17 Rhubarb

BACTERIAL DISEASES

▶ 17.1 Crown gall *Fig. 17.1*

Agrobacterium tumefaciens (E.F. Smith & Towns.) Conn

Crown gall is a minor disease of rhubarb in Canada. The pathogen has a wide host range that includes several vegetable crops (see Carrot, crown gall, 6.3).

Symptoms Galls appear on the new growth of roots and crowns as firm white masses that become enveloped in a heavily mottled covering as the season progresses (*17.1).* By late summer, the galls usually disintegrate. There appears to be little or no detrimental effect upon productivity of the plants.

Causal agent (see Carrot, crown gall, 6.3)

Disease cycle (see Carrot, crown gall, 6.3)

Management *Cultural practices* — Diseased plants should be removed as soon as they are noticed. (For other control measures, see Carrot, crown gall, 6.3.)

Selected references

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(Original by R.J. Howard and D.J. Ormrod)

▶ 17.2 Red leaf (bacterial soft rot) *Figs. 17.2a,b*

Erwinia rhapontici (Millard) Burkholder
(syn. *Bacterium rhapontici* Millard)

Red leaf is one of the most destructive diseases of rhubarb in Canada and has destroyed up to 50% of the plants in some fields. This disease was often referred to as crown rot until the mid 1950s, but since then it has been called red leaf in Canada and bacterial soft rot in other countries. The pathogen also has been reported on wheat and on pea seed in some areas of Canada.

Symptoms *Erwinia rhapontici* causes a crown rot disease on rhubarb. The main symptoms are decay of the terminal bud, a soft, chocolate-brown rotting of the pith, and the formation of a cavity within the crown *(17.2a).* Spindly side shoots may grow out but usually rot off. During wet weather, the bases of older leaves may also be affected. Dull red leaves are usually present on diseased plants *(17.2b).* Turnip mosaic virus (see Viral diseases, 17.9) and various fungi (see crown rot, 17.3) can cause symptoms that closely resemble those of red leaf.

Causal agent *Erwinia rhapontici* is a Gram-negative, non-spore-forming, non-capsulate rod, 0.5 to 0.8 by 1.2 to 1.5 µm. The cells are motile by several, usually about five, peritrichous flagella. This bacterium is a facultative anaerobe.

The pathogen can be isolated by plating pieces of diseased rhubarb tissue onto general-purpose bacteriological media. On nutrient agar, colonies are round, entire, smooth, glistening, butyrous and translucent white. Some isolates may produce a pink pigment that diffuses into the medium.

Disease cycle Relatively little is known about the dispersal and survival of the red leaf pathogen. Transplanting of infected crowns and foliage- and root-feeding insects moving from diseased to healthy plants are the most likely methods by which the disease spreads.

Management

Cultural practices — Only disease-free crowns should be used for planting and replacement. Plants with symptoms of red leaf or crown rot should be dug up and destroyed. New crowns should not be replanted in the same area from which diseased ones were removed. Aphids and other foliage-feeding insects should not be allowed to build up in rhubarb plantings.

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Letal, J.R. 1976. Crown rot of rhubarb in Alberta. *Can. Plant Dis. Surv.* 56:67-68.

Metcalfe, G. 1940. *Bacterium rhaponticum* (Millard) Dowson, a cause of crown-rot disease of rhubarb. *Ann. Appl. Biol*. 27:502-508.

(Original by R.J. Howard and D.J. Ormrod)

FUNGAL DISEASES

▶ 17.3 Crown rot

Phytophthora spp.
Pythium spp.
Rhizoctonia solani Kühn
(teleomorph *Thanatephorus cucumeris* (A.B. Frank) Donk)

Crown rot is occcasionally a problem in rhubarb, especially under wet soil conditions. *Phytophthora*, *Pythium* and *Rhizoctonia* species occur in many field and garden soils and are pathogens of several vegetable crops.

Symptoms Infection usually occurs at the base of the stalks or a little below the soil surface. Stalk lesions are brown and sunken. Rotted crown tissue is usually firm and brown, but may turn mushy if bacterial soft rot ensues. Leaves wilt and die, usually a few at a time, and badly infected plants eventually die. Symptoms of crown rot can resemble those of red leaf disease.

Causal agents (For detailed descriptions of *Phytophthora* spp., *Pythium* spp. and *Rhizoctonia solani*, see the Bean, Beet, Carrot, Cucurbits, Crucifers and Potato chapters.)

Disease cycle (see Bean, root rots, 15B.4; Carrot, crown rot, 6.11.)

Management

Cultural practices — Growers should establish rhubarb plantings in well-drained, fertile, weed- free fields. Rhubarb should not be planted immediately after other vegetable crops in the rotation. If possible, allow at least two to three years between these crops and rhubarb. The practices for managing red leaf can also be applied to crown rot.

Selected references

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(Original by R.J. Howard)

▶ 17.4 Downy mildew

Peronospora rumicis Corda

Downy mildew is most destructive on seedlings grown in cold frames, but it can affect rhubarb plants at any stage of growth. Rhubarb is the only reported host of *Peronospora rumicis.*

Symptoms Large brown lesions are formed on the leaves, and the lower surfaces often are covered with a violet to white fungal growth. When the invasion is extensive, the leaf dies. Small spots often tear away from the healthy tissue, leaving a ragged-appearing leaf.

Causal agent The sporangia of *Peronospora rumicis* are borne at the tips of dichotomously branched sporangiophores. Sporangia are ovoid, subhyaline, 16 to 18 by 25 to 34 µm, and germinate by germ tubes.

Disease cycle The pathogen requires cool, wet weather for rapid reproduction. The sporangia remain alive only for a day or so when the temperatures are moderate and the relative humidity low.

Management

Cultural practices — Downy mildew can be managed by using disease-free propagation stock and by not planting into fields where rhubarb has been grown within the previous three years.

Selected references

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(Original by R.J. Howard and D.J. Ormrod)

▶ 17.5 Gray mold

Botrytis cinerea Pers.:Fr.
(telemorph *Botryotinia fuckeliana* (de Bary) Whetzel)
(syn. *Sclerotinia fuckeliana* (de Bary) Fuckel)

Gray mold is occasionally damaging in rhubarb fields in high rainfall areas, but is more likely to be a problem in crops forced indoors. It is the most destructive post-harvest disease of rhubarb, especially when stalks are packed and shipped with the leaves still attached. The disease occurs in all of the major rhubarb-producing areas in Canada. The gray mold pathogen has a wide host range that includes many vegetable crops (see Lettuce, gray mold, 11.10; Asparagus, botrytis blight, 4.1).

Symptoms Gray mold may appear on old leaves and injured stalks under humid conditions in the field. Other stalks can become contaminated during harvest and packing. Red spots or water-soaked brown areas appear on the stalks and masses of dusty gray spores can form on these lesions. A semi-watery decay often follows, especially under non-refrigerated storage conditions.

Causal agent (see Lettuce, gray mold, 11.10)

Disease cycle (see Lettuce, gray mold, 11.10)

Management

Cultural practices — Growers should remove the leaves from rhubarb stalks before they are packed and shipped. Harvested stalks should be kept refrigerated. (For other management strategies, see Lettuce, gray mold, 11.10.)

Chemical control — Registered fungicides are available for use on rhubarb crops forced indoors.

(Original by D.J. Ormrod and R.J. Howard)

▶ 17.6 Leaf spots *Figs. 17.6a,b*

Ascochyta leaf spot

Ascochyta rhei (Ellis & Everh.) Ellis & Everh.
(syn. *Phyllosticta rhei* Ellis & Everh.)

Ramularia leaf spot

Ramularia rhei Allesch.

Ascochyta and ramularia leaf spots are common on field rhubarb. Losses are usually minor, except under prolonged wet growing conditions. Rhubarb is the main host of these pathogens.

Symptoms The first indications of ascochyta leaf spot are numerous, small, yellow-green spots in the upper leaf surfaces. When these lesions unite, as they often do, the leaf has the appearance of mosaic mottling. In less than a week, the invaded tissue

usually turns brown and dies, resulting in circular to angular spots that vary in size from 1 to 15 by 1 to 3 mm. These spots have white centers surrounded by a wide red margin that is bordered by a gray-green zone. In some of the smaller spots, only the red color may be present. Fruiting bodies of the pathogen are rarely visible in the spots, being sunk so deeply in the rhubarb tissue that only the openings are flush with the leaf surface. When the affected tissue dies, it may drop out, leaving large ragged holes in the leaves.

Leaf infection by *Ramularia rhei* first appears as small red dots. These gradually enlarge to form more or less circular lesions 1 cm or more in diameter *(17.6a).* Large spots are white to tan with purplish halos. Stalk infections, which occur later, first appear as small spots that elongate as the stalks grow. The larger ones become tan-colored, sunken lesions up to 1 cm long *(17.6b).* A white accumulation of conidia may be present in the center of spots on both leaves and stalks.

Causal agent *Ascochyta rhei* has globular, black pycnidia filled with short, hyaline, cylindrical conidia that are slightly constricted near the center. A small percentage of the spores have cross walls near the center. *Ramularia rhei* has hyaline conidia that are non- to three-septate, and 2 to 3 by 7 to 35 µm.

Disease cycle Both pathogens produce spores that are dispersed by splashing water and wind. New infections can result in visible lesions within 10 to 14 days. When old infected leaves or stalks drop to the ground, mycelial masses or fruiting bodies are formed and can remain alive over winter. Leaf spot fungi also can be spread in infected root stocks that are used for propagation.

Management

Cultural practices — As little crop residue as possible should be left on the soil surface after harvest. In gardens, the leaves should be gathered and composted or destroyed as soon as the first frost has killed them. In commercial fields, growers should thoroughly incorporate the crop residues between the rows after harvest. During the harvest of stalks in the spring, those with spotted leaves should be taken first, as much of the diseased material can be removed by this method. Rhubarb plants should be fertilized as soon as growth starts in the spring and another application should be made as soon as the harvest is completed to encourage strong, rapid regrowth.

Selected references

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(Original by R.J. Howard and D.J. Ormrod)

▶ 17.7 Powdery mildew

Erysiphe polygoni DC.

Powdery mildew rarely affects rhubarb seriously. The pathogen can attack wild and cultivated members of the buckwheat family (Polygonaceae) (see Crucifers, powdery mildew, 8.12).

Symptoms The characteristic symptom of this disease is diffuse, dusty white lesions on the surfaces of leaves and stalks.

(For a description of the causal agent and a discussion of the disease cycle, epidemiology and control of powdery mildew, see Crucifers, powdery mildew, 8.12.)

(Original by R.J. Howard and D.J. Ormrod)

▶ 17.8 Rust

Puccinia phragmitis (Schumach.) Körn.

Rust is a minor disease of rhubarb in Canada. Rhubarb is the only vegetable crop attacked by *P. phragmitis.*

Symptoms Rust produces large crimson spots on rhubarb leaves. The central part of the spot is crowded with the cluster-cups (aecia) of the fungus. The edges of the cups become torn, producing a fringed border.

Disease cycle The pathogen is a long-cycle, heteroecious rust. The aecia and pycnia appear on rhubarb and other species of *Rheum* and *Rumex,* while the uredinia and telia occur on reed grass, *Phragmites australis* (Cav.) Trin. The aecia appear on the lower side of the leaf surrounding the pycnia. The fungus overwinters as teliospores, which upon germination produce basidiospores that can infect the leaves of rhubarb.

Management Control measures are usually not necessary.

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(Original by R.J. Howard and D.J. Ormrod)

VIRAL DISEASES

▶ 17.9 Miscellaneous viral diseases *Fig. 17.9*

Arabis mosaic virus
Cherry leaf roll virus
Cucumber mosaic virus
Strawberry latent ringspot virus
Turnip mosaic virus

Viral diseases occasionally have caused serious damage to rhubarb plantings in British Columbia. All of the causal viruses have wide host ranges that include several species of vegetable crops.

Symptoms Mottling (17.9) and ring spotting of leaves, with or without stunting, is frequently observed in individual rhubarb plants or in patches within a crop. These symptoms may be due to infection by one or more viruses. In British Columbia, turnip mosaic virus is the one most commonly found. This virus can cause symptoms that mimic those of red leaf.

Causal agents (For a description of arabis mosaic virus, see Herbs and spices, 10.12; for cucumber mosaic virus, see Greenhouse cucumber, 22.20; for turnip mosaic virus, see Crucifers, 8.16.)

Cherry leaf roll virus has isometric particles, which measure about 28 nm in diameter. It is readily transmitted by sap inoculation and seed, and some strains are pollen-transmitted.

Strawberry latent ringspot virus is an RNA virus with isometric particles about 30 nm in diameter. It is sap- and nematode-transmissible.

Disease cycle Viruses can be introduced in infected crowns or seed and may subsequently be spread by aphid or nematode vectors. Several genera of plant parasitic nematodes have been found in rhubarb fields in Canada; some nematodes, such as *Xiphinema* spp., are known vectors of several of the viruses infecting rhubarb. These pests may be present in soil attached to crowns and farm equipment and thus may be responsible for virus spread, both within a field and from field to field.

Management

Cultural practices — Growers should plant rhubarb in fields that have not grown this crop within the previous two to three years and that do not have a detectable population of plant parasitic nematodes, particularly potential virus vectors. Only disease- and nematode- free rhubarb should be used for planting.

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(Original by R.J. Howard and D.J. Ormrod)

NEMATODE PESTS

▶ 17.10 Northern root-knot nematode *Fig. 7.15b*

Meloidogyne hapla Chitwood

Symptoms With heavy infestations, affected plants wilt, turn light green and progressively yellow. Roots show numerous small spherical swellings from which adventitious rootlets grow, producing increased branching that which can result in a bushy appearance. For a complete description and management strategies, see Carrot. 6.20; see also Management of nematode pests, 3.12.

▶ 17.11 Pin nematodes

Paratylenchus spp.

Symptoms These ectoparasitic nematodes feed on root tissues, such as the epidermis and cortex or, if their stylet is long enough, the vascular tissue. They never enter the roots of plants. At numbers as high as 5000 or more per kilogram of soil, pin nematodes have reduced yields of rhubarb in Ontario. See Nematodes, 2.3; see also Management of nematode pests, 3.12.

Selected references

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▶ 17.12 Sugarbeet cyst nematode *Fig. 5.14b*

Heterodera schachtii Schmidt

Symptoms are most noticeable in patches where nematode densities are high. Infected plants are stunted and outer leaves wilt, yellow prematurely and die. Lateral root development is excessive, giving a whiskered appearance to the tap root. In summer, pin-head sized, white or brown cysts can be seen on washed roots, particularly in the root axils. See Beet, 5.14; see also Management of nematode pests, 3.12.

INSECT PESTS

▶ 17.13 Miscellaneous insect pests *Figs.: see text*

Black bean aphid *Aphis fabae* Scopoli
European earwig *Forficula auricularia* L.
Potato stem borer *Hydraecia micacea* (Esper)
Rhubarb curculio *Lixus concavus* Say

The black bean aphid (see Potato, 16.43) (*16.43T1*) has been reported on rhubarb plantings in British Columbia, where it has been suspected but not proven to be a vector of turnip mosaic virus. The potato stem borer (see Potato, 16.47) *(16.47a,b)* and the rhubarb curculio affect rhubarb petioles and may be minor pests in Ontario and Quebec. Earwigs (see Crucifers, 8.43) *(8.43b,d)* may eat holes in rhubarb leaves, which can be important during establishment of young plants.

OTHER PESTS

▶ 17.14 Slugs *Figs. 11.27a-c*

Slugs have caused significant direct injury to rhubarb in southern coastal British Columbia, according to D.J. Ormrod. For information about slugs, see Crucifers, 8.49, and Lettuce, 11.27.

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