BEGINNER'S SERIES

Orchid Culture — 16 — Diseases, Part 2 — The Flagrant Fungi

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A LEAF, unblemished by disease, fully and uniformly green, is [a] highly admirable achievement in orchid culture! Unfortunately, it is one too seldom seen. The typical orchid leaf, at some point in its lifetime, becomes spotted or damaged in some way, usually a result of infection by one of the many pathogenic fungi in the conventional growing environment. While rarely lethal except to the youngest or weakest of orchids, these fungi do reduce the photosynthetic capacity and lifespan of leaves, and arc an aggravation to orchid growers everywhere.

THE CULPRITS

A considerable number of fungal pathogens have been found to infect the leaves of orchids. Many of these belong to the genus of fungus called *Cercospora.* More than a half-dozen identified *Cercospora* species parasitize a wide range of orchid genera. Three of the most prevalent arc: *Cercospora odontoglossi* (Figure 1), thought to be the most serious leaf-spotting fungus attacking Catlleya-type orchids, and capable of killing small seedlings and mericlones (Burnett, 1974, 1975): *C. dendrobii,* a particular problem with dendrobiums, both evergreen and deciduous types; and *C. epipactidis,* which has been reported attacking such thin-leaved orchid genera as *Catasetum, Lycaste, Phaius, Stanhopea* and *Coelogyne* (Figure 2). Other species of *Cercospora* have been found to infect the Vandaceous genera, angraecoids, cymbidiums, oncidiums — virtually every orchid genus commonly grown.

While *Cercospora* species are a widespread problem, they by no means have exclusive rights over delectable orchid leaf tissue! To add to the orchid grower's ever-growing Latin vocabulary, there is *Seploria selenophomoides,* a fungus found to attack an array of orchids, but which is perhaps most troublesome with dendrobiums, especially the *Den. nobile-like* species and hybrids (Figure 3). The fungus *Phyllosticta capitalensis* (syn. *Phyllostictina pyriformis*) can also be quite skilled at making a spotted mess of dendrobium leaves, and can do the same with a wide range of other genera (Figure 4 and 5). In addition, this fungus has been found to infect pseudobulbs, particularly those of *Dendrobium.*

There are other fungi associated with leaf-spotting of orchids. These can be found well pictured and described by Harry C. Burnett, Plant Pathologist for the Florida Department of Agriculture and Consumer Services, in either Bulletin 10, *Orchid Diseases,* produced by this department, or in the A.O.S. *Handbook on Orchid Pests and Diseases.*

THE SYMPTOMS

Though there are many different fungi which can and do attack

orchid leaves, the damage resulting from their various infections is difficult to distinguish. As a group, leaf-spotting fungi have much in common in the way they develop and manifest themselves in orchid leaf tissue. Like the bacteria and fungi which cause rots in orchids, the leaf-spotting fungi have to penetrate plant tissue before they can cause mischief. Initial infection can occur on either side of a leaf, but with *Cercospora* species it usually occurs on the underside. This may be the best place to look for symptoms of incipient attack, though, depending on the thickness of the leaf

FIGURE I — Leaf spot caused by *Cercospora odontoglossi,* as seen on the topside (above) and the underside (below) of leaves from a cattleya hybrid.

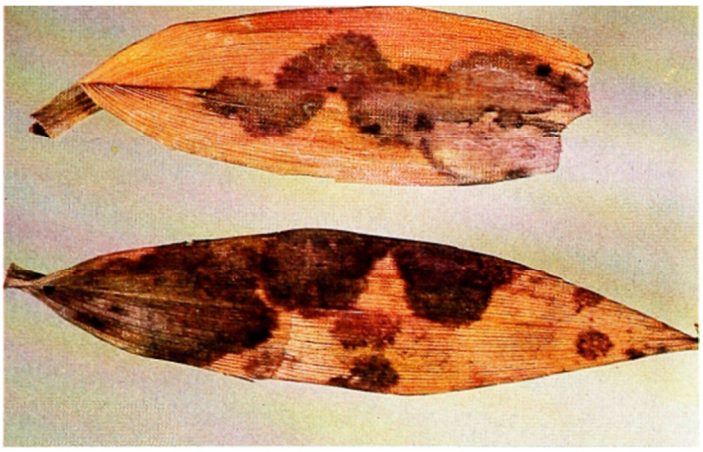
involved, it will not be long before symptoms appear on the topside of the leaf as well. Small, yellow spots are **typically** the first **indication** of infection. Next, these spots generally enlarge, and may form patches of infection (Figure 1). All too soon the infected tissue becomes necrotic, the spots or patches dark brown or black, and **somewhat** sunken. With **advanced** infections, spotting can cover entire leaves (Figure 2). Such severe infections **inevitably** lead to premature leaf drop (Figure 3). The actual pattern of spotting **resulting** from infection varies **tremendously from** plant to plant, growing area to growing area, season to season — even for the very same fungus (see Figures 1 and 5). Therefore, in examining the infected plants pictured here, the reader should not expect his or her orchids to necessarily react in

FIGURE 2

the same way to the same pathogens. We, as orchid growers, can only conclude that when our plants become infected by any of the leaf-spotting fungi, tissue will be destroyed, and photosynthetic capacity will to some degree be lessened. Unless infection is cheeked, it can lead to a loss of entire leaves, and ultimately to a reduction in flowering.

THE CONTROL

Fortunately for the orchid grower there is available one fungicide capable of providing reasonable control of every leaf-spotting fungus mentioned: Thiophanate-methyl. Alternative fungicides that offer control are Mancozeb, ferbam and copper-containing products like Phyton 27. Unlike other fungicides used for leaf-spotting diseases, thoiophanate-methyl has systemic properties. When sprayed on an orchid, this fungicide not only coats the surface of exposed tissue, as do conventional fungicides, it is also absorbed. This heightens its effectiveness against leaf-spotting fungi dramatically, since the growth and activity of these fungi are largely internal. So while conventional fungicides can only control pathogenic fungi they contact on the leaf surface, Thiophanate-methyl is capable of reaching and destroying leaf-spotting fungi where they do the damage — from within. One word of caution – use of thiophanate-methyl-based fungicides should be limited to two applications unless alternated with alternate control products.



Photography: courtesy of Harry C. Burnett

Septoria selenophomoides results in premature leaf
of a *Dendrobium* species.

FIGURE 3 — an infection of *Seploria selenophomoides* results in premature leaf drop of a *Dendrobium* species.

Preventing infection by leaf-spotting fungi is important, because even though the fungus can be eliminated, in most cases, after infection has occurred, it cannot erase the damage. Once a leaf is spotted, it will always be spotted, unless the necrotic tissue is surgically removed!

SPOTS VERSUS ROTS

The availability of an appropriate fungicide does make the control of leaf-spotting fungi a fairly easy task for the orchid grower, but one product is not effective on all diseases affecting orchids! What may prove effective against leaf-spotting fungi may not control orchid rots, whether they be fungal or bacterial in nature. It is necessary, then, for the orchid grower to be able to distinguish between these two groups of diseases requiring different chemical control measures.

Photography: Stephen R. Batchelor

FIGURE 4 — Leafspot, *Phyllostictina pyriformis*, on a *Cochleanthes* primary hybrid.

Both orchid rots and leaf-spotting fungi begin somewhere as a confined area of infected tissue around the point of initial penetration. At least initially they may look very much alike, but with continued infection, they become more distinct. Rots tend to be more diffuse in their infection, spots more confined. Yet this criterion would not distinguish the two organisms involved in FIGURES 6 and 7, and the two different chemicals needed for their control. Perhaps a better method would be to consider the state of the plant tissue after

FIGURE 5 — Leafspot, *Phyllostictina pyriformis*, on *Epidendrum parkinsonianum*.

FIGURE 6 — Bacterial rot, *Pseudomonas cattleyae,* consumes a *Phalaenopsis* seedling.

infection and destruction by these two groups of diseases. Orchid rots leave infected tissue in a wet, even soggy condition (FIGURE 6). Leaf-spotting and related fungi tend to cause a shrunken, dry necrosis of tissue (FIGURE 7). The pathogen responsible for infection in FIGURE 7 is *Gloeosporium affine,* European anthracnose, and while the leading edge of infection may be moist, the remaining necrotic tissue is shriveled and quite dry. This fungus is controlled by thiophanate-methyl. While in FIGURE 6, bacterial *Pseudomonas* rot is at large, leaving a sloppy mess only controlled by removal of infected tissue and treatment with Physan *(see* "Orchid Culture — 15 — The Ruinous Rots," *A.O.S. Bulletin* 51(5): 479-486). Guidelines such as these do indeed have their limitations. Examine FIGURE 8. These peculiar fluid-filled blisters, according to the guidelines set above and in the previous article of this series, would suggest that a bacterial rot is the cause, when actually the leaf-spotting fungus *Cercospora epipactidis (see* FIGURE 2) was responsible for the initial spots of necrotic tissue, which were subsequently used by bacteria as an easy avenue for penetration and secondary infection. The leaf-spotting fungus is the real culprit, despite the symptoms indicating otherwise.

FIGURE 7 — European anthracnose. *Gloeosporium affine* infects a leaf tip of *Ctt*. Jewel Box 'Scheherazade', AM/AOS.

PREVENTION

The above discussion brings to light once again an important factor to consider regarding orchid diseases. The pathogens discussed grow and feed from within. Before infection can begin, there must be penetration of the plant tissue by the germinating fungal spore (or bacterium). As with seed germination, water is necessary for the activation of any spores which may come in contact with plant tissue. But whether the germinating fungus is then able to successfully enter and infect the tissue depends on the inherent strengths of both the fungus and the plant involved.

Photography: Stephen R. Batchelor

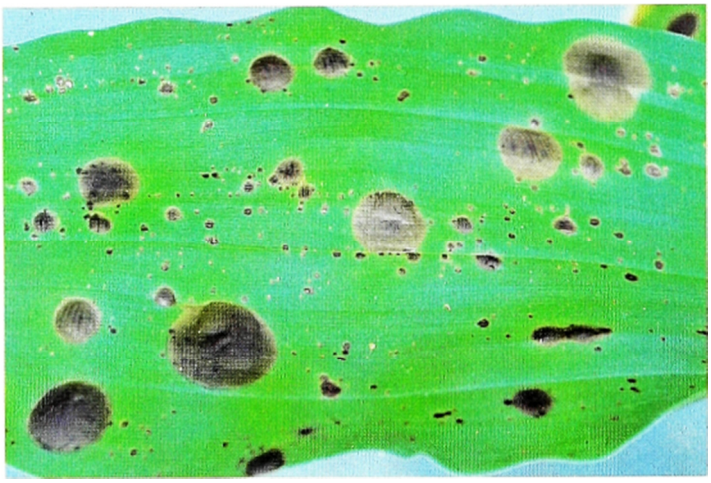


FIGURE 8 — Oozy, brown blisters on a *Catasetum pileatum* leaf results from an infection of *Cercospora epipactidis* followed by a secondary invasion of bacteria.

Some fungi are able to force their way into healthy plant tissue, others through natural openings such as the stomata present for air exchange on the leaf surface. But a great many infections, particularly by the weaker fungi, occur where plants are most vulnerable and penetration is the easiest. These

are typically areas where tissue has been previously damaged in some way. Consider the infection just discussed in FIGURE 8. In this case a weaker, secondary bacterium took advantage of the wounds caused by a *Cercospora* fungus to enter and infect the leaf tissue. Leaf-tip necrosis is a fairly common problem previously discussed in this series ("Orchid Culture —8 — Fertilizing," *A.O.S. Bulletin* 50(10): 1211) thought to be related to temperature and nutrient absorption. Whatever the cause, leaf tips are frequently points of weakness in many orchid genera cultivated. In the case of FIGURE 7, and the *Cattlianthe* (Sophrolaeliocattleya) Jewel Box 'Scheherazade', AM/AOS pictured, cultural factors in all likelihood were responsible for the initial necrosis of the leaf tip, which in turn provided an easy access for European anthracnose, considered a weak parasite (Burnett, 1975). Infection and further necrosis of the leaf then followed. Generally, it can be said that the healthier the plant tissue, the more resistant it is to disease. Weakened orchids are more susceptible to the pathogens present in every growing environment. Any number of factors can reduce the vigor of a plant. Growing orchids which insist upon cool conditions in a warm environment will weaken them considerably. For example, those who try to grow masdevallias or coelogynes have a particular problem during warm, humid (summer) weather. At such times these orchids are likely to become stressed, unless cooled, and their leaves, once green, transformed into necrotic, distorted — and ultimately aborted — "diseased tissue" *(see* FIGURE 2).

Photography: Stephen R. Batchelor

FIGURE 9 — After three months in bloom, during humid weather, this flower of *Paph.* Alma Gavaert shows considerable spotting, probably due to age and a low resistance to infection.

Age itself reduces a tissue's resistance to disease. Older leaves are more susceptible to attack than those which are younger. *Lycaste* growers, and those who grow other genera which are deciduous, realize that a leaf nearing the end of its life is rarely going to be free of disease. Some might say that to try to prevent infection in the face of such natural senescence is futile. *Botrytis cinerea* is a common flower-spotting fungus (FIGURES 9 and 10) with much the same characteristics and methods of control as the other leaf-spotting fungi discussed here. Older flowers about to fade are most likely to become infected, though other cultural factors can cause infection in

even the youngest flowers.

FIGURE 10 — Many a *Cattleya* and *Phalaenopsis* flower has been ruined by *Botrytis* blight, particularly under cool, damp and still conditions. No amount of spraying with fungicide will remove the damage already done here, but a program involving increased air circulation, diligent removal of diseased flowers, and a regular monthly spraying of appropriate fungicide should help future flowers.

Photography: Charles Marden Fitch

Water activates these pathogens. However it ends up on a flower or a leaf, it provides an essential ingredient to infection. Conditions of high humidity[1] and low air movement usually result in moist conditions on flower and leaf surfaces, and it is under these conditions that *Botrytis* and the leaf-spotting fungi are most troublesome. Naturally, too, if dead or diseased flowers and leaves are left to further decay-on and around the plants, then more infectious spores will be present, increasing the likelihood of yet more disease. Sanitation is a sound cultural practice! In the act of removing diseased tissue, however, a wound is created which is but another easy opportunity' for infection. Such cut surfaces should be coated with fungicide powder to seal off the entry way from the enemy!

CONCLUSIONS

Leaf-spotting fungi, a problem for nearly every orchid grower, are effectively controlled by thiophanate-methyl, a systemic fungicide. Even so, to significantly reduce the incidence of foliar disease in any collection requires more than the monthly application of such a spray. It requires the continuous application of proper cultural techniques to produce healthy, vigorous orchids, plants which are disposed to resisting infection. — *84 Sherman Street, Cambridge, Massachusetts 02140.*

ACKNOWLEDGMENTS

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