Orchid Pests and Diseases
Diagnosis, Treatment and Prevention

by Sue Bottom, sbottom15@bellsouth.net (Revision 1)

Common Orchid Pests

- **Plant Sap Feeding Insects**
  - Scale
  - Mealybugs
  - Thrips
  - Aphids
  - Whiteflies
- **Mites**
- **Chewing Pests**
  - Snails and Slugs
  - Caterpillars
  - Roaches and Grasshoppers
- **Ants**

Symptoms and Treatment of Sap Feeding Insects

Scale

Symptoms: Scale are sucking insects that attach to and feed on the underside of leaves, in leaf axils, on pseudobulbs and on rhizomes. They often are hidden under old leaves and pseudobulb sheaths. Severe infestations cause chlorotic areas to appear on the leaves and plant surfaces which will yellow and may darken and can cause the leaf to drop prematurely.

Varieties: The white boisduval scale is the bane of the cattleya grower's existence. Mature males are cottony white masses while the mature females lay their eggs under whitish circular shields. The crawlers are the nymph state that emerge from under the shield until they find their new home.

- Hard scale is another armored scale that ultimately forms a brown conical structure protecting the scale underneath it.
- Soft brown scale is light yellowish to dark brown with oval to circular shells appearing on leaves, flowers, flower spikes, pseudobulbs and sometimes rhizomes and roots. Soft scale produces honeydew while hard scales do not.

Symptoms and Treatment of Sap Feeding Insects
Scale (cont'd)

Treatment: If there are only a few scale, use a Q tip dipped in isopropyl alcohol or toothbrush dipped in a pesticide like Malathion, Orthene, Summer Oil or Safer Soap (used per label instructions) to physically remove scale. For more severe infestations, apply the pesticide at the crawler stage and repeat the application 2 weeks later. Be sure to spray all plant surfaces, particularly the undersides of leaves and leaf axils. A drench with one of the Bayer products containing imidacloprid will also kill them. With the Bayer product containing 1.47% imidacloprid, add 1.5 tsp into a quart of water and pour it through the mix to thoroughly drench the potting mix. The orchid will absorb the imadacloprid through the roots into the leaves and kill the scale from the inside out. Distance is an expensive insect growth regulator that will eliminate scale from your orchids.

Prevention: Remove old leaf and flower sheaths to eliminate scale hiding places and allow easy inspection. Check new plants carefully before adding to the growing area.

Symptoms and Treatment of Sap Feeding Insects

Mealybugs

Symptoms: Mealybugs are sucking insects that attack any part of the plant but tend to stay tucked away at the junction of leaf and stem. Severe infestations cause chlorotic areas to appear on the leaves, which may darken, causing the leaf to yellow and drop prematurely.

Treatment: If there are only a few mealybugs, use a Q tip dipped in isopropyl alcohol or toothbrush dipped in a pesticide like Malathion, Orthene or Safer Soap (used per label instructions) to physically remove the mealybugs. For more severe infestations, apply the pesticide and repeat the application 2 weeks later. Be sure to spray all plant surfaces, particularly the undersides of leaves and leaf axils.

Symptoms and Treatment of Sap Feeding Insects
Mealybugs (cont'd)

Treatment (cont'd): A drench with one of the Bayer products containing imidacloprid will also kill them. With the Bayer product containing 1.47% imidacloprid, add 1.5 tsp into a quart of water and pour it through the mix to thoroughly drench the potting mix. The orchid will absorb the imidacloprid through the roots into the leaves and kill the scale from the inside out.

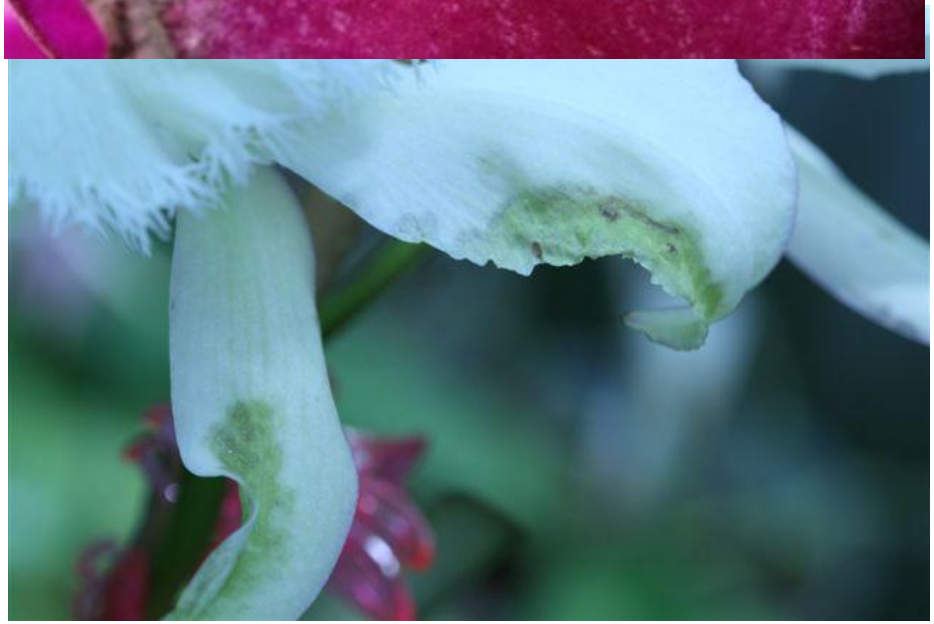
Prevention: Remove old leaf and flower sheaths to eliminate hiding places and allow easy inspection. Check new plants carefully before adding to the growing area.

Symptoms and Treatment of Sap Feeding Insects

Thrips

Symptoms: Thrips are very small sucking insects that feed on flowers and occasionally leaves and can transmit disease from plant to plant. Infested buds may not open and flowers may be deformed exhibiting water soaked spots. Leaves may appear pitted, stippled, silvery or bleached.

Treatment: Thrips are the most difficult to control of all the orchid pests. Managing thrips is difficult because they are very small and easy to overlook; they are mobile, spend part of their life cycle in the soil; prefer to feed on flower parts, where systemic insecticides do not reach them; like to hide in flowers, flower buds, and leaf buds making them hard to spot and reach with pesticides; live on a wide variety of host plants; reproduce rapidly in warm greenhouses; may be present in multiple life cycles from egg to adult; hide in plant materials and are resistant to a number of insecticides. Most adult thrips are females that lay eggs into plant tissue, particularly flowers and leaves.



Symptoms and Treatment of Sap Feeding Insects

Thrips (cont'd)

Treatment (cont'd): Plants and flowers can be sprayed with a pesticide like Orthene, Malathion or Safer Soap and the stronger chemicals like Talstar, Avid or the Bayer imidacloprid product, rotating products and applying them in accordance with label instructions. Conserve is another alternative and it can be sprayed directly on the flower. Repeat applications will be required because thrips remain hidden on the plant or can be reintroduced to the plant from other flowers in the landscape. For severe infestations, apply chemicals twice a week for three weeks.

Control: Good sanitation will help prevent infestation as will keeping plant hosts (flowers, citrus, gardenias, eucalyptus, etc.) separate from your orchids. Remove weeds, old plant debris, and growing medium from within and around the growing area. Eliminate old stock plants as these are a source of thrips and viruses. Removing old flowers may reduce the number of adults and eggs. Place flowers into a sealed bag or container. The thrips lay eggs that hatch in grassy areas so keep the grass mowed and weeds controlled.

Symptoms and Treatment of Sap Feeding Insects

Aphids

Symptoms: Aphids are sucking insects that attack buds, flowers and new growths and transmit disease from plant to plant. Buds and flower may fail to open and leaves may have a sticky deposit.

Treatment: Wash aphids away from the plant with a jet of water. Plants can be sprayed with a pesticide like Malathion, Orthene or Safer Soap using the product in accordance with label instructions.

Miscellaneous: The honeydew excreted by aphids and other sucking insects is attractive to ants and is an ideal medium for sooty mold. When sooty mold is present, inspect the plants for aphids, mealybugs, scale and mites.

pictures courtesy of the American Orchid Society

Symptoms and Treatment of Sap Feeding Insects
Whiteflies

Symptoms: Whiteflies are small, moth-like insects that attack buds, flowers and new growth. The tell tale sign of whiteflies is a cloud of tiny white insects arising from an affected plant when it is moved or disturbed.

Treatment: Plants can be sprayed with Malathion, Orthene or Safer Soap following label instructions. Repeat applications at 4 day intervals until whiteflies are no longer present.

Control: Good sanitation and elimination of weeds will help prevent infestation as will keeping plant hosts separate from your orchids.

bottom picture courtesy of the American Orchid Society

Symptoms and Treatment - Mites

Symptoms: Mites are not insects, they are members of the arachnid family. Mites typically feed on the underside of the leaves and can be found under the leaves as small, red to brown pests. A hand lens may be needed to see them. Leaf undersides may have webbing and brown splotches from the mite excrement. The upper surface of a damaged leaf may have a silvery sheen that eventually becomes sunken and turns brown. Leaves may be streaked, stippled or spotted due to lack of chlorophyll.

Varieties: There are three groups of mites infesting cultivated orchids, spider mites, flat mites and broad mites.

- The two spotted mite, or red spider mite (*Tetranychidae*), causes a chlorotic spot or stipple at each feeding site as chloroplasts are sucked out along with the plant sap. Leaves eventually develop a mottled or stippled appearance with webbing under the leaf in severe infestations.
- Flat mites, or false spider mites (*Tenuipalpidae*), including the Phalaenopsis mite, often feed on the upper surfaces of leaves creating a pock-marked appearance from empty and collapsed leaf cells. Flat mite feeding on thin leaves, especially the underside, is similar to the stippling caused by spider mites, but there is no webbing.
- Broad mites (*Tarsonemidae*) are microscopic in size and the initial symptom is chlorotic discoloration.

Symptoms and Treatment - Mites (cont'd)

Treatment: Try spraying upper and lower leaf surfaces with the home cure mixture of 1 part rubbing alcohol, 1 part 409 or Murphy's Oil Soap and 2 parts water. Plants can also be sprayed with a miticide like Avid, Talstar or Kelthane following label instructions being particularly careful to contact all the undersides of the leaves. During warm weather, new generations mature every 6 days so repeat applications will be required, perhaps 3 applications at 4 day intervals. TetraSan is an insect growth regulator that can be used to keep the egg and nymph stages from maturing.

Prevention: Mites appear during warm, dry weather. Increasing humidity and leaf wetness and, if possible, decreasing temperature help prevent infestations.

Symptoms and Treatment of Chewing Pests
Snails and Slugs

Symptoms: These mollusks will leave holes and notches in the leaves, flowers roots and may chew off the growing tips. Chewed areas may also appear on buds. These nocturnal pests travel on a layer of slime and this slime trail is evidence of their presence.

Treatment: Chemical baits may be placed in the growing area. Ash and diatomaceous earth can be spread on horizontal surfaces to create a barrier though water will deactivate it. Beer in shallow tins can be spread in the growing area and the drowned pests removed the next day. Regular applications will have to be used because watering will disperse the controls.

top pictures courtesy of www.ionopsis.com,
bottom pictures courtesy of the American Orchid Society

Symptoms and Treatment of Chewing Pests
Caterpillars

Symptoms: Caterpillars are the immature stage of moths and butterflies. While not common, they are voracious feeders that can do a great deal of damage to flowers and leaves in a short period of time.

Treatment: Caterpillars can be physically picked off the plant and destroyed, check the underside of leaves for their presence. Bacillus thuringiensis or Bt is a naturally occurring bacteria of insects, it is a safe and natural product that can be sprayed in the growing area following label instructions.

Prevention: Keep the growing area clean of free of fallen leaves and debris in which insect pests and their eggs can hide. Keep the landscape free of caterpillars.

top pictures courtesy of www.ionopsis.com,
bottom picture courtesy of the American Orchid Society

Symptoms and Treatment of Chewing Pests
Cockroaches and Grasshoppers

Symptoms: Cockroaches and grasshoppers cause damage by eating flowers, roots and new growths.

Cockroach Deterrence: Cockroach baits can be spread in the growing area or a paste of boric acid, sugar and flour mixed with water can be spread in every nook and crevice you can find. Don't get any of the stuff on the plants themselves. Another approach is to water and then flush a mix of liquid Sevin (1 tsp/gal) through the pot.

Grasshopper Deterrence: Crush the grasshoppers with a brick, shoe, etc. Partially bury jars filled with molasses and water and remove drowned victims the next day.

pictures courtesy of the American Orchid Society

Symptoms and Treatment of Pests

Ants

Symptoms: Ants cause little direct damage. Any damage present is more likely caused by a sucking pest that caused the plant to exude honeydew (basically plant sap) to which the ant is attracted.

Treatment: Pour a solution of Orthene or Liquid Sevin at 1 tsp/gallon through the pot. Do this outdoors because it should cause ants (and other hiding pests like roaches) to rapidly exit the pot. If you notice ants, check your plants for aphids, mealybugs, scale and mites and treat accordingly.

Prevention: Keep plants and the growing area free of sucking pests to minimize the honeydew attractant, although sometimes healthy vigorous orchids exude honeydew naturally.

Common Pesticides for the Treatment of Orchids

Chemical Name Active Ingredient	**Application Rate** (tsp/gal)	**Floral Damage?**	**Systemic ?**	**Mode of Action**	**Scale**	**Mealybugs**	**Thrips**	**Whiteflies**	**Aphids**	**Mites**	**Caterpillars**	**Fungus Ghats**
Bayer 3 in 1 Imidacloprid 0.47%	15.75	No?	Yes	4A Nicotinic Acetylcholine Receptor Disruptors	x	x	suppression	x	x	x		
Bayer Tree & Shrub Imidacloprid 1.47%	5 - 6	No?	Yes	4A Nicotinic Acetylcholine Receptor Disruptors	x	x	suppression	x	x	x		
Cygon 2E Dimethoate 23%	1.5	Yes	No	No	x	x	x		x	x		
Kelthane 50W Dicofol 51%	2	No	No	Unknown						x		
Malathion 50% EC Malathion 50% EC	3	No	No	1 Acetycholine Esterase Inhibitors	x	x	x	x	x			
Neem Oil Neem Oil	6	No	No	16 Desiccation or Membrane Disruptors	x	x		x	x	x		
Orthene Powder Acephate 97%	1	No	Yes?	1 Acetycholine Esterase Inhibitors	x	x	x	x	x			
Orthenex Acephate, Fenbutatin oxide	6	No	Yes?	1 Acetycholine Esterase Inhibitors	x	x	x	x	x	suppression		
Permetrol Permethrin 10%	1.3	No	No	3 Sodium Channel Blockers	x	x	x	x	x	x		
Safer 3-in-1 Sulfur 6.48% Soap 12.38%	48	No	No	1 Acetycholine Esterase Inhibitors	x	x	x	x	x	x		x
Summer Oil Spray Paraffinic Oil	2.5	Yes	No	16 Desiccation or Membrane Disruptors	x	x	x	x		x		
Thuricide Bacillus Thuringensis	2 - 4	No	No	11 Disruptors of Insect Midgut Membranes							x	x

Specialty Pesticides for the Treatment of Orchids

Chemical Name Active Ingredient	**Application Rate** (tsp/gal)	**Floral Damage?**	**Systemic?**	**Mode of Action**	**Scale**	**Mealybugs**	**Thrips**	**Whiteflies**	**Aphids**	**Mites**	**Caterpillars**	**Fungus Ghats**
Avid 0.15 EC Abamectin 2.0%	0.24-mites 0.48-thrips	No?	No	6 Chloride Channel Activators activators			suppression	suppression	suppression	x		
Conserve Spinosad 11.6%	0.36-thrips 1.2-mites	No	No	5 Nicotinic Acetylcholine Receptor receptor			x			suppression	x	
Discus Imidacloprid & Cyfluthrin												
Decathlon 20 WP Cyfluthrin 20%	0.2	No?	No?	3 Sodium Channel Blockers	crawler stage	x	x	x	x		x	x
Distance Pyriproxygen 11.23%	0.48-0.72	No	Yes	7C juvenile hormone mimics	x	suppression		x	suppression			x
Enstar II Kinoprene	0.3 - 0.6	Yes	No	7C juvenile hormone mimics	x	x	x	x	x			x
Floramite Bifenazate	.25 - 0.5	No?	No?	21A METI acaricides and insecticides						x		
Marathon II Imidacloprid 21.4%	0.10	Yes	Yes	4A Nicotinic Acetylcholine Receptor Disruptors receptor	x	x	suppression	x	x			
Mavrik Aqua Flow Fluvalinate 22.3%	0.3 - 0.6	No?	No?	3 Sodium Channel Blockers		x	x	x	x	suppression	x	
Merit 75WP Imidacloprid 75%	0.10	Yes!	Yes	4A Nicotinic Acetylcholine Receptor Disruptors receptor	x	x		x	x			
Mesurol 75 W Methiocarb 75%	1.5 - 3	?	?	1 Acetycholine Esterase Inhibitors			x		x	x		
Overture 35 WP Pyridalyl 35%	2	No	Yes	Unknown			x				x	
Preclude TR Fenoxycarb 4.8%	2 oz. aerosol can / 1500-3000 sq ft	No	Yes	7 juvenile hormone mimics	x	x	x	x	x	x	x	x
Safari 20 SG Dinotefuran 20%	0.5 - 1	No?	Yes	4A Nicotinic Acetylcholine Receptor Disruptors receptor	x	x		x		x		
Sanmite 75 WP Pyridaben 75%	1.10	No?	No?	15 Mitochodria Electron Transport Inhibitors				x		x		
Talstar Flowable Bifenthrin 7.9%	0.6 - 1.3	Yes	No?	3 Sodium Channel Blockers	x	x	x	x	x	x		x
Tristar 70 WSP Acetamiprid	0.2-0.43 scale 0.3-0.65 thrip	No?	No?	4A Nicotinic Acetylcholine Receptor Disruptors receptor		x	x	x	x			x

- Bacterial and Fungal Rots
- Leaf Spots and Foliar Blights
- Flower Spots and Blights

The symptom descriptions and prevention tips are extracted from *Orchid Species Culture*, Margaret L. and Charles O. Baker

- **Bacterial Diseases**
  - Soft and Brown Rots – *Erwinia*
  - Bacterial Brown Spot – *Acidovorax* (syn. *Pseudomonas*)
- **Black Rot** – *Pythium* and *Phytophthora*
- **Fungal Diseases**
  - Fusarium Wilt – *Fusarium*
  - Southern Blight (Collar Rot) - *Sclerotium*
  - Root Rot – *Rhizoctonia*

Symptoms of Bacterial Soft and Brown Rot

Erwinia spp.

Symptoms: Small water-soaked spots appear on the leaves and often are surrounded by yellow halos. If unchecked, the infection will rapidly rot the leaves and roots and spread more slowly into the rhizomes or pseudobulbs. This wet rot may have a foul odor and has a water soaked appearance.

In *Phalaenopsis*, the disease spreads so rapidly that plants may be completely rotted in 2-3 days. The bacteria are opportunistic organisms that can enter through wounds.

Dendrobium leaves appear yellow and water-soaked and become black and sunken.

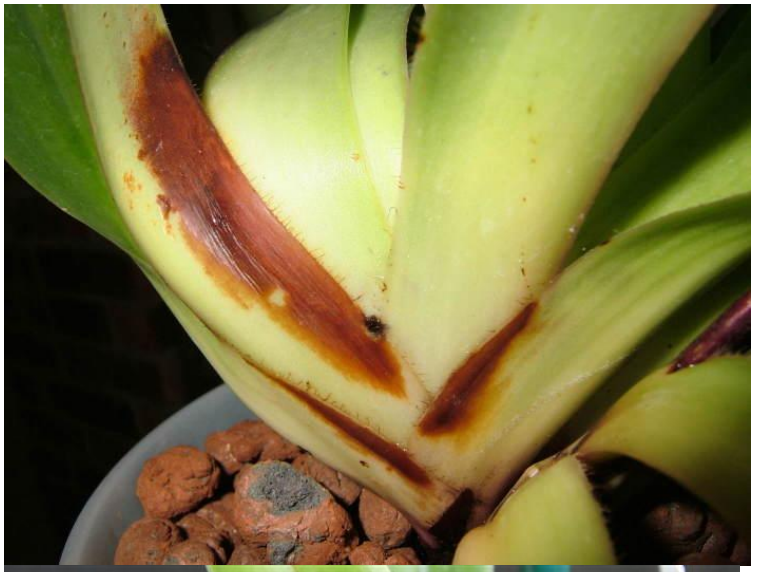
Symptoms of Bacterial Soft and Brown Rot

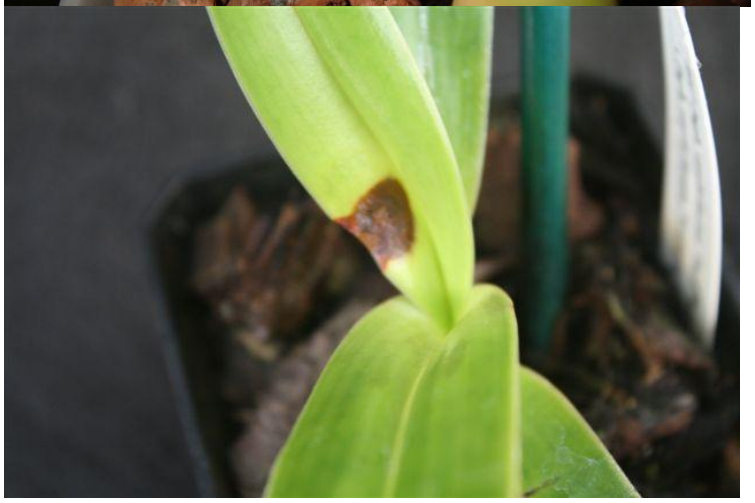
Erwinia spp. (cont'd)

Symptoms (cont'd): *Vanda* leaves develop translucent patches which become black and sunken.

Paphiopedilum leaves develop small, round spots that are initially yellow and water-soaked but eventually become reddish brown and sunken. The spot enlarges in all directions and may reach the growing crown before the leaf tip is affected. If untreated, the disease quickly spreads throughout the plant, leaving it a dark, shriveled mass.

Grammatophyllum leaves have w*ater*-soaked, browning spots which become black and sunken.





Treatment of Bacterial Soft and Brown Rot

Erwinia spp. (cont'd)

Treatment: Immediately remove infected tissue using a sterile instrument, spray bactericides like Physan or copper compounds on infected and adjacent plants following label instructions (copper should not be used on dendrobiums or blooming plants), disinfect growing area with 10% bleach solution. Treat nearby plants as well as those that are diseased.

Prevention: The disease is spread by splashing water so avoid overhead watering if the disease is present. The pathogen favors hot and moist conditions, so if infection occurs, keep leaves dry, increase air circulation and reduce temperature and humidity (if possible). Periodic preventive sprays with copper compounds help to prevent infection, particularly during hot and humid weather. Always follow label instructions.

Symptoms of Bacterial Brown Spot

Acidovorax (syn. *Pseudomonas*)

Symptoms: The symptoms may appear anywhere on the leaf as a small, soft, water soaked blister. Initially dirty green in color, the infected spot enlarges, coalesces and eventually becomes brown or black, dried up and sunken. It oozes bacteria-laden liquid, particularly when the disease reaches the tip of the leaf. It is most prevalent during the warmer weather.

In *Cattleya*, the infection enters through wounds on older plants and usually affects only older leaves. It advances slowly and is rarely fatal.

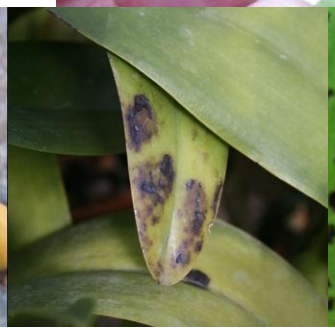
In *Phalaenopsis*, the blister-like spots may be surrounded with a yellowish or pale green halo. Spots coalesce, and the infection spreads rapidly. If the diseased area invades the crown, the plant will die.

Treatment of Bacterial Brown Spot

Acidovorax (syn. *Pseudomonas*) (cont'd)

Treatment: Immediately remove infected tissue and spray the plant with a bactericide like Physan or copper compounds following label instructions. Disinfect growing area with 10% bleach solution.

Prevention: *Pseudomonas cattleya* is a water-borne pathogen that prefers warm, moist conditions. Reduce humidity and temperature (if possible), eliminate overhead watering and increase air circulation.



Symptoms of Black Rot

Pythium & Phytophthora spp.

Symptoms: The infections usually starts on the leaves, new leads or roots, though all plant parts are susceptible. The disease spreads rapidly and will kill the plant unless treated promptly.

Leaf symptoms first appear on the underside as small, irregular, watery, brown spots which rapidly become purplish brown or purplish black. The spots may have a yellowish advancing margin. The lesions enlarge with age and may ooze water if pressed. Old lesions sometimes become dry and black, often allowing other diseases to attack the plant. The disease may spread rapidly to the rhizome and roots, particularly when the temperature and humidity are high.

Symptoms of Black Rot

Pythium & Phytophthora spp. (cont'd)

Symptoms (cont'd): New leads show a purple or purple-brown area with a yellowish advancing margin and may be pulled off easily.

Pseudobulbs, roots or rhizomes show infections as purplish-black, often sharply delineated, discolored area in the center of the plant. The infection often starts in the roots and may spread upward to the base of the pseudobulb or leaf, causing the plant to wilt.

Cattleyas may show a creamy yellow discoloration on one or both sides of the pseudobulbs. The discoloration eventually turns black or brown and softens, and the bulb rots.

Treatment of Black Rot

Pythium & Phytophthora spp. (cont'd)

Treatment: Unless the plant is valuable, the best approach is to discard it, as the disease is highly contagious and will spread from plant to plant from splashing water. If the plant is valuable, isolate it from your other plants, remove infected tissue with a sterile tool, and drench with a suitable fungicide like Subdue or Banrot following label instructions.

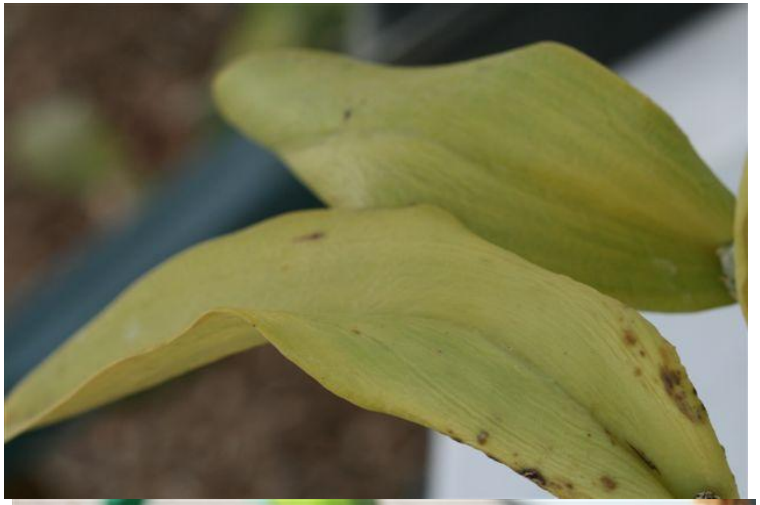
Prevention: High temperatures and humidity contribute to the spread of the disease. Consider using a preventative fungicide spray, particularly during hot humid periods, following label instructions.

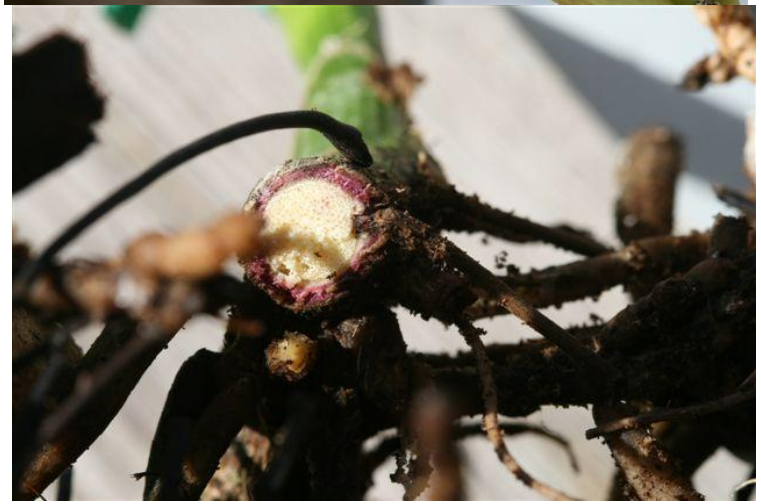
Symptoms of Fusarium Wilt

Fusarium sp.

Symptoms: Fusarium blocks the flow of moisture through the plant's vascular system plugging the phloem. Infected leaves are yellow, thin, shriveled, wrinkled or wilted and eventually die.

The diagnostic symptom in the plant is a circle or band of purple or pinkish-purple discoloration on the outer layers of the rhizome evident when the rhizome is cut. If the disease is extensive, the entire rhizome may turn purple, and the discoloration may extend to the pseudobulbs. The pathogen is spread through improper hygiene, generally as a result of using nonsterile cutting tools, which transfers the fungus from plant to plant. Severely infected plants may die in 3-9 weeks, while mildly infected plants gradually decline over a year or so.





Symptoms and Treatment of Fusarium Wilt

Fusarium sp. (cont'd)

Treatment: Discard infected part of rhizome and pseudobulb if the purple band is evident. Repot only the part of plant showing no purple discoloration. Drench sanitized plants in a thiophanate methyl (like Cleary's 3336) following label instructions. Be diligent in disinfecting growing area and cutting tools. Each time the cutting tool contacts infected tissue, it should be sterilized before making a second cut.

Prevention: Prevention is a simple matter of following proper hygiene. Sterilize cutting tools after each use, preferably through flame sterilization.

Symptoms of Southern Blight (Collar Rot)

Sclerotium sp.

Symptoms: The main symptom of Southern blight or Collar Rot is a rapid collapse and rotting of the roots, pseudobulbs and lower parts of the leaves. Roots, pseudobulbs, leaf bases and the lower part of stems turn creamy yellow. The affected tissue becomes brown (resulting from invasion by secondary pathogens), collapses and rots very rapidly. The disease eventually girdles and destroys the entire basal portion of the plant. Affected leaves yellow, wilt and die. Small yellow or tan sclerotia resembling mustard seeds form on the affected tissue. This is the resting form of the fungus.

Phalaenopsis - Base of stem turns light yellow, later dark brown, and infections spreads to roots and leaves. White fungal growth can sometimes be seen on stems with rapid collapse and rotting of roots, pseuodobulbs and leaves. This fungus thrives at high temperatures and humidity.

Treatment of Southern Blight (Collar Rot)

Sclerotium sp. (cont'd)

Treatment: Remove infected part of roots and leaves using a sterile cutting tool, drench the remaining plant in a protectant fungicide like thiophanate methyl (such as Cleary's 3336) or systemic fungicide (such as Subdue) following label instructions. Disinfect growing area with 10% bleach solution.

Prevention: Make sure your potting media is fresh and your plants are not overwatered. When disease is suspected in other plants or when repotting is overdue, unpot the plants, check their roots and repot as necessary. In hard-water areas, pots should be flushed at least monthly to prevent root damage by watering heavily to solubilize the salts and then watering heavily an hour later to flush the salts from the pot.

Symptoms of Fungal Root Rot

Rhizoctonia sp.

Symptoms: Root rot occurs when the medium breaks down, drainage is poor and/or plants are overwatered. Rot sets in when roots are damaged by injury or salt buildup from hard water or over fertilizing.

Rhizoctonia is primarily a root disease, but the symptoms can be noticed on aerial parts of the plant resembling the damage caused by Fusarium. Leaves and pseudobulbs become yellow, shriveled, thin and twisted and new growths become progressively smaller. The roots usually show a brown rot with white or brown fungal growth. In severe infections, the fungus girdles and kills the plant. The infection quickly invades the lower leaves and rhizomes of small seedlings.

Treatment of Fungal Root Rot

Rhizoctonia sp. (cont'd)

Treatment: Remove infected part of roots and leaves using a sterile cutting tool, drench the remaining plant in a protectant fungicide like thiophanate methyl (such as Banrot, Cleary's 3336 or Thiomyl) or systemic fungicide (such as Subdue) following label instructions. Disinfect growing area with 10% bleach solution.

Prevention: Make sure your potting media is fresh and your plants are not overwatered. When disease is suspected in other plants or when repotting is overdue, unpot the plants, check their roots and repot as necessary. In hard-water areas, pots should be flushed at least monthly to prevent root damage by watering heavily to solubilize the salts and then watering heavily an hour later to flush the salts from the pot.

Leaf Spots
Foliar and Petal Blights

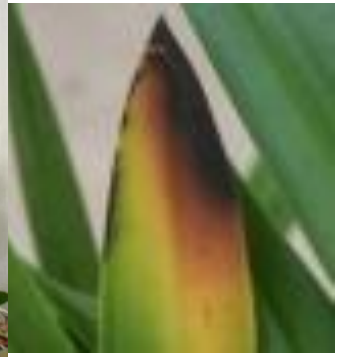
- **Leaf Spotting Fungal Diseases**
  - Anthracnose – *Colletotrichum* (syn. *Gloeosporioides*)
  - Cercospora Leaf Spot - *Cercospora*
  - Guignardia/Phyllosticta Leaf Spot – *Guignardia & Phyllosticta*
- **Botrytis Petal Plight** - *Botrytis*

Symptoms of Anthracnose

Colletotrichum & Glomerella spp.

Symptoms: This fungal disease infects the aerial portion of the plant. The leaves are most often attacked. Leaf tips turn brown beginning at the apex and proceeding toward the base. Dark brown or light gray patches develop, sometimes as concentric rings or as numerous dark bands across the leaf. The affected area is usually sharply defined and somewhat sunken, while the remainder of the leaf appears normal. Sporing bodies develop in the infected area.

Flowers develop watery, black or brown pustules which are usually raised and occur on the underside of older sepals and petals. The spots may merge and cover the entire flower.



Symptoms of Cercospora

Cercospora spp.

Symptoms: Infection shows first as a yellow spot on the underside of the leaf. Soon after infection occurs, the yellow-green area may be noted on the top surface of the leaf. The spots continue to enlarge in a circular or irregular pattern and may eventually cover the entire leaf. With age, the spots become slightly sunken and necrotic and change to purple-brown or purple-black. The advancing margin remains yellow. Heavily infected leaves usually fall from the plant prematurely, especially in the infection started near the base of the leaf. As the spots enlarge in irregular patterns, they become sunken and turn purplish brown to purplish black. The top surface of the leaf first becomes chlorotic and finally necrotic.

Symptoms of Guignardia

Guignardia and *Phyllosticta spp.*

Symptoms: The first signs of *Guignardia* infection are tiny, dark purple, elongate lesions on either leaf surface. These lesions run parallel to the veins and elongate into purple streaks or diamond-shaped areas. Spots often merge to form large irregular lesions that may affect a large part of the leaf. With age, the center of the lesion turns tan. Raised, black sporing bodies develop in the affected area. Affects mostly *Ascocentrum* and *Vandas* and their hybrids and may indicate insufficient light. This blight is also known as *Phyllosticta*; the names apply to two different sexual stages of the same fungus.

Symptoms of Phyllosticta

Guignardia and *Phyllosticta spp.* (cont'd)

Symptoms: Spotting from Phyllosticta may start anywhere on the leaf or pseudobulb. The lesions are tiny, yellow and slightly sunken. As they enlarge, they become round to oval and more sunken, especially if the infection is on the leaves. With age, they turn tan to dark brown and develop a slightly raised, red to purple-black margin. Eventually, tiny black, raised spore structures develop in the center of the spots. Individual spots are about ¼ in across. Severely infected leaves may drop prematurely. Its presence may indicate insufficient light. This blight is also known as *Guignardia*; the names apply to two different sexual stages of the same fungus.

Bottom picture courtesy of the American Orchid Society

Treatment of Leaf Spotting Fungi

Anthracnose, Cercospora, Guignardia and Phyllosticta

Treatment: Remove infected leaves with a sterile instrument. Spray with a systemic fungicide like thiophanate methyl (Cleary's 3336) or protectant fungicide like Mancozeb, following label instructions. Alternate systemic and protectant fungicide use.

Prevention: Good sanitation, good air movement, lower temperatures (if possible). Reduce leaf wetness, water on the leaves may increase chances for infection. If fungus is a continuing problem, monthly fungicide sprays may offer effective prevention.

Symptoms and Treatment of Botrytis Petal Blight *Botrytis sp.*

Symptoms: Very small, black or light brown, spots on the flowers. The spots may enlarge and cover the entire flower. If conditions are moist, a gray fungal growth may appear on severely infected or decaying flowers.

Treatment: Remove infected flowers, then spray with a protectant fungicide like Daconil. In enclosed areas, a smoke bomb Exotherm Termil (Daconil). Always follow label instructions. This fungus is common in the environment and cannot be eradicated.

Prevention: Remove infected flowers since these are reservoirs of infection. Infection may be reduced through careful sanitation, increased air circulation, reduced humidity and warmer night temperatures (>68^{o}F).

Common Fungicides and Bactericides
Treatment of Orchid Diseases

Chemical Name Active Ingredient	Application Rate (tsp/gal)	Floral Damage ?	Systemic ?	Bacterial Diseases			Fungal Rots				Leaf and Flower Blights			
				Soft Rot	Brown Rot	Brown Spot	Black Rot	Fusarium Wilt	Root Rot	Southern Blight	Anthracnose	Leaf Spots	Rusts	Botrytis
				Erwinia	*Erwinia*	*Pseuodomonas*	*Pythium*	*Fusarium*	*Rhizoctonia*	*Sclerotium*	*Colletotrichum*	*Cercospora*	*Sphenospora*	*Botrytis*
						Phytophthora						*Guignardia*	*Uredo*	
Captan 50W Captan	3	No	No	x	x						x	x	x	x
Daconil Chlorothalonil	2.3	No	No	x	x									x
Dithane, Mancozeb Mn,Zn,Ethylene bisdithiocarbam	4.5 Powder 1 Liquid	No	No								x	x		x
Kocide Copper Hydroxide	3	Yes	No	x	x	x					x	x		
Liquid Copper Copper salts-fatty,rosin acid	4 - 6	Yes	No	x	x	x					x	x		
Neem Oil Neem Oil	6	No	No								x	x		x
Physan (Consan) Quaternary Ammonium Chloride	2	No	No	x	x									x
Phyton 27 Copper Sulphate Pentahydrate	0.8 - 2.4	Yes	No	x	x	x					x	x		x

Specialty Fungicides and Bactericides
Treatment of Orchid Diseases

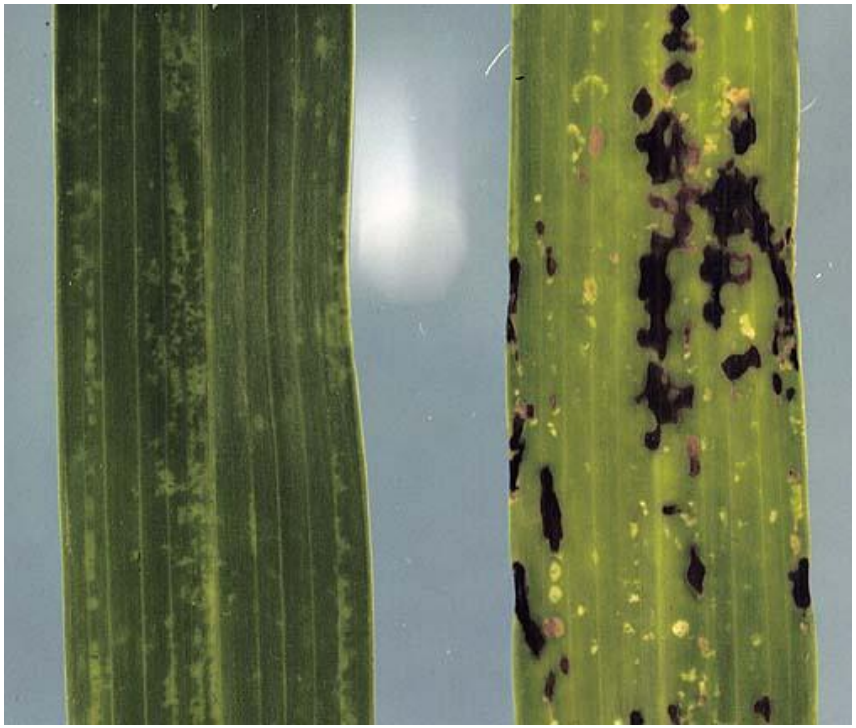
Chemical Name Active Ingredient	Application Rate (tsp/gal)	Floral Damage ?	Systemic ?	Bacterial Diseases			Fungal Rots				Leaf and Flower Blights			
				Soft Rot	Brown Rot	Brown Spot	Black Rot	Fusarium Wilt	Root Rot	Southern Blight	Anthracnose	Leaf Spots	Rusts	Botrytis
				Erwinia	*Erwinia*	*Pseuodomonas*	*Pythium*	*Fusarium*	*Rhizoctonia*	*Sclerotium*	*Colletotrichum*	*Cercospora*	*Sphenospora*	*Botrytis*
							Phytophthora					*Guignardia*	*Uredo*	
Aliette WDG Fosetyl aluminium 80%	5-9 foliar .8-1.5 drench	?	Yes				drench							
Chipco 26019 Iprodione	3.0	No?	Yes						drench					x
Banrot 40WP Etridiazole 15%Thiophanate M	0.5 - 1.1	Yes	Yes				x	drench	drench	drench	x	x		x
Cleary's 3336 WP Thiophanate M ethyl 50%	0.7 - 1	No	Yes					drench	drench	drench	x	x		x
Compass 50WDG Trifloxystrobin 50%	.2 - .4	No?	Yes?						x		x			x
Exotherm Termil Chlorothalonil	1 can / 1000 ft^2	No	No								x	x		x
Protect DF Mn,Zn,Ethylene bisdithiocarbam	4.5	No	No								x	x		x
Subdue Maxx Metalaxyl 21.3%	0.05 (7-30 drops)	No	Yes				drench	drench						
Terraclor 75% WP Pentachloronitrobenzene	0.4 - 0.8 drench	No?	Yes					drench	drench	drench				
Truban 25% EC Etridiazole	0.18 - 0.5	?	Yes				drench							
Zyban Mancozeb+Thiophanate methyl	0.75 - 1.5	No	Yes					drench	drench	drench	x	x		x

Viruses

- **Symptoms** – Chlorotic and necrotic spots, streaks, lines and rings in the leaves. Flowers may show necrotic spots and streaks as well as color break. The virus, if present, is present in all parts of the plant.
- **Treatment** – There is no treatment for a virused plant. Destroy the plant to prevent it from infecting other plants. If the plant is valuable, isolate it completely from other plants and follow precautions to prevent infecting other plants.

Viruses

Use Sterile Cutting Tools – Viruses are spread by transmitting the plant sap from one plant to another via mechanical means. The primary means by which viruses are spread from plant to plant is by improperly sterilized cutting tools. There are two ways to keep cutting tools sterilized, either use sterile single edged razor blades that are discarded after each and every use or use a hot flame to sterilize cutting tools after using the tools on a given plant. The cutting tool should be sterilized for 15 to 20 seconds with a hot flame on each side.



Viruses

Control During Repotting
Viruses can be spread whenever there is mechanical transmission of sap from an infected plant to another plant, even by leaves rubbing against one another. Observe these additional controls:

- **Latex Gloves.** Wear latex gloves when handling a given plant and discard those gloves when you are done handling the plant. Your bare hands can come into contact with plant sap containing the virus and infect the next plant.
- **Newspaper on Potting Surface.** Keep the potting surface sterile. Keep a stack of newspapers handy and when repotting, place newspaper under the potting area. Upon completion, wrap up the newspaper, gloves and other detritus and discard them before touching the next plant.

Viruses

Disinfect your Pots Prior to Use – Make sure your pots are sterile.

- **Disinfection of Plastic Pots** – Plastic pots can be disinfected by first washing them with soap to remove residual organic matter, then soaking them for an hour in a 10% bleach solution, then soaking them for an hour in Physan mixed per label instructions.
- **Disinfection of Clay Pots** – Clay pots are porous and cannot be sterilized against viruses by using bleach and Physan alone. Follow the normal disinfection routine for plastic pots above and then bake them in the oven at 400^{o}F for an hour to kill any residual virus.

Viruses

Control During Routine Activities
Viruses can be spread whenever there is mechanical transmission of sap from an infected plant to another plant, even by leaves rubbing against one another. Observe these additional controls:

- **Cutting Inflorescences**. Use a sterile tool to cut each inflorescence from the plant. The easiest way to do this is to use a sterile, single edged razor blade to remove the inflorescence and discard it after each use (or bake in a 350F oven for an hour). If you use shears, you should flame sterilize them between each inflorescence.
- **Removing Inflorescences by Hand.** Don't do it! A virus, if present, can be unknowingly transmitted to your hand and you can infect the next plant when you touch it or remove the next dead flower bud by hand. Instead, use a sterile razor blade and discard it after each use.

Other Types of Damage

- Edema
- Calcium Deficiency
- Magnesium Deficiency
- Cold
- Sunburn
- Bud Blast
- Fertilizer Burn on Flowers
- Salt Toxicity

Other Types of Damage - Edema

Symptoms: Excess water is absorbed by the roots more quickly than it is lost by the leaves, causing swelling of plant cells and producing a blister-like lesion. Occurs when plants watered during warm days and the nights turn cool or during periods of cool weather when water quantity and/or frequency is not reduced.

Treatment: No treatment

Prevention: Water early in the morning when nighttime temperatures drop below 65F. Reduce watering in the fall when plant growth slows.

Other Types of Damage – Calcium Deficiency

Symptoms: Calcium deficiency has a similar appearance to a bacterial or fungal rot, but is really the same problem as blossom end rot in tomatoes. It affects cattleyas primarily during periods of rapid growth. Calcium, a lesser macronutrient, is used to build cell walls. Deficiencies usually occur in spring and summer during periods of active growth. New leaves may turn black at the tips. The affected area has an advancing yellow band. Bud growth may be inhibited or buds may develop improperly. A calcium deficiency may also cause death of root tips.

Treatment/Prevention: Supply extra calcium when the plant is in active growth. Use a good cal mag fertilizer, add calcium nitrate at the rate of 1/4 to 1/2 teaspoon per gallon to your water (alternating with Epsom salts) between fertilizations, add 1 tablespoon of dolomitic lime per gallon or top dress with powdered dolomite as a source of calcium and magnesium during the hot months when calcium requirements are high. You can also make the calcium present in well water more available to the plant by using an acidity generating fertilizer like 20-10-20.

Symptoms of Magnesium Deficiency

Symptoms: Magnesium deficiency can result in cupped leaves, a reduction in growth and marginal or interveinal chlorosis (yellow along leaf edges or between veins) and usually is exhibited in the middle or older leaves. Plants grown with a magnesium deficiency can exhibit chlorotic mottling after exposure to extremes of temperature as well as an increase in anthocyanin (red/purple coloration) in leaves, particularly after exposure to cooler temperatures.

Treatment/Prevention: Supply extra magnesium when the plant is in active growth. Use a good cal mag fertilizer, add Epsom salts at the rate of 1/8 to 1/4 tsp weekly or 1/2 teaspoon per gallon to your water each month (you can add a megadose of up to 1 tbsp/gallon as a correction to reddened leaves), add 1 tablespoon of dolomitic lime per gallon or top dress with powdered dolomite.

Other Types of Damage - Cold

Symptoms of Chilling

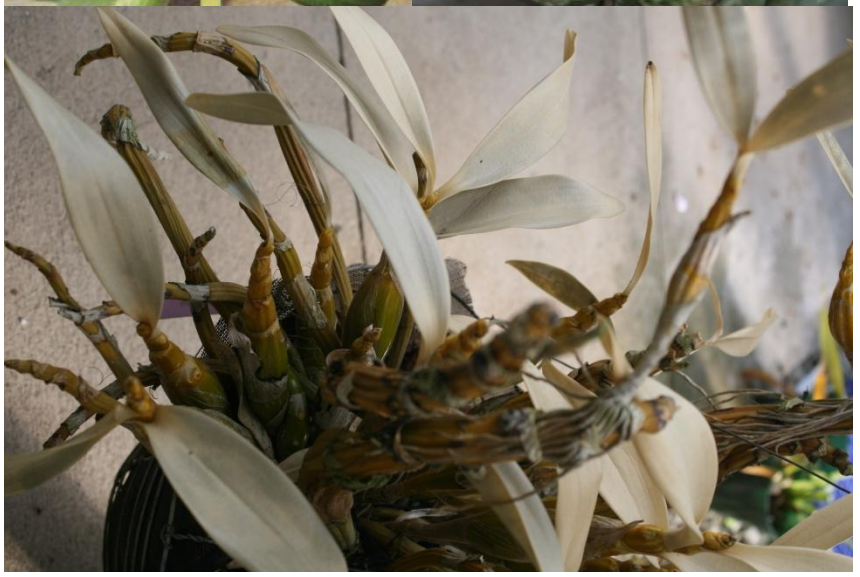
- Surface lesions, pitting, large, sunken areas and discoloration. Water-soaking in tissues, usually followed by wilting and browning.
- Internal discoloration (browning).
- Accelerated rate of natural death.
- Increased susceptibility to attack by fungi and bacteria.
- Slowed growth, or limited growth flush. This may be difficult to detect without non-chilled plants for comparison or a thorough knowledge of the orchid's normal growth rate.

Symptoms of Freezing

- Desiccation or burning of foliage.
- Water-soaked areas that progress to necrotic spots on leaves and death of sections of the plant or the entire plant.
- Obvious symptoms may not be present until after the plant has been stressed by warm temperatures.

Treatment: Remove the dead tissue to prevent secondary bacterial infection. As a precaution, create a slurry with cupric hydroxide (Kocide or Champion) combined in equal parts with mancozeb (Manzate or Dithane M45) and apply to damaged tissue with a toothbrush.

Prevention: Know the temperature requirements of your orchids and watch the projected nighttime lows during winter.



Other Types of Damage - Sunburn

Symptoms: Sudden appearance of black spots on leaves when the leaves become overheated from too much light caused by a sudden increase in light during the change in season or moving plants outdoors in the spring. The burn often will occur on the highest point of the leaf where it is exposed to the most sun. Burn fades to thin tannish leaf scar over time.

Treatment : Sunburn is irreversible and leaf damage could be an invitation to secondary infection.

Prevention: Move plants slowly into brighter light, moving them into slightly greater light over a 2 to 3 week period so they gradually become acclimated to the higher light conditions.

Other Types of Damage – Bud Blast

Symptoms: Bud blast can take many forms. Buds may wither and fall from an otherwise healthy plant, buds can fail to open into flowers or the buds may rot in the sheath.

Treatment: If you've just brought an orchid home, the most likely reason for bud blast is the damage to the sensitive bud from its being moved or radical changes in the amount of light and water the plant is used to.

- It can be caused by water: too dry and the moisture can be drawn from the sensitive buds or too much water can cause root rot and the plant can't sustain the emerging flower.
- Radical temperature changes can cause it: drafts from an air conditioner or heater can cause bud drop and condensation from day night temperature changes can cause buds in the sheath to rot.
- Chemicals from fumes and ethylene from combustion engines can cause the buds to age and distort flowers.
- Insects like aphids and thrips can feed on the buds and cause them to drop or be deformed after opening.
- Other reasons include drying out from too low of humidity or being too close to grow lights and chemical damage from fertilizers. Sometimes bud blast occurs and there is no obvious reason for it.

Prevention: The best prevention is good cultural practices maintaining the proper moisture and temperature for your plants to thrive. If a sheath starts to yellow or darken, carefully peel it back to prevent condensation from rotting the buds. If there is evidence of aphids or thrips, spray the plants with a chemical that won't damage the flower (such as a dilute Orthene).

Other Types of Damage – Fertilizer Burn

Symptoms: If you get water soluble fertilizer on your flowers while you are watering, you have the potential for burning the flowers, particularly if you use a full strength rather than dilute fertilizer. The fertilizer salts will burn the flower leaving a water soaked spot. Fertilizing blooming plants may also shorten the blooming time.

Treatment: After you're done fertilizing, come back with a plain water spray on the flowers to wash the fertilizer off the flowers to prevent their spoiling.

Prevention - It is safer to use a more dilute fertilizer more frequently than full strength fertilizer. Try using one quarter to one eighth of the labeled strength weekly (when you water), unless you determine your plant needs a higher fertilizer concentration.

Other Types of Damage – Salt Toxicity

Salt buildup. Salts present in your water supply and added by fertilizers accumulate over time. Salt buildup looks like whitish to brownish crusts on the medium and around the pot, or on the surface of the mounting substrate on mounted orchids, and can be a sign of over-fertilizing. If allowed to remain, those salts will negatively impact the health of your plant. Excess fertilizer salts burn and kill orchids.

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Symptoms. Lack of root growth may indicate an unhealthy concentration of mineral salts in the medium, on up to full fertilizer burn. If this is suspected, decant the plant and check its roots. Dead root tips, brown roots or salt crust on the potting medium surface are signs of trouble. In later stages, brown leaf tips, leaves and eventually pseudobulbs may appear, indicating burned roots. If allowed to continue, fertilizer burn will eventually kill the plant.

Prevention. It is preferable to use a dilute fertilizer, say ¼ to ⅛ of the labeled strength. Flush the pot monthly by watering with copious amounts of water to solubilize salts and then watering again an hour later to flush accumulated salts from the pot.

Pictures and text courtesy of the American Orchid Society