
















CARROT, CELERY, PARSNIP AND PARSLEY

Black canker	Black root rot/black mould	Carrot scab	Cavity spot	Crater rot
Page 80	Page 84	Page 88	Page 92	Page 96
				

Crown rot	Damping off	Leaf curl/ celery anthracnose	Root-knot nematode
Page 100	Page 104	Page 108	Page 112
			

Root-lesion nematode	Root rot complex	Sclerotinia rot (white mould)	Sclerotium rot
Page 116	Page 120	Page 124	Page 128
			

BLACK CANKER

Itersonilia perplexans | *Cylindrocarpon* spp. | *Mycocentrospora acerina*

WHAT SHOULD I LOOK FOR?






Orange-brown lesions often with a pale green-yellow halo form are seen on the leaves.

M. Kowalik-Kepler, APS












Red-brown to black cankers develop typically on the crown or shoulder of the root. Initially on the surface, but may decay further with secondary infection by other pathogens.

L. Tesoriero, NSW DPI

<p>WHERE WILL I SEE SYMPTOMS?</p> 	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="537 1292 683 1436">  <p>COOL</p> <ul style="list-style-type: none"> • 18-22°C </div> <div data-bbox="705 1292 851 1436">  <p>WET</p> <ul style="list-style-type: none"> • Periods of extended rain </div> </div>
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<p>DISTRIBUTION IN THE FIELD</p> <div style="border: 1px solid green; padding: 5px; margin: 5px;"> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p>  </div>	<p>HOW DOES IT SPREAD?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="1579 1268 1724 1412">  <p>WIND</p> </div> <div data-bbox="1736 1268 1881 1412">  <p>FREE WATER</p> </div> <div data-bbox="1892 1268 2038 1412">  <p>CONTAMINATED PLANT DEBRIS</p> </div> </div> <div style="background-color: #e67e22; color: white; padding: 5px; margin-top: 10px;"> <p>SURVIVAL TIME WITHOUT HOST Less than 3-10 years</p> </div>
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HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	
<p>PLANTING PREPARATION</p>	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>ADJUST DATE</p> <p>Adjust planting/harvest date to reduce infection risk</p> 	<p>CROP SELECTION</p> <p>Choose a resistant/less susceptible cultivar</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 

- Minimum 12 month break between parsnip crops

- Avoid an autumn planting/spring harvest which can favour infection

HOST RANGE

Parsnip, carrot

BLACK ROOT ROT/BLACK MOULD

Thielaviopsis basicola (Chalara elegans) or Chalaropsis thielavioides

WHAT SHOULD I LOOK FOR?



Dark grey to black fungal growth can develop around leaf base in the field. Blackened areas develop on roots, mostly post harvest when spores rapidly spread on wet carrots that are not stored below 5°C

L. du Toit, WSU













Blackened areas have a sooty appearance, do not have distinct margins and do not move beyond the skin of the carrot root

DPIRD

<p>WHERE WILL I SEE SYMPTOMS?</p>  <p>CARROT ROOT</p>	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p> <div style="display: flex; justify-content: space-around;">    </div> <p>• 17-25°C</p>
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<p>DISTRIBUTION IN THE FIELD</p> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 	<p>HOW DOES IT SPREAD?</p> <div style="display: flex; justify-content: space-around;">   </div> <p>SURVIVAL TIME WITHOUT HOST More than 10 years</p>
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HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE Stop movement of contaminated soil, water, plants and equipment </p>	<p>CROP ROTATION Select non-host rotation or cover crops </p>	<p>BIO FUMIGATION Grow a biofumigant crop </p>	<p>IMPROVE SOIL HEALTH Add organic matter or amendments to boost beneficial microbes </p>	
<p>PLANTING PREPARATION</p>	<p>NO RESIDUE AT PLANTING Ensure no plant residues from host crops at planting </p>	<p>DRAINAGE Plant on raised beds or well-draining soil </p>	<p>HARVEST</p>		
<p>POST-PLANT</p>	<p>IRRIGATION MANAGEMENT Monitor crop and soil to optimize amount and timing  <ul style="list-style-type: none">• Minimise irrigation splash</p>	<p>CLEAN WASH WATER Ensure wash water is regularly sanitized and changed </p>		<p>AVOID PLANT INJURY Avoid any physical damage to plant </p>	<p>POST-HARVEST STORAGE  <ul style="list-style-type: none">• Rapid cooling and store at 0°C</p>

HOST RANGE

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

CARROT SCAB

Streptomyces scabiei

WHAT SHOULD I LOOK FOR?



No visible symptoms on leaves. Dry corky lesions on root that may be raised or sunken; usually develop where lateral roots emerge from tap root

Bayer Crop Science, UK



Multiple lesions may merge to form large scabby horizontal bands

Bayer Crop Science, UK

WHERE WILL I SEE SYMPTOMS?



FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT



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	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<ul style="list-style-type: none"> • Preferably rotate with legumes. Avoid fields that have previously grown potatoes.
PLANTING PREPARATION	<p>CROP SELECTION</p> <p>Choose a resistant/less susceptible cultivar</p> 	<p>SOIL PH</p> <p>Use amendments to adjust soil pH</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>FERTILISER SELECTION</p> 	<ul style="list-style-type: none"> • Use acidifying fertilisers e.g. ammonium sulphate to help lower pH 	
POST-PLANT	<p>AVOID WATER STRESS</p> <p>Ensure plants receive adequate water</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 			

HOST RANGE

Carrot, potato, peanut, beetroot, swede, parsnip, radish

CAVITY SPOT

Pythium sulcatum or *P. violae*

WHAT SHOULD I LOOK FOR?



Pin-head sized dots that progress to small (10mm) sunken oval lesions, often with a yellow halo, anywhere along the root surface.


L. du Toit, WSU




Symptoms can begin one month before harvest and develop rapidly. Damage can make fresh carrots unmarketable.

L. du Toit, WSU


WHERE WILL I SEE SYMPTOMS?



FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT



WARM



WET

pH < 7

ACIDIC SOIL

• 20-28°C
Optimum *P. sulcatum* -28°C
P. violae -19°C

DISTRIBUTION IN THE FIELD

SCATTERED

Individual/small patches of infected plants



HOW DOES IT SPREAD?



FREE WATER


















CONTAMINATED PLANT DEBRIS



INSECTS

SURVIVAL TIME WITHOUT HOST | More than 10 years

HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	<p>CHEMICAL FUMIGATION</p> <p>Always use with care and as per label</p> 
<p>PLANTING PREPARATION</p>	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>SOIL PH</p> <p>Use amendments to adjust soil pH</p> 	<p>CROP SELECTION</p> <p>Choose a resistant/less susceptible cultivar</p> 	<p>SOIL TEST</p> <p>Conduct a pre-sowing soil test to help predict level of risk</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<ul style="list-style-type: none"> • Rotate with non-hosts such as broccoli, lettuce or beans • 5 year break between host crops • Consult APVMA or InfoPest website for current registered products
<p>POST-PLANT</p>	<p>CHEMICAL TREATMENT</p> <p>Use registered soil drench at planting</p> 	<p>IRRIGATION MANAGEMENT</p> <p>Monitor crop and soil to optimize amount and timing</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>ADJUST DATE</p> <p>Adjust planting/harvest date to reduce infection risk</p> 	<ul style="list-style-type: none"> • Avoid summer or autumn harvest. Monitor 1 month prior to expected harvest date to avoid over maturity 	<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products

HOST RANGE

P. sulcatum - Carrot, parsnips, celery, parsley

P. violae - Carrot, parsnips, celery, parsley, broccoli, wheat, lucerne

CRATER ROT

Rhizoctonia carotae

WHAT SHOULD I LOOK FOR?



Horizontal dark brown bands develop mostly on the crown and upper root





L. Tesoriero, NSW DPI



Rotted pits develop under the bands, joining to form craters as the disease progresses.








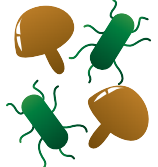





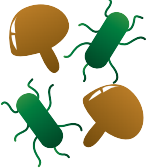
White cottony growth may develop in high humidity

Plant Disease Clinic, University of Minnesota

<p>WHERE WILL I SEE SYMPTOMS?</p>  <p>• Crown and upper part of root</p>	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="481 1305 622 1449">  <p>COOL</p> </div> <div data-bbox="638 1305 779 1449">  <p>HIGH HUMIDITY</p> </div> <div data-bbox="795 1305 936 1449">  <p>MOIST SOIL</p> </div> </div> <p>• 16-20°C</p>
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<p>DISTRIBUTION IN THE FIELD</p> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 	<p>HOW DOES IT SPREAD?</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="1585 1273 1729 1417">  <p>FREE WATER</p> </div> <div data-bbox="1742 1273 1886 1417">  <p>MOVEMENT OF CONTAMINATED SOIL</p> </div> <div data-bbox="1899 1273 2042 1417">  <p>CONTAMINATED PLANT DEBRIS</p> </div> </div> <p>SURVIVAL TIME WITHOUT HOST 3-10 years</p>
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HOW DO I CONTROL IT?

FALLOW/COVER CROP	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 
PLANTING PREPARATION	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>BIOCONTROL PRODUCTS</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat seed/seedlings with registered fungicide</p> 	<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products
POST-PLANT	<p>IRRIGATION MANAGEMENT</p> <p>Monitor crop and soil to optimize amount and timing</p> 	<p>ADJUST DATE</p> <p>Adjust planting/harvest date to reduce infection risk</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 	<p>BIOCONTROL PRODUCTS</p> 

- Harvest early in high risk situations to reduce chance of infection

HOST RANGE

Carrot

CROWN ROT

Fusarium spp. | *Rhizoctonia* spp.

WHAT SHOULD I LOOK FOR?



Crown rot in carrots caused by *Rhizoctonia* spp. causes black lesions at the soil line that spreads to the top of the root. This often causes breaking off of leaves at harvest
L. Tesoriero, Crop Doc Consulting





Crown rot symptoms may also be caused by *Fusarium* spp. as shown in mature carrots
H. Pung, Peracto







Crown rot in parsley caused by *Fusarium* spp. causes (a) soft brown rot where the root meets the soil and (b) discolouration of the internal root tissue
L. Tesoriero, Crop Doc Consulting

WHERE WILL I SEE SYMPTOMS?

 LEAVES
  CARROT ROOT

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

 WARM
• 18-25°C
  WET
  pH < 7
ACIDIC SOIL
  NUTRITIONAL IMBALANCE

DISTRIBUTION IN THE FIELD

SCATTERED

Individual/small patches of infected plants




HOW DOES IT SPREAD?

 FREE WATER
  MOVEMENT OF CONTAMINATED SOIL

SURVIVAL TIME WITHOUT HOST
3-10 years

HOW DO I CONTROL IT?

FALLOW/COVER CROP	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	<ul style="list-style-type: none"> • Minimum 3 year break between host crops
PLANTING PREPARATION	<p>SOIL PH</p> <p>Use amendments to adjust soil pH</p> 	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>BIOCONTROL PRODUCTS</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat seed/seedlings with registered fungicide</p> 	<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products
POST-PLANT	<p>IRRIGATION MANAGEMENT</p> <p>Monitor crop and soil to optimize amount and timing</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>BIOCONTROL PRODUCTS</p> 	<ul style="list-style-type: none"> • Stressed crops are more susceptible to infection 	

HOST RANGE

Carrot, parsnips, celery

DAMPING OFF

Rhizoctonia or Pythium spp.

WHAT SHOULD I LOOK FOR?





Seedling emergence may be poor leading to bare patches. Seedlings may emerge but have stunted growth, as shown in parsley

L. Tesoriero, Crop Doc Consulting













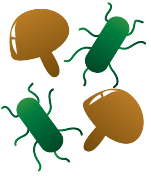

Seedlings may also develop red-brown lesions at the soil junction, resulting in wilt and eventual death, as shown in carrots

B. Conde, NT DPIF

<p>WHERE WILL I SEE SYMPTOMS?</p> 	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p>  <p>• 13-18°C</p>
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<p>DISTRIBUTION IN THE FIELD</p> <p>LARGE AREAS</p> <p>Large areas of infected plants clearly visible</p> 	<p>HOW DOES IT SPREAD?</p>  <p>SURVIVAL TIME WITHOUT HOST More than 10 years</p>
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HOW DO I CONTROL IT?

FALLOW/COVER CROP	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>CHEMICAL FUMIGATION</p> <p>Always use with care and as per label</p> 
PLANTING PREPARATION	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat seed/seedlings with registered fungicide</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products 		
POST-PLANT	<p>IRRIGATION MANAGEMENT</p> <p>Monitor crop and soil to optimize amount and timing</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>BIOCONTROL PRODUCTS</p> 	<p>CONTROL PESTS</p> <p>Control insect pests that spread spores</p> 	<ul style="list-style-type: none"> • Stressed crops are more susceptible to infection • Sciarid flies can spread disease

HOST RANGE

Carrot, parsnips, celery, parsley

LEAF CURL/CELERY ANTHRACNOSE

Colletotrichum acutatum | *C. orbiculare*

WHAT SHOULD I LOOK FOR?



Stunting of plants resulting in small cupped leaves. Older leaves may curl downward and become distorted. Brown lesions may develop on leaf margins. Lesions may become brittle and crack.

L. Tesoriero, Crop Doc Consulting










Stalks may become twisted with red to light-brown lesions, sometimes in stripes.

L. Tesoriero, Crop Doc Consulting

<p>WHERE WILL I SEE SYMPTOMS?</p> 	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p>  <ul style="list-style-type: none"> • Extended leaf wetness • 23-27°C
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<p>DISTRIBUTION IN THE FIELD</p> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 	<p>HOW DOES IT SPREAD?</p>  <ul style="list-style-type: none"> • Continuous water splash <p>SURVIVAL TIME WITHOUT HOST Less than 3 years</p>
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HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 
<p>• 3 to 4-year break</p>			
<p>PLANTING PREPARATION</p>	<p>CROP SELECTION</p> <p>Choose a resistant/less susceptible cultivar</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	
<p>POST-PLANT</p>	<p>AVOID OVER IRRIGATION</p> <p>Saturated soils favour disease development and spread</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat plant with registered foliar fungicide</p> 	
<p>• Consult APVMA or InfoPest for current registered products</p>			

HOST RANGE

Wide host range including celery

ROOT-KNOT NEMATODE

WARM CLIMATE SPECIES: *Meloidogyne incognita* | *Meloidogyne javanica* | *Meloidogyne arenaria*

COOL-CLIMATE SPECIES: *Meloidogyne hapla* | *Meloidogyne fallax*

WHAT SHOULD I LOOK FOR?



Aboveground scattered areas of stunted, yellow and wilted plants may be visible.
B. Hammeraas, NIBIO, Bugwood.org

Belowground infection by *Meloidogyne* spp. can result in swollen galls on carrot roots.
S. Nelson FLICKR

Infection by *Meloidogyne hapla* can cause forking and severe distortion of carrot roots
W. Peraza-Padilla, National University Costa Rica, Bugwood.org

WHERE WILL I SEE SYMPTOMS?

ABOVE GROUND

CARROT ROOT

FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT

WARM

• Active 15°C +

SANDY SOIL

COOL

• Active 8.5°C +

SANDY SOIL

DISTRIBUTION IN THE FIELD

LARGE AREAS

Large areas of infected plants clearly visible

HOW DOES IT SPREAD?













MOVEMENT OF CONTAMINATED SOIL

FREE WATER

CONTAMINATED PLANT DEBRIS

SURVIVAL TIME WITHOUT HOST | Less than 3 years

HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE Control volunteer host plants and weeds</p> 	<p>CROP ROTATION Select non-host rotation or cover crops</p> 	<p>CHEMICAL FUMIGATION Always use with care and as per label</p> 	<p>BIO FUMIGATION Grow a biofumigant crop</p> 	<p>SOIL TEST Conduct a pre-sowing soil test to help predict level of risk</p> 
<p>PLANTING PREPARATION</p>	<p>CROP SELECTION Choose a resistant/less susceptible cultivar</p> 	<p>SOIL SOLARISATION Cover soil with a tarp and kill harmful pathogens</p> 	<p>IRRIGATION MANAGEMENT Monitor crop and soil to optimize amount and timing</p> 	<p>ADJUST DATE Adjust planting/harvest date to reduce infection risk</p> 	<p>NO RESIDUE AT PLANTING Ensure no plant residues from host crops at planting</p> 	<p>CHEMICAL TREATMENT Use registered soil drench nematicide at planting</p> 
				<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products 		<ul style="list-style-type: none"> • e.g. PREDICTA® B testing service. If numbers are high consider fallow or non-host break crop

HOST RANGE

Very wide, with over 2000 plant species acting as hosts to root-knot nematode

ROOT-LESION NEMATODE

Pratylenchus penetrans



WHAT SHOULD I LOOK FOR?





Aboveground scattered areas of stunted, yellow and wilted plants may be visible
 B. Hammeraas, NIBIO, Bugwood.org



Belowground infection by *Pratylenchus penetrans* can cause forking, distortion and prolific formation of lateral roots
 S. Collins, DPIRD

<p>WHERE WILL I SEE SYMPTOMS?</p> 	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p>  <p>• 20-25°C</p>
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<p>DISTRIBUTION IN THE FIELD</p> <p>LARGE AREAS</p> <p>Large areas of infected plants clearly visible</p> 	<p>HOW DOES IT SPREAD?</p>  <p>SURVIVAL TIME WITHOUT HOST More than 10 years</p>
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HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<p>FARM HYGIENE Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE Control volunteer host plants and weeds</p> 	<p>CROP ROTATION Select non-host rotation or cover crops</p> 	<p>CHEMICAL FUMIGATION Always use with care and as per label</p> 	<p>BIO FUMIGATION Grow a biofumigant crop</p> 	<p>SOIL TEST Conduct a pre-sowing soil test to help predict level of risk</p> 	<ul style="list-style-type: none"> • Consult APVMA or InfoPest website for current registered products 	<ul style="list-style-type: none"> • e.g. PREDICTA® B testing service. If numbers are high consider fallow or non-host break crop
<p>PLANTING PREPARATION</p>	<p>CROP SELECTION Choose a resistant/less susceptible cultivar</p> 	<p>SOIL SOLARISATION Cover soil with a tarp and kill harmful pathogens</p> 	<p>IRRIGATION MANAGEMENT Monitor crop and soil to optimize amount and timing</p> 	<p>NO RESIDUE AT PLANTING Ensure no plant residues from host crops at planting</p> 	<p>ADJUST DATE Adjust planting/harvest date to reduce infection risk</p> 	<ul style="list-style-type: none"> • Select planting date to maximise growth in cool conditions when nematode activity is reduced. Bring forward harvest to minimise damage in high risk situations 		

HOST RANGE

Wide, infecting over 400 plant species including carrot, potatoes and fruit trees

ROOT ROT COMPLEX

Phytophthora/Pythium spp.

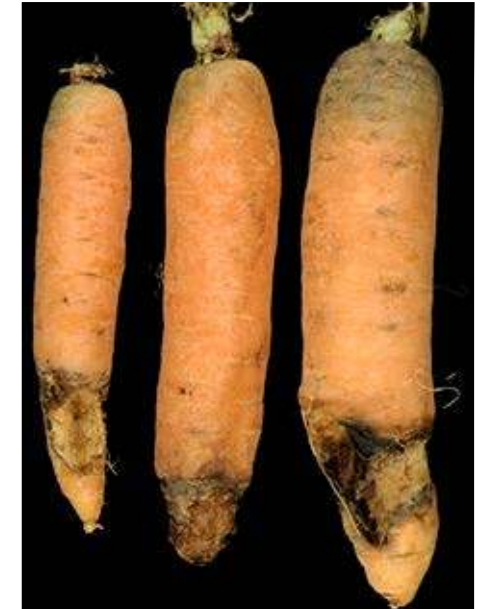
WHAT SHOULD I LOOK FOR?







Aboveground, yellowing and wilting of leaves followed by plant collapse and death, as shown in parsley
L. Tesoriero, Crop Doc Consulting






Belowground, reduction in side roots predominantly by *Pythium* spp, as shown in infected parsley (right) compared to healthy plant (left). Infection with *Phytophthora* spp. leaves roots intact but often causes browning
L. Tesoriero, Crop Doc Consulting










Roots may also develop a brown spongy rot as shown in carrots
L. Tesoriero, Crop Doc Consulting

<p>WHERE WILL I SEE SYMPTOMS?</p>  	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p> <ul style="list-style-type: none"> • Especially waterlogged soils <10°C   <ul style="list-style-type: none"> • 8-15°C
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<p>DISTRIBUTION IN THE FIELD</p> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 	<p>HOW DOES IT SPREAD?</p>   <p>SURVIVAL TIME WITHOUT HOST More than 10 years</p>
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HOW DO I CONTROL IT?

<p>FALLOW/COVER CROP</p>	<div data-bbox="224 146 448 470"> <p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p>  </div> <div data-bbox="519 146 743 470"> <p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p>  </div> <div data-bbox="815 146 1039 470"> <p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p>  </div> <div data-bbox="1196 146 1420 470"> <p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p>  </div> <div data-bbox="1500 146 1724 470"> <p>CHEMICAL FUMIGATION</p> <p>Always use with care and as per label</p>  </div> <p data-bbox="795 494 1041 550">• 3 to 4 years between host crops</p> <p data-bbox="1500 494 1736 598">• Consult APVMA or InfoPest website for current registered products</p>
<p>PLANTING PREPARATION</p>	<div data-bbox="224 646 448 970"> <p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p>  </div>
<p>POST-PLANT</p>	<div data-bbox="224 1029 448 1353"> <p>IRRIGATION MANAGEMENT</p> <p>Monitor crop and soil to optimize amount and timing</p>  </div>

HOST RANGE

Carrot, parsnip, celery, parsley

SCLEROTINIA ROT (WHITE MOULD)

Sclerotinia sclerotiorum | *S. minor*




WHAT SHOULD I LOOK FOR?



At base of stem fluffy white fungal growth is visible, leading to stem rot and collapse
H.F. Schwartz. Bugwood.org









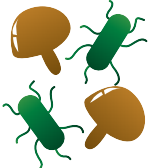




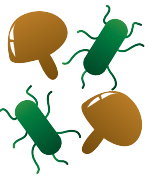


Survival structures (*sclerotia*) form later on and can be up to 25mm long in *S. sclerotiorum* and much smaller (up to 3mm long) in *S. minor* C. Balbalian, Mississippi State University, Bugwood.org

<p>WHERE WILL I SEE SYMPTOMS?</p>  <p>CARROT ROOT</p>	<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="551 1310 696 1453">  <p>COOL</p> </div> <div data-bbox="730 1310 875 1453">  <p>WET</p> </div> </div> <p>• 13-18°C</p>
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<p>DISTRIBUTION IN THE FIELD</p> <p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 	<p>HOW DOES IT SPREAD?</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="1585 1270 1731 1414">  <p>WIND</p> </div> <div data-bbox="1749 1270 1895 1414">  <p>FREE WATER</p> </div> <div data-bbox="1912 1270 2058 1414">  <p>MOVEMENT OF CONTAMINATED SOIL</p> </div> </div> <p>SURVIVAL TIME WITHOUT HOST 3-10 years</p>
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HOW DO I CONTROL IT?

FALLOW/COVER CROP	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 
PLANTING PREPARATION	<p>AIR CIRCULATION</p> <p>Increase row/plant spacing to improve air flow</p> 	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>BIOCONTROL PRODUCTS</p> 	
POST-PLANT	<p>AVOID OVER IRRIGATION</p> <p>Saturated soils favour disease development and spread</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat plant with registered foliar fungicide</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 	<p>BIOCONTROL PRODUCTS</p> 

• Consult APVMA or InfoPest website for current registered products

HOST RANGE

Very wide (more than 400 different plant species). Infects most vegetable crops










CARROT, CELERY, PARSNIP AND PARSLEY
SCLEROTIUM ROT

Sclerotium rolfsii









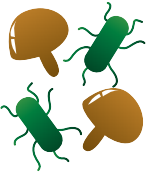




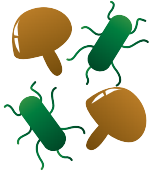
WHAT SHOULD I LOOK FOR?



Watery rot, leading to stem collapse. Characteristic white ropey fungal growth seen at the soil line with light brown survival structures (sclerotia) resembling mustard seeds
 D. Langston, University of Georgia, Bugwood.org

<p>WHERE WILL I SEE SYMPTOMS?</p>	 
<p>FAVOURABLE CONDITIONS FOR DISEASE DEVELOPMENT</p>	   <p>• 25-35°C</p>
<p>HOW DOES IT SPREAD?</p>	   <p>• Mostly through splash</p>
<p>DISTRIBUTION IN THE FIELD</p>	<p>SCATTERED</p> <p>Individual/small patches of infected plants</p> 
<p>SURVIVAL TIME WITHOUT HOST 3-10 years</p>	

HOW DO I CONTROL IT?

FALLOW/COVER CROP	<p>FARM HYGIENE</p> <p>Stop movement of contaminated soil, water, plants and equipment</p> 	<p>HOST-FREE ZONE</p> <p>Control volunteer host plants and weeds</p> 	<p>CROP ROTATION</p> <p>Select non-host rotation or cover crops</p> 	<p>BIO FUMIGATION</p> <p>Grow a biofumigant crop</p> 	<p>IMPROVE SOIL HEALTH</p> <p>Add organic matter or amendments to boost beneficial microbes</p> 
PLANTING PREPARATION	<p>AIR CIRCULATION</p> <p>Increase row/plant spacing to improve air flow</p> 	<p>DRAINAGE</p> <p>Plant on raised beds or well-draining soil</p> 	<p>NO RESIDUE AT PLANTING</p> <p>Ensure no plant residues from host crops at planting</p> 	<p>BIOCONTROL PRODUCTS</p> 	
POST-PLANT	<p>AVOID OVER IRRIGATION</p> <p>Saturated soils favour disease development and spread</p> 	<p>CHEMICAL TREATMENT</p> <p>Treat plant with registered foliar fungicide</p> 	<p>AVOID PLANT INJURY</p> <p>Avoid any physical damage to plant</p> 	<p>GOOD NUTRITION</p> <p>Ensure plants' nutritional needs are met</p> 	<p>BIOCONTROL PRODUCTS</p> 

• 3 to 4 years between host crops

• Consult APVMA or InfoPest website for current registered products

HOST RANGE

Very wide (more than 400 different plant species). Infects most vegetable crops including members of the bean, brassica and pumpkin families.