



## COMMON VIRUS DISEASES OF ORCHIDS

Most orchid genera are affected by one or more virus diseases. With the increasing importation and rapid exchange of plants by both commercial and amateur growers, the introduction and spread of viruses among orchid plants in a grower's or florist's greenhouse is highly probable. Virus-infected plants bloom less efficiently, lack vigor, and produce flowers of lesser quality than healthy plants. The introduction of virus-infected stock not only costs the grower and florist in terms of greenhouse space, but also presents a dangerous virus reservoir that may serve to contaminate other orchid plants and seedlings.

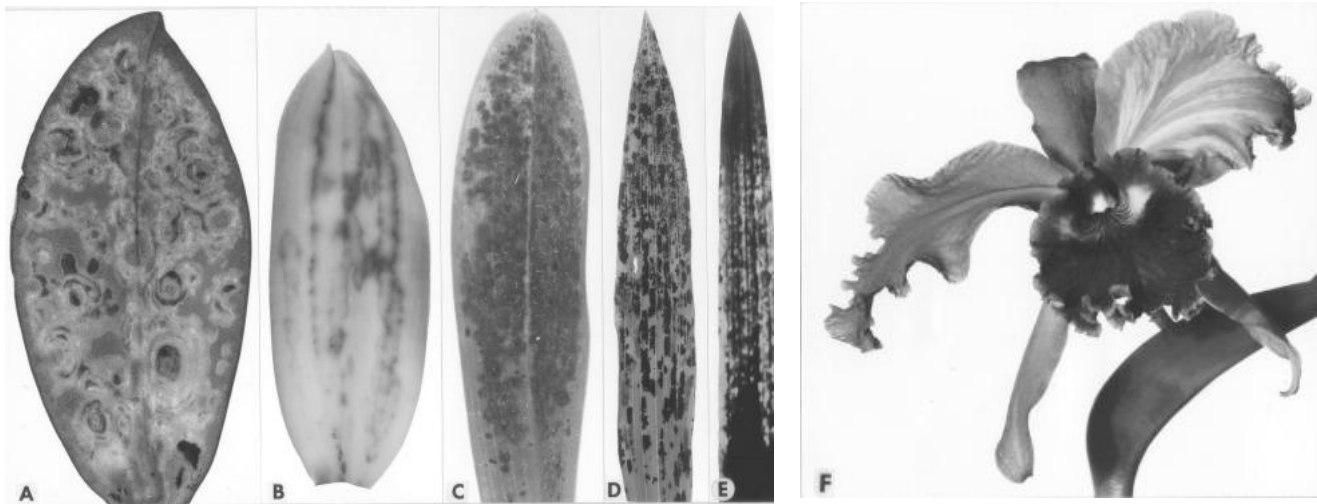


Figure 1. Virus diseases of orchids. A. Ringspot symptoms occurring on the underside of a *Phalaenopsis* leaf infected with tobacco mosaic virus strain 06 and *Cymbidium*. B. *Cattleya* leaf infected by tobacco mosaic virus strain 03. C. Upper surface of a *Cattleya* leaf infected with *Cymbidium* mosaic virus. D. *Zygopetalum* leaf infected by *Cymbidium* mosaic virus. E. *Cymbidium* leaf infected with tobacco mosaic strain 01 virus. F. *Cattleya* flower with streaks or "breaks" in pigmentation and distortion in floral symmetry. Flower breaks in orchids are produced by several viruses. (Photograph courtesy of Dr. C.I. Kado, Dept. of Plant Pathology, University of California at Davis).

The efficient control of orchid virus diseases depends on rapid and accurate diagnosis, followed by the destruction of diseased plants. The symptoms produced by orchid viruses depend on the particular viruses and strains involved; the hybrid, species, and genera of orchids infected; the age of the leaves; the time of year; and the environmental conditions. The same virus may cause widely different symptoms on different genera, e.g., a flower breaking on the blossoms of one genus, a bar mottle or other symptoms on another genus. Virus-like symptoms also may be produced by thrips on *Vanda* and by scales and mites feeding on *Cymbidium* leaves. Abnormal nutrition and fungal infections also produce virus-like symptoms.

For further information contact Nancy R. Pataky, Extension Specialist and Director of the Plant Clinic, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

Symptoms in flowers may also be mistaken for those caused by a virus. Aphids and thrips have been reported to damage *Cymbidium* and *Vanda* flowers, respectively. Thrips injury is very similar to a virus disease in *Vanda* orchids. Some virus-infected plants may show **no** symptoms. Such symptomless plants are excellent virus “carriers” for they go unnoticed in the greenhouse. Under adverse conditions, these symptomless plants may develop strong symptoms. Virus symptoms also may vary between plants that are grown under different conditions. Plants infected with more than one virus also express variable symptoms.

Growers should be familiar with the common orchid virus diseases. Much worry can be overcome by isolating suspect plants and employing stringent control measures. These factors make the diagnosis of orchid diseases difficult.

## Symptoms

1. **Leaf necrosis, black streak.** Leaf necrosis, caused by the cymbidium mosaic virus, is probably the most common virus disease of many kinds of orchids. Infected plants have irregular, brown-to-black, elongated spots and streaks of dead tissue on both surfaces of older leaves (Figure 1C and 1D). Infected leaves that show symptoms tend to age quickly and dry up. Flowers from such plants are usually symptomless, but they may open in an unthrifty manner. If the leaves die prematurely, the flowers are usually fewer in number and of smaller size. Diseased plants are usually less vigorous; however, not all infected plants show symptoms. Spread of the virus is usually via contaminated pruning tools. No insect vector is known.

Leaf necrosis affects *Cattleya* and its hybrids as well as many species of *Angraceum*, *Cymbidium*, *Epidendrum*, *Laelia*, *Oncidium*, *Spathoglottis*, and *Zygopetalum*.

Certain strains of the tobacco mosaic virus also produce leaf necrosis on *Cattleya* (Figure 1B), *Cymbidium* (Figure 1E), and other orchids that closely resembles symptoms produced by the cymbidium mosaic virus.

2. **Mild flower break.** This is caused by a strain of tobacco mosaic virus. Mild flower breaking is much more common in *Cattleya* than is severe flower breaking. Affected plants have much less variegation in the flowers than plants infected with severe flower break. The flowers are not malformed, and the leaves have only mild mosaic symptoms. The means of transmission of this virus is unknown.

Mild flower breaking has been reported on about 30 species and hybrids of *Cattleya*. This virus also produces spots and rings of dead tissue on the leaves of *Odontoglossum* and diamond mottle on *Cattleya*, *Cymbidium*, *Odontoglossum*, and *Phalaenopsis*. Diamond mottle is distinguished by elongate chlorotic areas that are often diamond-shaped. Older leaves sometimes develop brown to black flecks and streaks.

3. **Severe flower break.** This conspicuous virus disease of *Cattleya* and its hybrids is characterized by rolling and twisting of the sepals and petals and variegation in the flowers (Figure 1F). The normal pigment of the petals, sepals, and petioles is replaced by irregular streaks, blotches, ring and line patterns which are either more or less intense than the normal color. Leaves that develop after infection are sometimes twisted and mottled with streaks of light and dark green. (Leaves formed earlier may be symptomless). The dark-green areas are somewhat raised, producing ridges and bumps. The severe flower-breaking virus is transmitted by the green peach aphid (*Myzus persicae*),

by grafting, or by juice inoculation. The time between the infection of the flower buds and the expression of flower-breaking symptoms ranges from 12 to 19 days. If conditions are right, the time needed for leaf infections to appear in plants inoculated through the flower buds varies from 2 ½ to 4 ½ months.

In addition to *Cattleya* and its hybrids, the severe flower break virus infects *Cymbidium* and *Oncidium* and possibly other genera. In *Cymbidium*, the symptoms consist of numerous, severely chlorotic, rectangular areas on the leaves, giving the disease the name “Bar mottle.”

4. **Symmetrical flower break.** In addition to severe and mild flower streaking, where the variegation is irregular, a symmetrical variegation occurs in *Cattleya*. The pigment occurs along the sepal margins and over most of the petals except in middle areas that have little or no pigment. The leaves develop an inconspicuous mottle. The means by which the virus causing symmetrical flower break disease is transmitted in the greenhouse is unknown, but it can be experimentally transmitted by juice inoculation.
5. **Blossom necrotic streak.** A strain of cymbidium mosaic virus causes latent streaks or spots on orchid blossoms. The blossoms first appear symptomless but brown (necrotic) spots and streaks become visible after one or more weeks. Delay in the appearance of flower symptoms after the blossoms open creates a problem for growers who sell their blooms. Infected flowers may develop necrotic symptoms 3 to 5 days after they are cut from the plant. Long, yellowish, irregular streaks may develop in the leaves. Transmission of this strain of cymbidium mosaic virus occurs on contaminated pruning tools. *Cattleya* and its hybrids are affected, plus species of *Angraceum*, *Cymbidium*, *Epidendrum*, *Laelia*, *Oncidium*, *Spathoglottis*, and *Zygopetalum*.
6. **Ringspot.** Cymbidium ringspot virus also causes single or concentric ringspot patterns on old and young leaves. The rings may later be brown to purple-black and enclose a central light green or yellow “island.” Rings may overlap or merge to form large compound patterns. Ringspot may cause death of young shoots and often of the entire plant. Species of *Cattleya*, *Cymbidium*, *Spathoglottis*, and *Trichosma* are affected.

Ringspot symptoms may also result from double virus infections such as a strain of tobacco mosaic virus and cymbidium mosaic virus (Figure 1A).

## Virus Indexing

Under certain conditions, some diseased orchid plants do not show distinct symptoms and control measures cannot be effectively carried out. In such instances, a simple diagnostic test is required to determine whether a plant is infected with a virus or whether symptoms are due to other causes. Biological tests can be performed on young indicator plants outside the Orchidaceae<sup>1</sup>. Useful indicator plants include Coffee senna (*Cassia occidentalis*), Jimson-weed (*Datura stramonium*), Globe-amaranth (*Gomphrena globosa*), and *Chenopodium amaranticolor*. These tests are called indexing. They provide a means of detecting mild flower break, leaf necrosis, and other viruses.

## Control

Cultural practices offer the most effective means of control.

1. **Exclude and eradicate diseased plants.** Prompt removal and burning (or burying) all infected plants is an excellent control measure. Once virus-infected, plants never recover although symptoms may disappear at least temporarily. Economically, it may be necessary to first destroy only poorly producing plants and those showing flower breaking. Other infected plants should be removed and isolated, preferably in a separate greenhouse section since they might serve as a source of infection to other plants. Seedlings from older or newly traded and purchased plants should be isolated until known to be virus-free.
2. **Start with virus-free propagating stock and seedlings.** Care should be taken when securing plants to ensure that they are virus-free. Seedlings can be considered free of viruses since these disease agents are **not** known to invade orchid seed. Virus-free meristematic tissue can be removed from diseased plants and cultured. This technique is time-consuming and expensive to set up, but can be undertaken to save valuable stock.
3. **Stringent sanitary measures are needed.** When pruning, dividing, or harvesting flowers, sterilize tools after each plant. Tools can be dipped in 70 percent rubbing alcohol and then flamed or soaked for 20 to 30 seconds in liquid household bleach (Clorox, Purex, or Sunny Sol) solution, using 1 part of bleach in 5 parts of water. All fragments of plant material should be wiped off the knife. When the solution turns green from plant juices, discard it and make up a fresh solution. Use clean pots and new potting media. Avoid handling plants except when necessary. Carefully wash hands with soap and hot, running water after handling diseased plants and tools. Keep down all weeds around growing orchids. They may harbor one or more viruses.
4. **Spray or fumigate regularly to control virus-carrying insects.** Timely applications of recommended insecticides will control aphids, thrips, scales, and other insects. Insect feeding is known to damage flower buds and leaves. Follow the current suggestions of the Illinois Extension Entomologists.

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<sup>1</sup>Kado, C.I. 1965. "Problems in the Control of Virus Diseases." The Orchid Digest 29:106-108.