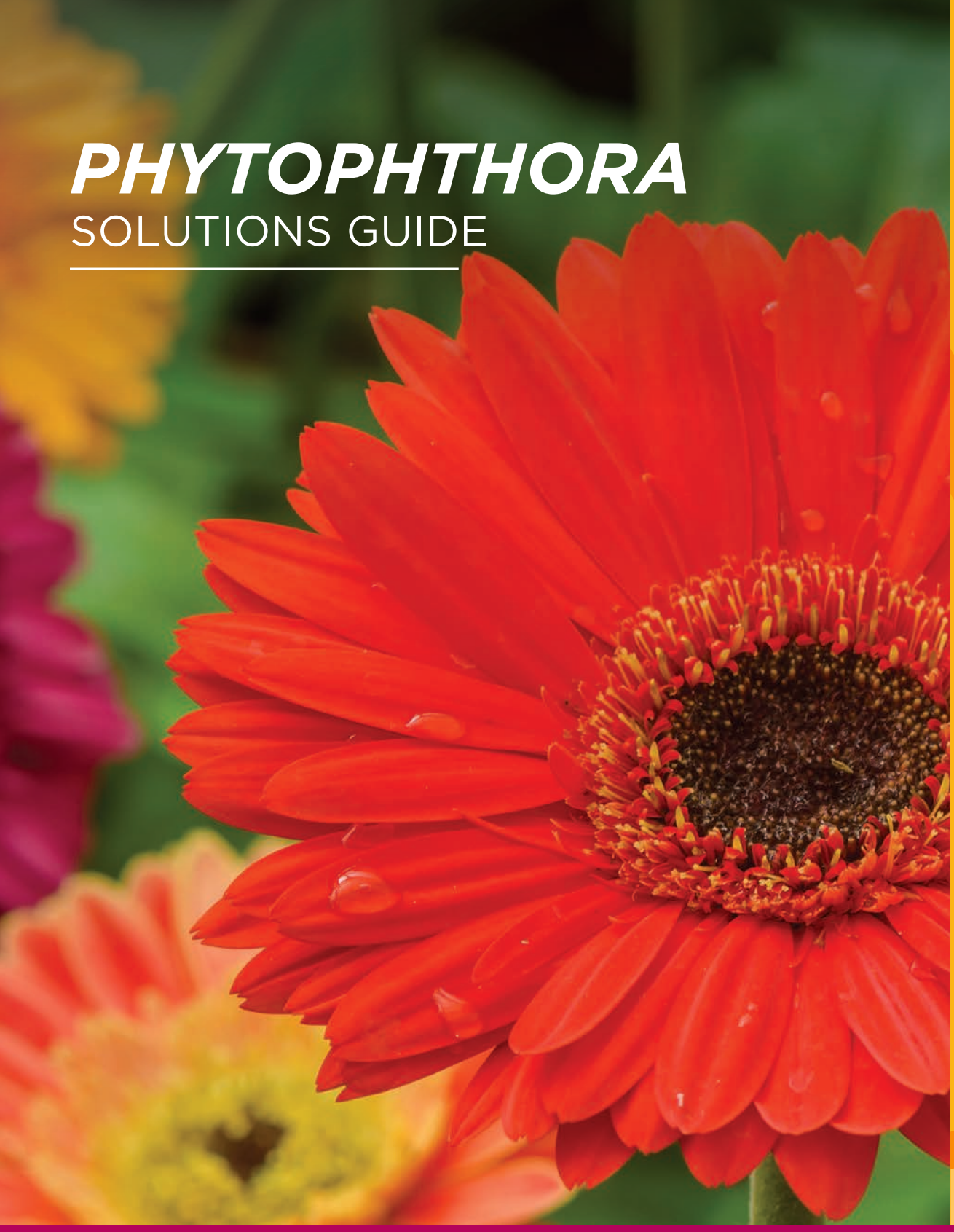


PHYTOPHTHORA
SOLUTIONS GUIDE

Ornamentals

syngenta®

Products and Tips for Successful Control

Phytophthora organisms are a group of soil-borne pathogens, often referred to as water-molds. Dispersal of this pathogen can occur through contaminated groundwater, streams and irrigation water, use of infested potting media and soils, as well as contaminated plant material. Plants grown in saturated soil conditions due to overwatering and areas prone to flooding are at risk for infection.

There are numerous *Phytophthora spp.* that can affect a wide range of herbaceous and woody ornamental plants in the nursery and landscape. They are responsible for causing root and stem rots, cankers, as well as foliar blights.

The effect of *Phytophthora spp.* diseases can be devastating. In vegetable crops, *Phytophthora infestans* was responsible for the European famine in the mid-1800s. More recently, the sudden decline of oaks (AKA Sudden Oak Death), *Rhododendron spp.* and other woody species across many parts of the U.S. is caused by *Phytophthora ramorum.* Knowing the conditions that are conducive to infections and the susceptible plant species, coupled with good scouting and a preventive rotation of effective fungicides, can help you to avoid losses from *Phytophthora* diseases.

Woody Ornamentals

- Azalea
- Boxwood
- Camellia
- Citrus
- Ilex
- Juniper
- Kalmia
- Honeysuckle
- Lilac
- Magnolia
- Oaks
- Pieris
- Rhododendron
- Viburnum

Phytophthora on Rhododendron. Rechcigl, Syngenta.

Disease Symptoms

Recognizing the early signs of *Phytophthora spp.* infections is critical for stopping the spread of the pathogen across production areas. Symptoms to look for include:

Stem Rot and Cankers

- Irregularly shaped, water-soaked lesions often develop on the main stem near the soil line
- Dark brown, greasy lesions/cankers can develop on stems and petioles in the upper canopy
- Foliage on affected stems will be wilted and discolored as the disease progresses
- Internal tissue of affected stems will be discolored above and below the stem lesion
- Oozing cankers can form on the trunk and branches of woody plants

Root and Crown Rot

- Plants will have slow growth, smaller than normal foliage and are often stunted
- Affected roots can't absorb water resulting in leaves turning yellow, becoming rolled/wilted and dropping from the plant
- One or more branches will show signs of wilt, eventually turn brown and necrotic
- The plant will collapse when the infection encompasses the entire lower stem
- White, fluffy mycelial growth may be seen at the affected site under high humidity
- Roots of affected plants will be dark brown-black and have a musty odor
- Symptoms may develop over a period of several weeks to months as the pathogen destroys the roots and works its way into the stems

Foliar Spots and Leaf Blights

- Lesions begin at the margin of the leaf and move inward, creating brown, zonate lesions that are irregular or elliptical in shape
- The margin of the lesion may have a dark border and appear water-soaked when held up to the light
- When wet, humid conditions prevail, lesions expand giving the tissue a blighted appearance
- Foliar blights can move into the stem causing shoot blights

Environmental Conditions

Temperature preferences vary among the *Phytophthora* species. While many prefer warm-to-high temperature conditions (70 – 90°F), others like *Phytophthora ramorum* thrive in cool-to-moderate temperatures (36 – 79°F, 68°F optimum). Infections occur with prolonged periods of foliar or soil wetness. The pathogen can overwinter in soil or in plant debris as oospores or chlamydospores, which germinate in the spring creating new infections. Motile zoospores are released under saturated soil conditions and enter the plant through wounds. The presence of water on leaves and high humidity are favorable conditions for foliar infections.

Cultural and Management Tips

- Use clean soil media for containerized production *(do not re-use old planting media without proper steaming or pasteurization)*
- Provide a clean, dry growing environment
- Avoid overhead watering, if possible, by using drip or micro-irrigation
- Avoid overwatering and monitor weather conditions for rain events
- Irrigate early in the day to reduce how long leaves and soil are wet
- Provide good plant spacing and horizontal air flow
- Elevate plants off the ground to avoid water spread, particularly in areas prone to flooding
- Immediately remove and dispose of infected plants
- Sanitize between crops
- In greenhouse production, keep humidity low by heating and venting as needed

Preventive treatments with effective fungicides are the best defense against *Phytophthora* diseases. For outdoor production areas, monitor weather conditions closely. If there is going to be a significant rain event causing saturated soil conditions for an extended period, make sure the plants are protected.

Fungicide	FRAC Groups	Rate (Per 100 Gal)	Activity
Mural® fungicide	7 + 11	2-3 oz. drench | 4-7 oz. foliar	Systemic and translaminar
Segovis® fungicide	49	0.6-3.2 fl. oz. (Drench or foliar spray)	Systemic and translaminar
Micora® fungicide	40	4-8 fl. oz. (Drench or foliar spray)	Translaminar
Subdue Maxx® fungicide	4	1-2 fl. oz. (Drench or foliar spray)	Systemic and translaminar

Pathogen	Temperature Range	Injury & Common Plant Hosts
Phytophthora cactorum	36 – 89°F (77°F optimum)	Root & crown rot on broad range of herbaceous & woody ornamentals
Phytophthora cinnamomi	41 – 93°F (75-82°F optimum)	Root rot & cankers on broad range of woody ornamentals
Phytophthora citricola	37 – 89°F (77-82°F optimum)	Root rot & trunk canker on citrus, *Rhododendron spp.*, other woody species
Phytophthora cryptogea	34 – 91°F (71-77°F optimum)	Root & crown rot of gerbera, pansy and other herbaceous plants
Phytophthora drechsleri	41 – >95°F (82-88°F optimum)	Root and crown rot of poinsettia, calibrachoa and other herbaceous plants
Phytophthora nicotianae/parasitica	43 – 98°F (80-89°F optimum)	Root & crown rot on broad range of herbaceous plants
Phytophthora palmivora	51 – 95°F (80-86°F optimum)	Root rot and foliar blight on palms & foliage plants
Phytophthora ramorum	35 – 79°F (68°F optimum)	Twig & foliar blight on *Quercus spp., Rhododendron spp.*, camellia, other woody species
Phytophthora syringae	40 – 73°F (59-68°F optimum)	Stem canker on crab apple, lilac and *rosa spp.*
Phytophthora tropicalis	70 – 90°F (75-82°F optimum)	Leaf blight & stem canker on foliage & herbaceous plants

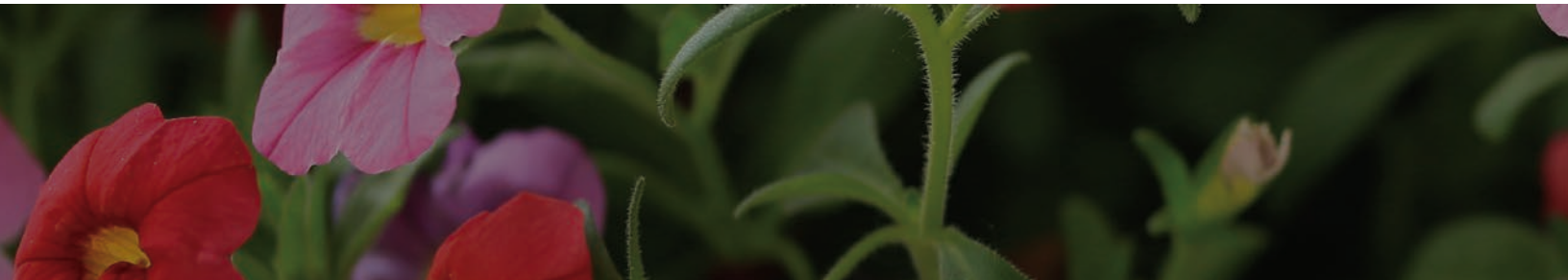
Susceptible Crops

Phytophthora spp. can infect a wide range of ornamental crops under the right conditions. Carefully scout the following plants that are prone to infection:

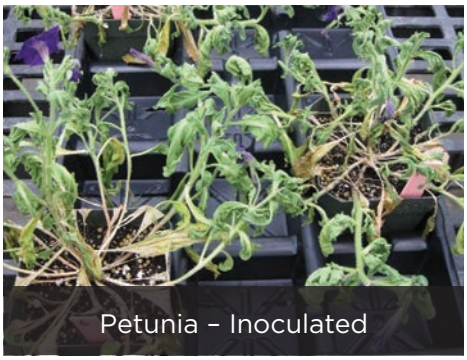
Herbaceous Plants

- Begonia
- Calibrachoa
- Foliage plants (including Dieffenbachia, Pothos, Spathiphyllum, English Ivy and more)
- Gerbera
- Gloxinia
- Lavender
- Liriope
- Pansy
- Petunia
- Poinsettia
- Snapdragon
- Vinca
- Violet

Phytophthora blight on Vinca. Rechcigl, Syngenta.



Phytophthora nicotianae Control on Petunia

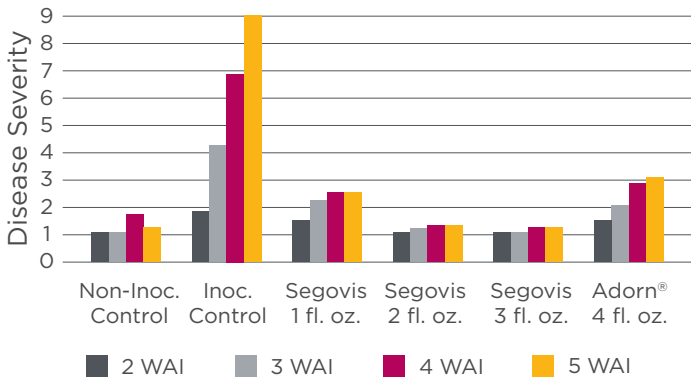

Petunia – Inoculated


Segovis 2 fl. oz./100 gal


Segway® 3 fl. oz./100 gal

2016 – Vero Beach Research Center

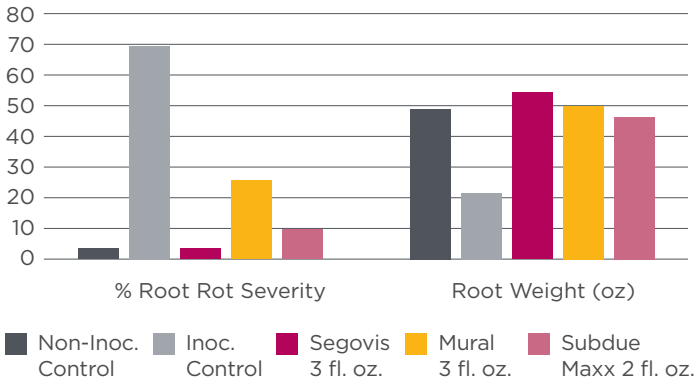
CONTROL OF PHYTOPHTHORA CROWN ROT (*Phytophthora Cryptogea*) on Gerbera



2015 – Hand, The Ohio State University
WAI = Weeks After Inoculation
Rates per 100 gal

Drench application – 7/17/2015
Inoculated – 7/21/2015

CONTROL OF PHYTOPHTHORA ROOT ROT (*Phytophthora Cinnamomi*) on Dogwood



2017 – F. Gurel & Timmons, Tennessee State University
Rates per 100 gal

Your Comprehensive ***Phytophthora spp.*** Solution

A preventive fungicide is essential for successfully controlling *Phytophthora spp.* since often, it is too late to control once it is found. Incorporating effective fungicides and appropriate cultural practices can help reduce the threat of *Phytophthora spp.* in greenhouses and nurseries.

To learn more, visit
GreenCastOnline.com/Solutions

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LGC 9077A 07-2021