

polyphialide. A phialide with more than one open end.

proleg. A fleshy abdominal leg of certain insect larvae; prolegs occur in pairs.

pseudothecium (pl., pseudothecia). Asci produced in cavities (locules) located within a stroma (usually black); resembles a perithecium.

pupa (pl., pupae). The resting, inactive stage of an insect between larva and adult.

pustule. Small blisters created by a fungus that mature into fruiting structures.

pycnidium (pl., pycnidia). A fungal fruiting body, typically flask shaped, in which asexual spores are produced.

pycnidiospore. An asexual spore produced in a pycnidium.

pycniospore. A specialized spore, produced in a pycnium by rust fungi, that functions as male gamete. Synonym: spermatium.

pycnium (pl., pycnia). A structure developed by rust fungi that produces tiny, one-celled spores which function as male gametes.

resistant. Able to withstand, without serious injury, attack by an organism or damage by a nonliving agency, but not immune from such attack.

root collar. The area where the major roots join the together with the base of the stem; root crown.

rot. See Decay.

rust. A disease caused by certain fungi in the Basidiomycetes and usually characterized by the production of large numbers of reddish (rusty) spores on foliage, branches, or stems.

saprophyte. An organism that uses dead organic material as food.

sclerotium (pl., sclerotia). A firm, frequently rounded, multicellular resting structure produced by fungi.

scorch. The sudden browning of large, indefinite areas on a leaf; caused by infection, chemical injury, or unfavorable weather conditions.

senescent. Late stage of a plants lifecycle, eventually leading to mortality.

septate. Having cross walls, or septa, that divide hyphae or spores into a number of separate cells.

septum (pl., septa). The cross walls that divide a hypha or spore into two or more distinct cells.

sexual state. The state in the life cycle of a fungus in which spores are produced after sexual fusion. Synonym: perfect state.

sign. Vegetative or fruiting structures of the casual organism on a diseased plant. Along with symptoms, signs are used to diagnose cause(s) of disease.

sporangium (pl., sporangia). A cell that contains one or more asexual spores.

spore. The reproductive structure of the fungi and other lower plants.

sporodochium (pl., sporodochia). A conidial fruiting body in which the spore mass is supported by a cushionlike mass of short conidiophores.

sporulate. To produce spores.

stage. Any definite period in the development of an insect, for example, egg and larva.

state. One spore type produced by a fungus, which produces two or more spore types during its life cycle. Sometimes referred to as stage.

stoma (pl., stomata). A pore in the leaf epidermis, surrounded by two guard cells, leading into an intercellular space within the plant.

stool. A plant from which offsets may be taken or with several stems arising together; a clump of roots or root stocks that may be used in propagation.

stroma (pl., stromata). A cushionlike body on or in which fungus fruiting bodies are formed.

stylet. A hollow protractible spear used to puncture plant or animal prey.

sublethal infection. An infection that does not result in death of the host.

susceptible. Unable to withstand, without serious injury, attack by an organism or damage by a nonliving agency.

symbiosis. A mutually beneficial association of two or more different types of organisms.

symptom. The visual evidence of disturbance in the normal development and function of a host plant, for example, chlorosis, necrosis, galls, and stunting.

systemic. Affecting or distributed throughout the whole plant.

taproot. The primary descending root of a plant from which the secondary, or lateral, roots branch.

teliospore. The sexual spore state of a rust fungus from which the basidium and basidiospores arise upon germination.

telium (pl., telia). The structure in rust fungi that gives rise to teliospores.

tendrils. Mass of spores in a gelatinous matrix, which oozes from a fruiting body in long curling strings or hornlike projections.

thorax. The second or intermediate region of the insect body bearing the true legs and wings.

translocation. The transfer of food materials or metabolites within a plant.

truncate. Cut off, a straight edged base.

urediospore. A binucleate, asexual spore produced by some rust fungi, which is capable of reinfesting the host on which it is formed. Sometimes called urediospore.

uredinium (pl., uredinia). The structure in rust fungi that gives rise to urediniospores. Sometimes called uredium.

vascular. Plant tissue that conducts water, food, and hormones within the plant.

vegetative. Concerned with growth and development, as distinguished from reproductive functions.

vesicle. A bladderlike sac, the swollen apex of a conidiophore or hypha.

viable. Capable of becoming normally active.

wilt. A type of plant disease characterized by the sudden wilting and collapse of the succulent parts of affected plants.

virulent. Capable of causing severe disease; strongly pathogenic.

sylem. The woody water-conducting tissues of stems and roots.

zoospore. A motile free-swimming spore produced by the water molds.