BEGINNER'S SERIES

# Orchid Culture — 15 — Diseases, Part 1 — The Ruinous Rots

STEPHEN R. BATCHELOR

I WAS A TEENAGE beginning orchid grower and had only recently purchased my first orchid from the local farm-and-garden supply. Having heard that orchids grew in trees, I hung the plant in a tree in the backyard. It was strange to look at, with its leathery leaves and thickened stems, but from a peculiar sheath at the top soon came two of the most exquisite flowers I thought I had ever seen. The plant grew in a pot of coarse, arid-looking bark chips, so I watered it diligently every day.

*Photographer: Stephen R. Batchelor*

**FIGURE 1** — in a matter of weeks, black rot reduced this *Cattleya* hybrid to the lifeless collection of stumps illustrated here.

Soon after flowering, I noticed that my orchid was turning black from the bottom up. Within the week the base of the leaves had yellowed. In terror I ran to bring the plant indoors, only to have every single leaf snap and fall from the plant when I went to move it. In my trembling hands, all that remained of my cherished first orchid was a collection of oozy, blackened stumps.

Such was my rude initiation into the black-thumbed — and red-faced — legion of orchid growers who have suffered with rot. Are you a member like me?

## FUNGAL ROTS

Nearly every orchid grower has had some experience with black rots, whether they readily admit it or not! Because these rots are so lethal to plant tissue, and spread so quickly, I would venture to guess that more orchids have been lost to them than to any other orchid pest

or disease. Beginners may tend to have more problems with rot, because of their inclination to overwater, but even experienced growers can be caught oil-guard.

Black rots are fungal in nature, caused by two closely-related fungi, *Pythium ultimum* and *Phytophthora cactorum.* They are likely to attack any part of an orchid, generally working from the bottom up or the top down. Black rots are most insidious — and therefore most likely to kill — when infection occurs first in the roots or rhizome. From there, the infection can spread the entire length of the rhizome.

*Photography: Stephen R. Batchelor*

FIGURE 2 — soon after penetration (sunken area) this fungal infection has spread nearly the length of this *Cattleya* pseudobulb.

effectively destroying the plant before the grower is even aware of the problem. Only when the infection then moves up the pseudobulbs, usually preceded by a characteristic band of yellow, docs it become very noticeable — but by this stage it is far too late. The only living, green tissue then remaining is in the upper pseudobulbs and their leaves, now isolated and without viable eyes, or roots, at their bases. In a remarkably short time, the pseudobulbs too will turn entirely black, the leaves yellow and brittle. The tragic end result: a lifeless, leafless, black "skeleton" (Figure 1).

When a black rot infection begins in a leaf or a pseudobulb, it is more likely to be detected before the destruction of the plant is complete. Infection may begin as a purplish-black softened spot, but can likewise spread downward with alarming speed (Figure 2). New leads are known to be particularly susceptible to invasion by black rot, perhaps because the tissue is "unhardened", and therefore vulnerable, or possibly because, as their leaves expand; they can cup and collect water, providing ideal conditions for infection. *Pythium* is often responsible for the rot, or "damping off", of small seedlings or mericlones in community

pots. In these typically cramped conditions this decimating rot can spread quickly from plant to plant. Orchid growers should always be on the lookout for the blackening of plant tissue, yet any period during which damp conditions prevail in the growing area should be a time of heightened concern. On mature orchids, pseudobulb and rhizome sheathing should be routinely removed as soon as it turns brown and dries so that the tissue underneath can be better observed. Once a suspicious patch of darkened tissue is spotted, treatment should be immediate. Because these destructive rots are so quick to spread, any delay could greatly imperil the plant involved.

In treating a plant infected with black rot, the first step is to remove and destroy all infected tissue, taking along with it at least one inch of green, uninfected tissue. In this way, the rot can hopefully be isolated from the plant. This is a fairly painless affair (for the grower) if the infection is caught early enough to be confined to a leaf, or the very end of a pseudobulb or rhizome. The small portion is removed and the plant then treated with a chemical drench or dip. But for more advanced infections the grower may have to face the agony of sacrificing whole pseudobulbs, and their connecting rhizomes, in order to give what is left of the plant a fighting chance.

Occasionally the oldest backbulb of an orchid will die. This may be death due to "natural causes", but the darker it then turns, the more suspicious the grower should become. Leaving such a pseudobulb attached to the plant is, at the very least, providing a potential avenue for infection (FIGURE 3). It is best to remove this non-contributing plant part and chemically treat as described below.

Truban 30 WP (Terrazole) is recommended for control of these fungal infections. It should be applied as a drench to the infected plant at the rate of 1 ½ teaspoons (1/2 tablespoon) per gallon of water. In other words, this dilute mixture of the wettable powder and water should be applied to the potting medium in much the same manner as water alone is given. The roots and medium should be soaked. A follow-up application within a week or two may be necessary to fully protect the plant against reinfection. The systemic fungicides Aliette and Subdue have also been shown to give reasonable control.

*Photography: Stephen R. Batchelor*

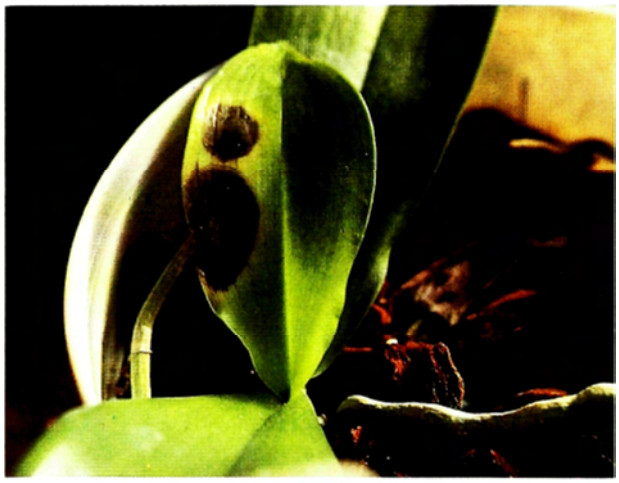
FIGURE 3 — though this backbulb may have died of "old age", it has suspiciously darkened. Removal would lessen the possibility of infection.

**ROOT ROTS**

Thiophanate-methyl is effective in the control of another troublesome fungus, *Rhizoctonia solani,* or root rot. This rot is generally confined to the roots of mature orchids, only extending as far as the rhizomes or leaves of smaller seedlings or mericlones. Unlike rots caused by *Pythium* and *Phytophthora,* this organism causes a gradual deterioration of flowering-size orchids resulting from root loss. Plants in decomposing media are particularly vulnerable. Specimen plants in large pots are inclined to contract this root rot as well, in their growths towards the center of the pot. On the other hand, in causing the damping-off of immature plants in community pots, *Rhizoctonia* can be a real killer.

If at all possible, orchids infected with *Rhizoctonia* should be unpotted and the old media and dead roots removed. The plant can then be dipped in a fungicide solution for five minutes and afterwards potted up, or repotted first and then drenched with the solution. In both cases, the manufacturer's recommendations with regard to dilution rates should be followed. Thiophanate-methyl fungicides are marketed under a variety of product names and concentrations; each having specific handling instructions. Care should be taken thereafter to keep the treated plants somewhat dry, and out of direct light, in order to encourage the formation of new roots.

"Fusarium wilt" causes symptoms similar to root rot in orchids and can also be treated with Thiophanate-methyl fungicides. Infected plants likewise suffer root loss followed by a general



*Photography: Karen Tiles* FIGURE 4 — a watery patch or blister on Phalaenopsis usually indicates that a bacterial infection has begun. These tan blisters will soon coalesce.

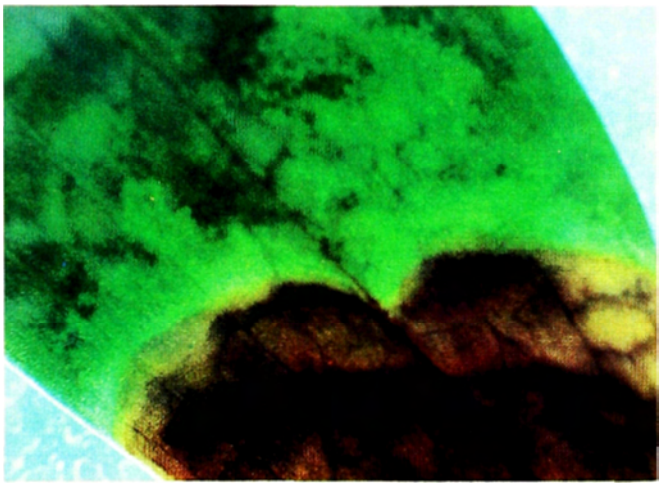
shriveling of pseudobulbs and leaves. The organism, *Fusarium oxysporum f. cattleyae,* is known to enter orchids through the cut ends of rhizomes and appears as a purplish band when the infected rhizome is cut. The *Handbook on Orchid Pests and Diseases* offers management strategies.

Harry C. Burnett suggests treating with Banrot when *Pythium, Phytophthora, Fusarium* and *Rhizoctonia* are all suspected of being present.

## BACTERIAL ROTS

Orchid rots can also be bacterial in nature. This would not be of great consequence to the orchid grower, except for the fact that bacterial rots are controlled by a somewhat different set of chemicals than those recommended for fungal black rots. The problem, then, is to distinguish between the two.

Generally, the bacterial brown or soft rots — identified variably as *Erwinia, Pseudomonas* or *Enterobacter* species — are a nuisance to orchids with "crowns", those with centralized growing points such as *Phalaenopsis* and *Paphiopedilum.* Hence the common name "Crown Rot", applied most frequently when *Phalaenopsis* are attacked. From the crown, new and older leaves emerge and form a sort of cup capable of holding water for some time *(see* FIGURE 4). These bacteria require wet surface conditions in order to penetrate and infect plant tissue, and this water-



*Photography: Karat Miller*

FIGURE 5 — Bacterial infections can begin near the tip of a leaf, as shown here on *Paphiopedilum concolor,* and edge up the leaf like a rising tide.

holding trait is thought to predispose orchids with this type of growth habit to bacterial infection. On the other hand, the fungal black rots present more of a problem to orchids with prominent pseudobulbs, such as the cattleyas. With these orchids, bacterial infections have been found to cause only limited, non-lethal, black spotting (Burnett, 1974).

The distinction between fungal and bacterial rots from this point on is necessarily vague. One could argue that bacterial rots are generally chestnut-brown in color (FIGURES 4, 5, 6) and fungal rots purplish-black (FIGURES 1, 2, 3). Yet this is not always the case (FIGURE 7). One could suggest that bacterial rots are less virulent, seemingly slower to spread, thereby giving the grower a better opportunity to act and control the infection. But this depends on the type and condition of the host plant. Regardless, the bottom line remains: once both fungal and bacterial infections reach vital meristematic issue, be it in the "eye" of a cattleya pseudobulb or in the "crown" of a phalaenopsis, the damage is serious and all or part of the plant will be lost.

Like fungal rots, bacterial rots begin as a patch of dark, necrotic tissue somewhere on the plant, and are most likely to occur during damp conditions. In the middle of a leaf, the initial infection may appear as a spot or *a* watery blister (FIGURE 4). Frequently, bacterial infections will begin at the tip of a leaf and work their way down in an almost fluid manner (FIGURE 5). If the infection reaches the crown of the plant, additional leaves will become infected (FIGURE 6) and can detach even while still largely green. This happens because their point of attachment to the plant is the first to go. In such a case as this, the infected plant literally falls to pieces (FIGURE 7) and is destroyed.

Photography: Walter Bertsch

FIGURE 6 — This *Erwinia* bacterial rot has reached the crown of this *Paphiopedilum* hybrid, where it has easily infected many leaves and effectively destroyed several growths.

Bacterial infections have also been known to cause sheath rot (McCorkle, 1974). The symptoms are similar to those described above, and can be distinguished from the normal drying and browning of the flower sheaths of some orchids by their watery character. Flower buds, when present inside, will also contract the disease and die, or "blast".

Control of bacterial brown or soft rots, like their fungal counterparts, involves first the removal of infested plant parts before the infection spreads to vital areas. Infections which are still confined further up the leaf (or sheath) should be cut off, again along with an inch or more of healthy tissue, in the hopes of removing the infection in its entirety. Leaves which have been infected to or from the base portion

**FIGURE 7 — *Pseudomonas cattleyae,* a prevalent** bacterial rot in phalaenopsis, claims another victim. The remaining mature leaf, though green, will soon drop, having been infected at the base.

are usually all but separated from the plant, and can easily be

removed, even without a cutting instrument. Spraying with an antibiotic should immediately follow. Physan has been found to be very effective in protecting orchids against further bacterial infection, and will help prevent infection if used on a regular basis (Burnett, 1974; McCorkle, 1971). At the rate of 1 1/2 teaspoons per gallon of water, Physan should be sprayed generously on the infected plants to the point where it collects in the crowns and the axils of the leaves. Following up with another spraying within the week is often helpful. Copper-based fungicides like Phyton 27 exhibit bacterial control as well however care should be taken to test plants for toxicity. Some orchid genera are quite susceptible to copper. Some growers have had success in treating crown rot in Phalaenopsis with powdered cinnamon; an expression of its anti-bacterial/anti-fungicidal properties.

**PREVENTION**

In contrast to most orchid pests which feed on the surface of a plant, orchid rots penetrate the tissue surface to spread and consume from within. Because of this, superficial spraying after infection has begun is generally less effective than it is with pest infestations. If at all possible, fungal and bacterial rots need to be physically removed from the infected plant and destroyed. Then a spray or soak of the proper chemical solution can be used, essentially to protect the remaining tissue from further infection.

The trick with the orchid rots, and with many other diseases, is to prevent penetration and infection to begin with. These pathogens are everywhere in our growing environments, but while on the outside of the plants, they are far more disposed to any control measure taken by the grower. One can reduce the possibility of infection by these rot diseases in any number of ways. Since they require wet conditions in order to first penetrate tissue, efforts should be directed towards reducing the amount of time the plants are truly wet. It is difficult in watering to avoid getting water on the leaves, yet if watering is done early in the day just before or as conditions become optimum for evaporation, the length of time water remains on the plant surfaces can be shortened considerably. Good air movement, naturally, helps greatly in this regard. Efforts should still be made to reduce the splashing of water from plant to plant, as this is one major means by which diseases are spread. After watering, water which has collected in crowns and new growths should be promptly removed by tipping the plants, as it can persist some time even under drying conditions. If conditions are not conducive to rapid evaporation, as they can be on a dark, winter's day, then watering should be deferred.

Keeping things less than soaking wet for rot prevention applies to below-surface roots and rhizomes as well. Potting media which is decomposed or over-watered provides optimum conditions for an insidious infection of black rot. Repotting religiously is a part of every good prevention program. Good habits such as always using sterilized and appropriate cutting utensils in order to make clean cuts also make a great deal of difference. I find flaming clippers or scissors with one of

the inexpensive, disposable lighters on the market is a quick and easy way to sterilize. Others suggest boiling water, 2% formalin or Clorox dips, or the use of disposal blades for one-time-only use. Cutting one's orchids with the same dirty blade is a highly efficient way of spreading rots, other diseases, and virus, throughout the entire collection. The wound made in the process of cutting any plant tissue is an open invitation to infection. This is why many veteran orchid growers try to seal this likely avenue of infection with a paste or dusting of fungicidal powder. Some sear these cut surfaces with a hot blade (Thomas, 1980). General sanitation involving the removal of any dead or infected plant tissue from the growing area also goes far in reducing the ammunition of the enemy.

Even with all these measures diligently taken, a grower is still likely to encounter bacterial or fungal rots at one time or another. The hobbyist should be especially wary during periods of cool, dark and damp conditions which typically occur during the winter months. As previously mentioned, these are conditions when rots can occur in greatest frequency (though of course they can and do occur during the warm times of the year). Likely rot victims are the "children of the orchid world," those small seedlings and mericlones found in every collection. Generally, the smaller and weaker the plant, the more vulnerable it is to a rapid and lethal attack, though this is not to say that no healthy, flowering-sized plants have succumbed! Specimen plants are also potential candidates for infection, especially when they are in large pots. In the center of these pots a core of medium which is the last to dry and the first to decompose can form, on top of which are usually the oldest, weakest pseudobulbs. Many a specimen plant has lost its beginnings, its size, and possibly its life to black or root rots which take advantage of this situation!

Lastly, periodic spraying should be considered as part of a general program to prevent rot infection. Physan has been recommended for both fungal "damping off' and bacterial rot infections of seedlings. Consan Pacific, Inc. manufacturer of Physan, recommends a monthly "preventative maintenance" spraying of Physan at the rate of 1-1 ½ teaspoons per gallon of water. In this way, a protective surface can be formed on the plants to discourage infection before it starts.

Next month, the discussion will center on the less life-threatening, though still very bothersome leaf-spotting diseases.

REFERENCES

Burnett, Harry C. 1973. **Controlling Pythium and Phytophthora Black Rots of Orchids with Truban.** *Amer. Orchid Soc. Bull.* 42(4): 326.

Burnett, Harry C. 1974. *Orchid Diseases.* Bulletin 10 of the Florida Department of Agriculture, Tallahassee, Florida.

Simone, G. W. and Burnett, Harry C. 2008. **Diseases Caused by Fungi and Bacteria.** In the *Handbook on Orchid Pests and Diseases.*

American Orchid Society, Delray Beach, Florida.
Consan Pacific. Inc. Information sheet on Physan. 12205 E. Whittier Boulevard, P.O. Box 208. Whittier, California 90608.
McCorkle, M.D., James K., Leo E. Reilly, M.D. and T. O'Dell. M.T.. A.S.C.P. 1969. **Pseudomonas Infection of Phalaenopsis.** *Amer. Orchid Soc. Bull.* 38(12): 1073-1078.
McCorkle, M.D.. James K. 1971. **Comments on Certain Infectious Diseases of Orchids.** *The Orchid Digest* 35(8): 224-226.
McCorkle. J.D.B and J.K. McCorkle. M.D. 1974 **Bacterial Sheath Infections Due to Pseudomonas and Practical Aspects of Control.** *Amer. Orchid Soc.. Bull.* 43(9): 780-782.
McCorkle, M.D., James K. 1979. **Further Remarks on Bacterial Infections of Orchids, with Scatologic Considerations.** *Amer. Orchid Soc. Bull.* 49(12): 1368-1370.
Northen, Rebecca Tyson. 1973. **Orchid Ailments: Part II, Diseases.** *Amer. Orchid Soc. Bull* 42(9) 810-821.
Thomas. Dr. J.W. 1980. **The Culture of Odontoglossums.** *Amer. Orchid Soc. Bull.* 49(7): 723.