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Phytophthora on Chrysanthemum (chrysanthus, mums)



Imprint

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Importance of *Chrysanthemum*

Chrysanthemums are ornamentals of worldwide importance in natural habitats (<http://www.discoverlife.org/mp/20q>) as well as in horticulture production. Cultivation of chrysanthemums as ornamentals started in the 15th century in China. During the 17th century *Chrysanthemum* sp. were introduced to the Western world (<http://www.mums.org/history-of-the-chrysanthemum/>).

Today *Chrysanthemums* are mainly produced in Japan and China. In Europe, The Netherlands is the country with the biggest *Chrysanthemum* production area (total area 480 ha in 2013; LEI Wageningen UR, 2015). In the US, the estimated combined revenue from cut flowers, potted florist mums, and garden mums is of US \$200 million (NASS Report April 2016). *Chrysanthemums* are cultivated mainly as potted plants and for cut-flowers. The plants are grown in the field and on container stands, or protected under plastic tunnels or in glasshouses. Hydroponic culture for cut-flower production is also an important cultivation system in some countries.

Phytophthora species

From *Chrysanthemum* with characteristic disease symptoms such as wilting, root rot, and stem canker, the following *Phytophthora* species have been isolated directly from plant tissue

<i>Phytophthora</i> species	Symptoms symptoms	Reference
<i>P. chrysanthemi</i>	wilting, root rot	Götz et al. 2017; Lin et al. 2017; Naher et al. 2011; Tomić and Ivic 2015; Watanabe et al. 2007
<i>P. cactorum</i>	stem canker	cited from Erwin and Ribeiro 1996
<i>P. cambivora</i>	wilt	cited from Erwin and Ribeiro 1996
<i>P. cinnamomi</i>	root rot	cited from Erwin and Ribeiro 1996
<i>P. cryptogea</i>	blight	cited from Erwin and Ribeiro 1996
<i>P. drechsleri</i>	root rot	cited from Erwin and Ribeiro 1996

All of the *Phytophthora* species isolated from diseased *Chrysanthemum* have a wide host range except for *P. chrysanthemi*, which infects only chrysanthus.

Disease symptoms (see figures)

Phytophthora species can attack several plant organs and cause different disease symptoms on *Chrysanthemum*. The most common symptoms are:

Upper plant part: growth depression, wilting, discoloration of the leaves (on older plants first only single leaves can show the symptoms)

Stem: necrosis at the stem base

Roots: root rot

Usually the crown symptoms are the first visible symptoms, followed by stem necrosis. Root rot can remain undetected in the early stages of disease. Disease symptoms can develop rapidly (e.g. within a week).

Possibility of symptom confusion

The disease symptoms presented in the previous chapter are not specific for *Phytophthora* infection. Other root pathogens, like *Pythium* species, can cause identical or similar symptoms, especially when the plants are stressed (Pettitt et al. 2011). Necrosis at the stem base (and on other plant parts) is also caused for example by *Phoma ligulicola* var. *ligulicola*/*Didymella ligulicola* (Pethybridge et al. 2004). To specify the cause of the disease plant samples must be examined in the laboratory.

Disease development

Disease development depends on several parameters like culture conditions, age of the plants, cultivar, *Phytophthora* species/isolate. Especially *P. chrysanthemi* in particular is very aggressive and can kill rooted cuttings within a week. When the disease is progressing slowly the very first symptom is reduced growth.

Diagnosis

It is not possible to identify a *Phytophthora* infection only by disease symptoms. Different diagnostic techniques like direct isolation, molecular and serological methods help to identify *Phytophthora* as the cause of the disease and to specify the *Phytophthora* species. Information on *Phytophthora* diagnosis in general is given for example in <http://forestphytophthoras.org/key-to-species>, <http://www.phytophthoradb.org/>, <http://phytophthora-id.org/> and in Martin et al. (2012). For The diagnosis of *P. chrysanthemi* see also JKI Data Sheet *Phytophthora chrysanthemi*. Please contact your national authorities (see next chapter) for help with diagnosis.

What to do in case chrysants are suspected to be infected?

Contact your responsible national authorities

- Examples for **European contact addresses**: [addresses.pdf](#)
- In **Germany** please contact first your plant protection services; address list see <https://www.julius-kuehn.de/linksammlung/>
- In the **USA**, each state has an in-state based plant disease clinic. To find a lab based on state, visit: <https://www.npdn.org/>.

Management and control

For direct control with chemicals contact your national authorities (see chapter above). If feasible, the following measures might help to prevent infection and to keep the plants healthy: no stagnant moisture in potted plants or bare root cultivation, optimum nutrition and soil aeration. Disinfect water in hydroponic cultures regularly, e.g. by filtration. High salinity can force root infection (MacDonald 1984). Although *Phytophthora* species can invade plant tissue actively any kind of wounds increases invasion potential.

Recommendations

- **EPPO quarantine recommendation**
None of the *Phytophthora* species detected up to now on *Chrysanthemum* are listed on any of the EPPO lists http://www.eppo.int/QUARANTINE/Alert_List/alert_list.htm
P. chrysanthemi: EPPO Code: PHYTKR
- **US recommendations**
<http://www.canr.org/newsletter/PhytophthorachrysanthemiNPAGReport20160401R.pdf>

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Links to further information

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Disease symptoms of *Phytophthora chrysanthemi* on *Chrysanthemum* (chrysams, mums)



Symptoms in nurseries

Left, center: in the field (1)

Right: on potted chrysams on a container stand (1)



Symptoms on *Chrysanthemum indicum* cv. 'Palisade Yellow' after inoculation with *P. chrysanthemi* JKI-050-15-8-01-2-0

Left: Reduction of growth and wilting (2)

Right: Wilting, necrosis at the stem base and root rot (2)

Photos: (1) – Ž. Tomić, (2) M. Götz, S. Werres