California Orchids

resistant to some diseases in habitat become susceptible in greenhouse

Peter A. Ark

Orchid growing in California is a multi-million dollar industry and in the process of expansion.

Under natural conditions in the tropics orchids are attacked by both fungi and viruses but there are no records to indicate they are attacked by bacteria or that the fungus and virus diseases cause serious losses.

Changes in the environment, both climatic and nutritional, are known to aggravate certain plant diseases. Especially is this true in regards to conditions prevailing in glasshouses.

Feeding *Odontoglossum grande* orchids with nitrogenous fertilizers usually leads to serious attacks of Gleosporium leaf spot. Here unbalanced and artificial conditions—designed for accelerated growth to produce maximum blooms in the shortest period of time—tend to upset the natural equilibrium in the plant and increase the chances for contracting certain diseases.

Glasshouse-grown orchids are subject to many diseases caused by fungi, bacteria and viruses. The most important from a commercial standpoint are: Pythium black rot, brown spot, brown rot, bacterial leaf scorch and pseudobulb rot.

Pythium Black Rot

Pythium black rot is a disease of seedlings and of full-grown plants of Cattleya orchids.

The disease develops in seedlings when they are planted in community pots.

Caused by a fungus, with strict aquatic habits, called *Pythium ultimum*, the disease is favored by high humidity, overwatering of the plants, and a high temperature—above 65° F. It commences as a small translucent spot and in a short time extends into the growing point causing the death of the plant.

The fungus grows only where there is free water. Under this condition it produces numerous zoospores which swim in the water. On reaching the surface of the plant the zoospores penetrate into the cells where they produce a mycelium that spreads rapidly from cell to cell. The attacked plants wilt and sometimes die rather suddenly. Since plants in community pots are close to each other, the disease spreads with phenomenal rapidity and losses can be considerable.

On full-grown plants the Pythium disease can start on the upper part of the leaf or on pseudobulbs. It kills both the leaves and the pseudobulbs and invades the rhizome whence it can spread to other plants in the clump. The disease is especially noticeable after the plants are divided and repotted. Wounding of orchids provides portals of entry for zoospores and for new infections. Wounds left after flower spikes are cut are an excellent place for the fungus to start the disease.

Control measures for the seedling phase of the disease consist in drenching the pots with copper sulfate solution, one part in 100,000 parts of water. The zoospores and the fungus mycelium are very sensitive to copper. This treatment will eliminate the disease in a short time. Repeated applications at the rate of about one a week are not harmful to the plants.

Drenching or submerging the plants in 8-quinolinol benzoate—or sulfate—or the sodium salt of o-hydroxydiphenyl—Natriphene—in a solution of one part in 2,000 parts of water, give very good results and is recommended. These organic chemicals do not possess any residual effects since they are denatured by bacteria and light soon after the treatment.

Full-grown plants having Pythium black rot should be separated from the healthy ones and dried thoroughly. They then can live for some time if watered carefully. Advanced cases of the disease should be destroyed.

Brown Spot

Brown spot, a bacterial disease caused by *Phytomonas cattleyae*, mainly affects Phalaenopsis and Cattleya orchids.

In Phalaenopsis the disease attacks both the seedlings and the full-grown plants. Only full-grown plants of Cattleya are known to be attacked.

On seedlings, water-soaked translucent spots of various sizes are formed, and the disease kills the plants eventually by rotting the growing point. The spots enlarge and soften the tissues so that the leaf becomes soft and often breaks. The exudate found in such cases contains large numbers of the bacteria which can be spread to other parts of the plant or to other plants.

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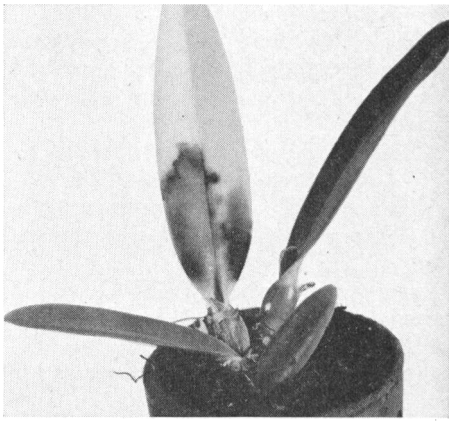
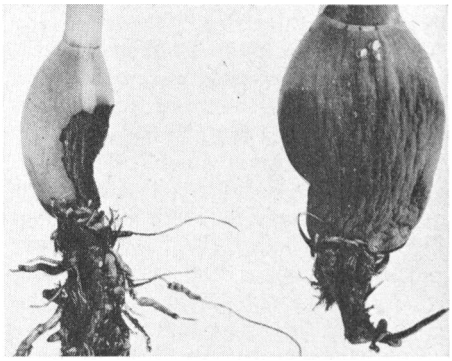
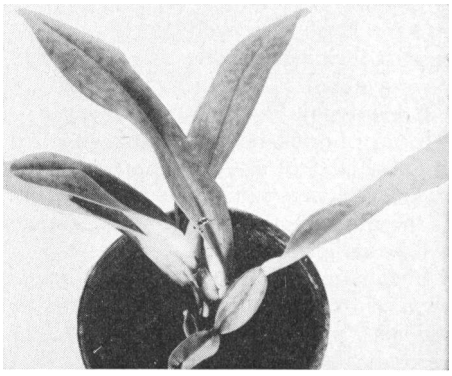
Black rot of full-grown Cattleya orchid caused by *Pythium ultimum*. Note the disease in pseudobulbs starting at the points where the cut was made.



Brown spot of orchids caused by *Phytomonas cattleyae* on full-grown Cattleya.



Bacterial scorch of Milltonia orchids. Pseudobulb rot originating from the rhizome.



Brown rot of Cypripedium caused by *Erwinia cypripedii*. Lesion on a leaf at left.

TOMATOES

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the second hybrid—red crossed with tangerine—only the *Tt* pair segregates, while all plants have both *RR* genes. Thus, the *T* gene is dominant over the *t* gene. In the case of the third hybrid—yellow crossed with tangerine—both of the gene pairs segregate.

From a study of the three hybrids and their progeny, it is clear that at least one *R* and one *T* is necessary for the formation of the red carotenoid pigment, lycopene. The precise role of these two gene pairs in the formation of carotenoid pigments is not entirely clear. There are two uncertainties that will require further study. First, the double recessive *rrtt* has not yet been identified. Second, certain yellow tomatoes collected in Mexico are definitely anomalous. When collected, they were classified as doubtful yellows. When grown in Berkeley, they did not behave as pure yellow varieties, but were consistently intermediate between red and yellow.

Independent studies carried on at Riverside suggest that three gene pairs determining pigment differences segregating in the species cross—*Lycopersicon esculentum* crossed with *L. peruvianum*—one of the green-fruited wild species. This fact together with the two uncertainties mentioned indicate that only a beginning has been made in the study of inheritance of tomato pigment differences.

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ORCHIDS

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In full-grown plants the symptoms are similar to those on seedlings. Infections start on any part of a leaf but the most dangerous location is at the base because then the infection quickly moves into the growing point and the plant is doomed.

Phalaenopsis plants of all ages are equally susceptible to the disease.

In Cattleya brown spot is often confined to the upper part of the leaf. The progress of the disease is not as rapid as in Phalaenopsis. The lesion has well-defined margins and the color is nearer black than brown. The disease very seldom causes death in Cattleyas.

Control of brown spot is achieved by the use of one part 8-quinolinol benzoate to 2,000 parts of water or the sodium salt of o-hydroxidiphenyl—Natriphene—also at the rate of 1:2,000. In Cattleyas brown spot may be treated locally by swabbing it with a solution of corrosive sublimate, 1:1,000. If necessary, the treatments may be repeated within a week or so.

Soft Rot

Soft rot of Cattleya orchids caused by *Erwinia carotovora* is a rare disease. Its advent is sudden and the results are devastating. It is caused by the common soft rot bacterium—a soil inhabitant—which attacks such crops as celery, carrots, and potatoes.

The disease can start in fresh wounds on Cattleya leaves and with high temperature and very high humidity it will rapidly change the leaf into a sack containing liquefied tissues. The leaf wrinkles and droops. Later it breaks open and the contents leak out.

Plants affected by it can not be saved. Control consists in early recognition of the disease and burning all the affected plants. The room in which the trouble occurred should be promptly and thoroughly disinfected.

Brown Rot

Cypripediums are the only orchids in California subject to the brown rot disease in orchid houses. It is caused by a bacterium, *Erwinia cypripedii,* which prefers a temperature of 65° F or above and a humidity of 70% or higher.

The disease is characterized by small to medium-sized circular, somewhat greasy spots which, on running together, form large sunken patches. The color varies with the age of the lesion and in the final stages is deep chestnut brown. The spots are frequently located close to the base of a leaf. Under favorable conditions the organisms migrate into the crown and thence into other buds causing death of all the living components of the clump. To save plants already attacked the treatment described above for brown spot of Phalaenopsis should be applied.

Bacterial Scorch

Bacterial scorch and pseudobulb rot has been observed recently on Miltonia orchid hybrids. It is most severe under conditions favorable for Miltonia growing—cool and moist greenhouses.

The disease starts in wounds which are always present on the brittle leaves of Miltonia. The bacteria are exuded copiously on the surface of the leaf and may be spread by the water in syringing operations from one pot to another, thus creating an epidemic.

The affected leaves are water soaked in early stages of the disease but later turn gray and even light brown and appear scorched or blighted. Sometimes the disease is in the form of a narrow or wide streak, terminating in the growing point on the pseudobulb which turns at first a delicate yellow changing into orange red or red. The leaves finally drop off and numerous orange red pseudobulbs can be seen in the pot. From the pseudobulb the organism migrates into the rhizome and will travel from plant to plant.

The disease is very infectious and requires immediate attention as soon as it is first recognized. The control consists in applying 8-quinolinol or Natriphene as for brown spot in Phalaenopsis. Sanitary measures must be observed and operators should disinfect their hands after handling infected Miltonias so as not to spread the disease.

Black Spot

The shippers of orchid blossoms also have troubles. Vanda blossoms shipped from a distance sometimes develop a black spot right in the throat of the blossom. Sometimes minute black spots scattered on the petals of the flower ruin its market value. The trouble is due to *Glomerella* sp., a fungus similar in its habits to the gray mold fungus *Botrytis cinerea* which sometimes attacks the flowers of Cattleya in greenhouses and in transit.

Black spot infection of Vanda flowers occurs before they are cut and shipped. When it reaches its destination the flower begins to lose its color and black spots appear. The fungus develops slowly at the low temperature prevailing in shipment but in the higher temperature of the sales room the fungus grows and produces the black spot. Black spot infection of Vanda blossoms has been prevented by the use of 8-quinolinol benzoate 1:2,000 as a spray. This concentration of the chemical did not injure the appearance of the flowers.

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The above progress report is based on Research Project No. 973 being conducted by the Division of Plant Pathology.

DECIDUOUS

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vail, a serious shortage could result. Such a shortage would undoubtedly give an upward boost to the price structure on canned fruits all the way from the grower to the consumer.

With January and February temperature playing a critical role in the final outcome, it will be mid-March or early April before accurate estimates of the situation can be made. By then the blossom periods for most species will have been reached or past and a real estimate of the fruit actually set can be made.

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