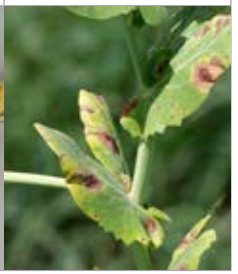
GREEN BEANS AND PEAS

Aphanomyces root rot	Ashy stem blight (charcoal rot)	Black root rot	Black spot
Page 134	Page 138	Page 142	Page 146
			

Fusarium root rot	Pea wilt	Pythium stem rot
Page 150	Page 154	Page 158
		

Rhizoctonia root rot	Sclerotinia rot (white mould)	Sclerotium rot
Page 162	Page 166	Page 170
		

APHANOMYCES ROOT ROT

Aphanomyces euteiches

WHAT SHOULD I LOOK FOR?

Initial honey-brown discolouration of root and area above the seed up to the soil line as shown in plants on right hand side, compared to healthy plants on the left. Nodulation on roots may also be poor. Roots become darker as disease progresses and eventually die

L. Porter, ARS USDA

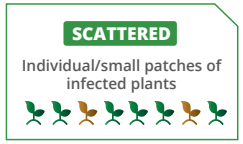
Aboveground yellowing will occur starting at the bottom leaves, followed by wilting and death

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- 22-28°C

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

CROP ROTATION

Select non-host rotation or cover crops

- 6 to 10 year rotation

HOST-FREE ZONE

Control volunteer host plants and weeds

BIO FUMIGATION

Grow a biofumigant crop

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

PLANTING PREPARATION

SOIL TEST

Conduct a pre-sowing soil test to help predict level of risk

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

DRAINAGE

Plant on raised beds or well-draining soil

CROP SELECTION

Choose a resistant/less susceptible cultivar

- Avoid late-maturing varieties especially in paddocks with history of Aphanomyces root rot

POST-PLANT

IRRIGATION MANAGEMENT

Monitor crop and soil to optimize amount and timing

CONTROL PESTS

Control insect pests that spread spores

- Sciarid flies can spread spores and larvae damage roots

HOST RANGE

Range of legume crops and weed species including peas, beans, clovers and medics

ASHY STEM BLIGHT (CHARCOAL ROT)

Macrophomina phaseolina

WHAT SHOULD I LOOK FOR?

Sunken lesions develop on the stem, as shown here in seedlings. Lesions have sharp margins and may contain concentric rings *H. Schwartz, Colorado State University, Bugwood.org*

As the disease progresses, dry rot of the stem and pale, ash-coloured "dust" develop
H. Schwartz, Colorado State University, Bugwood.org

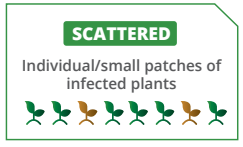
Small black survival structures (*microsclerotia*) develop in dead tissue
P. Bachi, University of Kentucky Research and Education Center, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- 24-27°C

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

CROP ROTATION

Select non-host rotation or cover crops

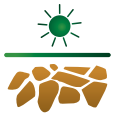
- 4 to 6 year break from susceptible crop

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

SOIL SOLARISATION

Cover soil with a tarp and kill harmful pathogens



BIO FUMIGATION

Grow a biofumigant crop

PLANTING PREPARATION

CROP SELECTION

Choose a resistant/less susceptible cultivar

USE CLEAN SEED OR SEEDLINGS

Source seed/ seedlings from a certified reputable source

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

SOIL TEST

Conduct a pre-sowing soil test to help predict level of risk

CHEMICAL TREATMENT

Treat seed/ seedlings with registered fungicide

- Consult APVMA or InfoPest website for current registered products

POST-PLANT

AVOID WATER STRESS

Ensure plants receive adequate water

GOOD NUTRITION

Ensure plants' nutritional needs are met

- Avoid excess Nitrogen

AVOID PLANT INJURY

Avoid any physical damage to plant

HOST RANGE

Very wide, host range infecting over 500 plant species including members of the pumpkin, bean, brassica and pepper families.

BLACK ROOT ROT

Thielaviopsis basicola (aka. Chalara elegans)

WHAT SHOULD I LOOK FOR?

Initially long red lesions appear on the root which eventually turn black

Virginia Tech Learning Resources Center

Tap root may become stunted, aboveground plant may also become stunted, wilt and possibly die

N. Cattlin, Alamy Stock Photo

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

• 17-25°C

DISTRIBUTION IN THE FIELD

SCATTERED

Individual/small patches of infected plants

HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

CROP ROTATION

Select non-host rotation or cover crops

- 5 to 6 year break from host crops

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

BIO FUMIGATION

Grow a biofumigant crop

PLANTING PREPARATION

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

DRAINAGE

Plant on raised beds or well-draining soil

POST-PLANT

IRRIGATION MANAGEMENT

Monitor crop and soil to optimize amount and timing

- Minimise irrigation splash

AVOID PLANT INJURY

Avoid any physical damage to plant

HOST RANGE

Wide host range, including beans, peas, cotton, lettuces, lucerne, lupin and soybean

BLACK SPOT (ASCOCHYTA BLIGHT)

Didymella pinodes often in a disease complex with Phoma medicaginis var. pinodella, Phoma Koolunga and Didymella pisi.

WHAT SHOULD I LOOK FOR?

Irregular dark brown to black spots that develop into large purplish-black lesions on stems, leaves and pods.
M. Wunsch, North Dakota State University

Concentric rings and black survival structures (pycnidia) can often be seen in the middle of the lesion.
M. Wunsch, North Dakota State University

WHERE WILL I SEE SYMPTOMS?

- In severe cases

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- 18-22°C

DISTRIBUTION IN THE FIELD

SCATTERED

Individual/small patches of infected plants

HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | 3-10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

HOST-FREE ZONE

Control volunteer host plants and weeds

CROP ROTATION

Select non-host rotation or cover crops

- Minimum 3 year break and 500m from previous host crops

PLANTING PREPARATION

NO RESIDUE AT PLANTING

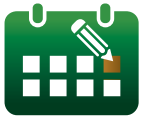
Ensure no plant residues from host crops at planting

USE CLEAN SEED OR SEEDLINGS

Source seed/ seedlings from a certified reputable source

ADJUST DATE

Adjust planting/harvest date to reduce infection risk



- Avoid early planting at high seeding rates which increases exposure

AIR CIRCULATION

Increase row/plant spacing to improve air flow

CHEMICAL TREATMENT

Treat seed/ seedlings with registered fungicide

- Consult APVMA or InfoPest website for current registered products

HOST RANGE

Most severe on peas, but also infects lentils, alfalfa, faba beans, clover and vetch

FUSARIUM ROOT ROT

Fusarium solani f. sp. phaseoli

WHAT SHOULD I LOOK FOR?

Aboveground plants may initially appear yellow, stunted and wilted and eventually may die
H. Schwartz, Colorado State University, Bugwood.org

Belowground lower root may die off and secondary roots may form above the diseased area
H. Schwartz, Colorado State University, Bugwood.org

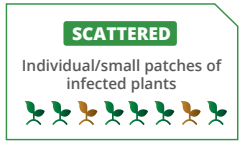
Cutting the stem reveals drying out and reddening of the taproot
H. Schwartz, Colorado State University, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- Soil <13°C at planting

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

CROP ROTATION

Select non-host rotation or cover crops

- Minimum 5-6 year break from host crop

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

BIO FUMIGATION

Grow a biofumigant crop

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

PLANTING PREPARATION

CULTIVATION

Cultivate heavily compacted soil e.g. deep rip

- Consider cultivation in heavily compacted soils

FERTILISER SELECTION

- Avoid acidifying NH4+ fertilizers

SOIL SOLARISATION

Cover soil with a tarp and kill harmful pathogens

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

POST-PLANT

HILL UP

Bury the base of the plant to encourage new growth

- May encourage new growth above diseased area

AVOID PLANT INJURY

Avoid any physical damage to plant

GOOD NUTRITION

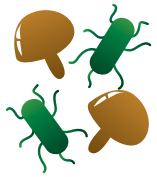
Ensure plants' nutritional needs are met

- Consider calcium supplements

CONTROL PESTS

Control insect pests that spread spores

BIOCONTROL PRODUCTS



HOST RANGE

Green beans

PEA WILT

Fusarium oxysporum f. sp. pisi

WHAT SHOULD I LOOK FOR?

Aboveground yellowing of leaves, begins at the base of the plants and progresses upwards. Stunting of plants is also common. *L. Porter, ARS-USDA*

Belowground brown to black lesions form around seed and root tissue that start small and then grow together to form large lesions. *L. Porter, ARS-USDA.*

Rot may only be confined to the outer layers of the root and cutting off the outer sheath reveals healthy inner tissue, as shown in the two outer plants. *L. Porter, ARS-USDA.*

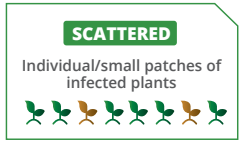
WHERE WILL I SEE SYMPTOMS?

- In severe cases

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- 25-30°C
- High soil moisture favours disease

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

CROP ROTATION

Select non-host rotation or cover crops

- Minimum 5-6 year break from host crop

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

BIO FUMIGATION

Grow a biofumigant crop

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

PLANTING PREPARATION

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

CHEMICAL TREATMENT

Treat seed/ seedlings with registered fungicide

- Consult APVMA or InfoPest website for current registered products

DRAINAGE

Plant on raised beds or well-draining soil

USE CLEAN SEED OR SEEDLINGS

Source seed/ seedlings from a certified reputable source

CROP SELECTION

Choose a resistant/less susceptible cultivar

FERTILISER SELECTION

- Use low ammonium fertilisers

POST-PLANT

AVOID PLANT INJURY

Avoid any physical damage to plant

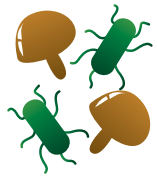
CONTROL PESTS

Control insect pests that spread spores

GOOD NUTRITION

Ensure plants' nutritional needs are met

BIOCONTROL PRODUCTS



HOST RANGE

Peas

PYTHIUM STEM ROT

Pythium spp.

WHAT SHOULD I LOOK FOR?

Brown discolouration and soft rot of lower plant stem
H. Schwartz, Colorado State University, Bugwood.org

Watery rot and white fluffy growth may also develop on pods post-harvest. Unlike Sclerotinia, no black fruiting with survival bodies (sclerotia) will form
B. Olson, Oklahoma State University, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

STEM BASE

ROOTS

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

HOT

WET

PHYSICAL DAMAGE

- Daytime 30-35°C
  Night >20°C

DISTRIBUTION IN THE FIELD

LARGE AREAS

Large areas of infected plants clearly visible

HOW DOES IT SPREAD?

WIND

FREE WATER

MOVEMENT OF CONTAMINATED SOIL

INSECTS

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE
Stop movement of contaminated soil, water, plants and equipment

HOST-FREE ZONE
Control volunteer host plants and weeds

CROP ROTATION
Select non-host rotation or cover crops

- Minimum 5-6 year break from host crop

CHEMICAL FUMIGATION
Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

BIO FUMIGATION
Grow a biofumigant crop

IMPROVE SOIL HEALTH
Add organic matter or amendments to boost beneficial microbes

PLANTING PREPARATION

DRAINAGE
Plant on raised beds or well-draining soil

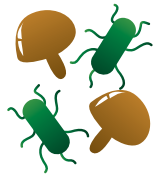
- Use registered seed treatment

CHEMICAL TREATMENT
Treat seed/ seedlings with registered fungicide

- Consult APVMA or InfoPest website for current registered products

NO RESIDUE AT PLANTING
Ensure no plant residues from host crops at planting

BIOCONTROL PRODUCTS



POST-PLANT

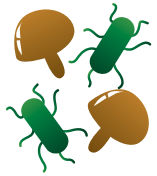
IRRIGATION MANAGEMENT
Monitor crop and soil to optimize amount and timing

AVOID PLANT INJURY
Avoid any physical damage to plant

CONTROL PESTS
Control insect pests that spread spores

GOOD NUTRITION
Ensure plants' nutritional needs are met

BIOCONTROL PRODUCTS



HOST RANGE

Very wide host range, including all legumes and most vegetable crops

RHIZOCTONIA ROOT ROT

Rhizoctonia solani

WHAT SHOULD I LOOK FOR?

Infected seedlings may appear stunted and sunken; red lesions on root and lower stem are visible. In some cases new roots form above the diseased area, and the plant can continue to grow satisfactorily. Infection in older plants may occur

(a) E. Sikora, Auburn University, Bugwood.org. (b) H. Schwartz, Colorado State University, Bugwood.org

Aboveground yellowing of leaves begins at the base of the plants and progresses upwards. Stunting of plants is also common

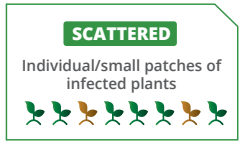
L. Porter, ARS-USDA

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

- Soil temperature <20°C

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

HOST-FREE ZONE

Control volunteer host plants and weeds

CROP ROTATION

Select non-host rotation or cover crops

- Minimum 6 month break from potatoes, cabbages, cauliflowers or broccoli

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

IMPROVE SOIL HEALTH

Add organic matter or amendments to boost beneficial microbes

BIO FUMIGATION

Grow a biofumigant crop

PLANTING PREPARATION

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

DRAINAGE

Plant on raised beds or well-draining soil

CHEMICAL TREATMENT

Treat seed/ seedlings with registered fungicide

- Consult APVMA or InfoPest website for current registered products

POST-PLANT

HILL UP

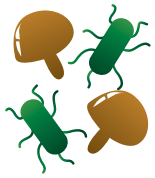
Bury the base of the plant to encourage new growth

- May encourage new growth above diseased area

AVOID PLANT INJURY

Avoid any physical damage to plant

BIOCONTROL PRODUCTS



GOOD NUTRITION

Ensure plants' nutritional needs are met

HOST RANGE

Very wide host range, including all legumes and most vegetable crops

SCLEROTINIA ROT (WHITE MOULD)

Sclerotinia sclerotiorum | S. minor

WHAT SHOULD I LOOK FOR?

Symptoms begin as water-soaked lesions which eventually rot and collapse. As the disease progresses, characteristic white fluffy growth develops followed by black survival structures (sclerotia).

N. Cattlin, Alamy Stock Photo

Survival structures (sclerotia) can also develop on (a) stems and (b) can be up to 25mm long in *S. sclerotiorum* and much smaller (up to 3mm long) in *S. minor*

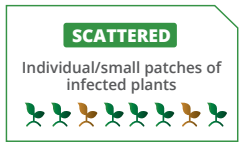
(a) NY State IPM Program, Bugwood.org (b) C. Balbalian, Mississippi State University, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

• 15-20°C

DISTRIBUTION IN THE FIELD



HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | 3-10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

HOST-FREE ZONE

Control volunteer host plants and weeds

CROP ROTATION

Select non-host rotation or cover crops

BIO FUMIGATION

Grow a biofumigant crop

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

PLANTING PREPARATION

AIR CIRCULATION

Increase row/plant spacing to improve air flow

- Consult APVMA or InfoPest website for current registered products

DRAINAGE

Plant on raised beds or well-draining soil

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

IMPROVE SOIL HEALTH

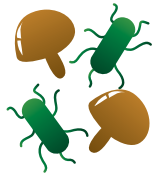
Add organic matter or amendments to boost beneficial microbes

POST-PLANT

IRRIGATION MANAGEMENT

Monitor crop and soil to optimize amount and timing

BIOCONTROL PRODUCTS



CHEMICAL TREATMENT

Treat plant with registered foliar fungicide

- Consult APVMA or InfoPest website for current registered products

HOST RANGE

Very wide (more than 400 different plant species), including most vegetable crops

SCLEROTIUM ROT

Sclerotium rolfsii

WHAT SHOULD I LOOK FOR?

Watery rot that eventually leads to collapse of infected area. Characteristic white “ropey” fungal growth develops along with light brown survival structures (sclerotia)

Bridget Lassiter, NCDA & CS, Bugwood.org

Survival structures may develop on the infected tissue or soil surface resembling mustard seeds

Clemson University, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

• 25-35°C

DISTRIBUTION IN THE FIELD

SCATTERED

Individual/small patches of infected plants

HOW DOES IT SPREAD?

SURVIVAL TIME WITHOUT HOST | 3-10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP

FARM HYGIENE

Stop movement of contaminated soil, water, plants and equipment

HOST-FREE ZONE

Control volunteer host plants and weeds

CROP ROTATION

Select non-host rotation or cover crops

CHEMICAL FUMIGATION

Always use with care and as per label

- Consult APVMA or InfoPest website for current registered products

PLANTING PREPARATION

AIR CIRCULATION

Increase row/plant spacing to improve air flow

DRAINAGE

Plant on raised beds or well-draining soil

NO RESIDUE AT PLANTING

Ensure no plant residues from host crops at planting

USE CLEAN SEED OR SEEDLINGS

Source seed/ seedlings from a certified reputable source

POST-PLANT

IRRIGATION MANAGEMENT

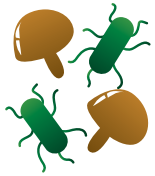
Monitor crop and soil to optimize amount and timing

CHEMICAL TREATMENT

Treat plant with registered foliar fungicide

- Consult APVMA or InfoPest website for current registered products

BIOCONTROL PRODUCTS



HOST RANGE

Very wide (more than 500 different plant species), including most vegetable crops