PHYTOPHTHORA

The most frequent pathogenic species of *Phytophthora* in cyclamen are *Phytophthora* parasítica and *P.nicotianae*, which can also attack many other pot plants.

This fungus is responsible for root and crown rot, causing the plant withering. It can also affect stems and leaves, which turn aqueous and yellow and/or brown, or even black.

Phytophthora symptoms can be mistaken for those of *Fusarium* and *Pythium*. In order to differentiate them from the symptoms of *Phythium*, it is necessary to get a complete lab diagnosis, whereas the differentiation from the symptoms of *Fusarium* can be done through observation, such as described at the end of this fact sheet.
Other crops of host species, such as aromatics, *Gerbera*, *Capsicum*, *Catharanthus*, *Hibiscus*, *Fuchsia* or *Kalanchoe* can also be sources of infection.

I. SYMPTOMS

Phytophthora can attack different organs of the plant, with different symptoms.

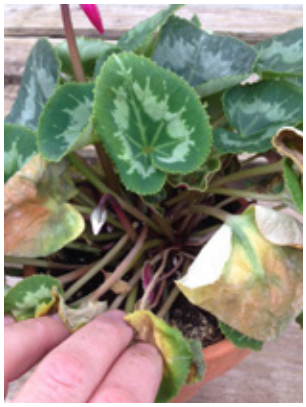
An infected plant may not clearly show symptoms if the conditions favouring the development of the disease are not present.

The plant management and conditions, e.g. irrigation system, as well as plant age, can make the symptomatology vary.

a) Total or partial plant withering

There are several degrees of spread of the disease :

Very severe total withering when the roots are attacked.



Less severe partial withering when a part of the crown is attacked.

Withering is frequently accompanied by pale yellowing caused by obstruction of vessels.

The above symptoms can also be accompanied by leaf necrosis.

b) Crown rot

The contamination can usually take place through water projections at crown level.
The crown can be deeply affected as shown here below with no spots on the bulb.

c) Affected bulb

After the crown has been infected, the bulb can be affected by orangey brown necrosis.
The bulb usually shows an aqueous aspect that begins in the upper section and spreads towards the base

d) Damaged stems and leaves

The infection of the crown can also invade stalks and occasionally, the veins of the leaves, which turn dark brown.

These symptoms can frequently be accompanied by partial yellowing of other leaves.

e) Root rot

Roots turn black and the cortex (root peel) can peel off very easily.

II. SPREADING

- The optimum temperature for the development of *Phytophthora* is **20-25 °C (68-77°F)**, though it can develop from 13-15 °C (55-59°F)

- *Phytophthora* spreading is favoured by very **high humidity** combined with the **lack of oxygen** in the substratum.

- Spores spread from already infected material through water movement (splashes, puddles, etc.)

Certain irrigation systems favour the fungus spreading:
- Recycling irrigation system: The contaminated water is reincorporated to the irrigation circuit.
- Subirrigation system: The water circulates from a healthy plant to a contaminated one.
- Drip irrigation system: The puddles formed can infect the neighbouring plants.

Infected crop under subirrigation and recycling system.

III. PREVENTION

a) Disinfection

The spores of *Phytophthora* can stay dormant for long periods and survive in the water, the upper layer of the soil, plant waste and other greenhouse substrate.

In order to avoid an outbreak of the disease, it is strongly recommended to **thoroughly disinfect surfaces** and cultivation tools.

Products based on peracetic acid have proven highly effective.

Water purification through UV light or application of low doses of copper are other methods used for *Phytophthora* control.

b) Irrigation control

It is important to optimise the irrigation network management so as to limit the excess water, which results in areas of stagnant water (capillary obstruction, water flow management, supply of the volume of water required, etc.).

In the same way, attention must be paid to the lack of water that could make plants weaker then, consequently, more sensitive to disease.

c) Plant isolation

Begin by removing all infected plants and plant waste.

Those who cultivate on the ground must remember that the soil disinfection does not guarantee a total control of the disease.

Sometimes, the spores stay dormant deeper in the soil, where the disinfectant cannot reach them, with the consequent risk of being transported again in the presence of water.

It is recommended that the pots **should be elevated/lifted** by using, for instance, another pot placed upside down or putting them into a lower container. Pot-carrying trays can also be used.

Lifted crops, isolated from the ground to avoid infections

d) Crop management without stress

Roots are the first part of the plant to be attacked. Therefore, a plant with a weak root system is more liable to be infected.

Consequently, **it is necessary to meet the following conditions** so as to manage the crop:

- Appropriate shade,
- Substratum with good drainage and buffer effect,
- Rooting period previous to spacing,
- Uniform and regular irrigation,
- Fertilisation based on controlled growth.

All the above makes it possible to fight a possible infection, even in the presence of *Phytophthora* spores.

Plentiful healthy roots thanks to a balanced cropping

e) Treatments

Chemical and biological treatments should be preferably used at **rooting stage** so as to optimise their efficacy.

The homologation of phytosanitary products evolves permanently according to each country's regulations.

It is up to each producer to find them out at the local office of plant health so as to meet the regulations on use of phytosanitary products, which is under the users' responsibility.

A previous test on a sample of plants is strongly recommended so as to measure the action of the active ingredient (dose) and the crop reaction (phytotoxicity).

With regard to **biological products** based on antagonistic fungi, it is necessary to check their **compatibility** with other treatments in order not to kill the antagonist fungi.

Nevertheless, it should be taken into account that there are no miraculous treatments. It is **imperative to follow the above recommendations on prevention.**

IV. WRONG DIAGNOSES

Phytophthora symptoms are very often mistaken for those of Fusarium.

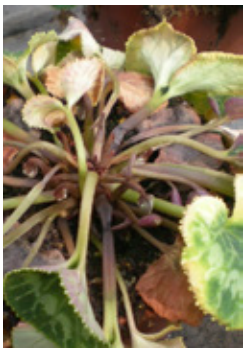
The comparison between the symptoms of Phytophthora and Fusarium for each part of the plant makes it possible to establish a final diagnosis. In case of doubt about the diagnosis, it is strongly recommended to send the samples to a specialised laboratory.

a) Foliage

Phytophthora sp:
Partial or total withering with random pale golden yellowing.

Fusarium oxysporum sp :
There is no evident withering. Golden yellowing from the centre to the edge of the leaf.

b) Crown



Phytophtora sp :
Soft aqueous stems of brown or else black colour.

Fusarium oxysporum sp :
The attack on the crown is less frequent. There may be a white mold on it. Stems are sometimes aqueous, though not brown or black.

c) Bulb

Phytophthora sp :
The bulb often becomes aqueous. There may or may not be orange spots on its entirety.

Fusarium oxysporum sp :
The aspect of the bulb is normal, with neatly defined orangey brown spots on its side.

For further information, please access the technews on FUSARIOSIS