Diseases of *Rubus parviflorus* in British Columbia

R.E. Wall and S.F. Shamoun [1]

The native shrub, thimbleberry (Rubus parviflorus Nutt.) was examined for disease throughout its range in southern British Columbia. Previously unreported fungi were Discosia sp., and Seimatosporium sp. associated with leaf spots and Cylindrocarpon destructans (Zinf.) Scholten, Naematoloma fasciculare (Huds. ex Fr.) Kar., Resinicium *bicolor* (Alb. & Schw. ex Fr.) Parm. and *Verticillium* sp. associated with root rots. Pathogenicity tests were conducted with several of the fungi collected.

Can. Plant *Dis. Surv. 70:2, 133-135, 1990.*

La ronce parviflore (Rubus parviflorus Nutt.) a été examinee a l'égard de la presence de maladies dans toute sa zone de distribution du sud de la Colombie-Britannique. Les champignons non déjà signalés sont Discosia sp., et Seimatosporium sp. associes aux taches des feuilles et Cylindrocarpon destructans (Zinf.) Scholten, Naematoloma fasciculare (Huds. ex Fr.) Kar., Resinicium *bicolor* (Alb. & Schw. ex Fr.) Parm. et *Verticillium* sp. associes aux pourritures des racines. Les auteurs ont effectue des essais de pathogénicité avec plusieurs des champignons preleves.

introduction

Wild shrubs are important reservoirs of pathogens of horticultural crops (Credi et al. 1986). **Also,** with current concern over the use of chemical herbicides on forest lands, agents that cause diseases of shrubs are potential biological controls. Thimbleberry ***(Rubus parviflorus*** Nutt.) is an example of such a shrub. It is a noticeable feature of roadsides as well as a frequently dominant weed on cut and burned-over forest land throughout British Columbia (Haeussler and Coates 1986). Consequently, attention has recently been turned to indigenous diseases of this and other non-commercial species which compete with conifers on forest land.

Thimbleberry is included in most plant disease indices (Anonymous 1960; Conners 1967; Farr et al. 1989; Ginns 1986; Lowe 1977; Shaw 1973; Toms 1964), most collections being recorded from the Rocky Mountain and Pacific regions where thimbleberry is most commonly found. In addition, Greene (1957) lists three fungal diseases of thimbleberry in the Great Lakes region, where this shrub occurs in isolated pockets. Virus diseases have been studied by Credi et al. (1986), Stace-Smith (1958), and Stace-Smith and Shier (1988).

Searches to detect and collect diseases of thimbleberry have been conducted since 1987 by the authors and by Forest Insect and Disease Survey staff throughout its range in southern B.C.

Materials and methods

Diseased tissues were examined and cultured within **3** days after collecting. Cultures were made by placing small pieces of tissue from surface sterilized plant material on corn-meal, malt, potato dextrose, and V-8 juice agars or by germinating spores from associated fruiting bodies on agar media. Cultures were incubated in the dark at 20°C and stored at 10°C when fully developed. To induce sporulation, some cultures were exposed to 4 – 5 days of irradiation with near ultraviolet light (365 nm wavelength) during the early stages of growth (Leach 1962).

Inoculations were performed in triplicate in the greenhouse (15-25°C, 16 hr daylength) on potted plants that had been grown from rhizome cuttings. Inoculations with foliar disease fungi were accomplished by spraying to runoff with aqueous suspensions of spores (one million spores/ml) and placing the plants in a dew chamber at 20°C for 24-48 hr. Basidiomycetous root fungi were cultured on sterilized segments of thimbleberry rhizomes and placed in the soil adjacent to the root mass. Root inhabiting fungi imperfecti were applied as spore suspensions to the soil at the base of the plant.

Inoculation results were evaluated at weekly intervals and disease symptoms scored by the following rating system: 0 = healthy, 1 = occasional leaf spots, 2 = noticeable leaf spots or foliar browning, 3 = about 50% of the leaf area damaged, 4 = plant wilted or 60-90% of leaf area lost due to disease, 5 = plants dead.

Results and discussion

Disease collections and inoculation results are summarized in Table 1. Most diseases were collected between July 15 and the time of autumn leaf senescence, but the most common disease, septoria leaf spot, could be found as early as the second week of June. Septoria leaf spot was found in open as well as shaded locations and disease severity appeared to differ little between these two habitats. This disease also was collected on salmonberry ***(Rubus spectabilis*** Pursh.) and to a lesser extent on raspberry ***(Rubus idaeus*** L.). With the inoculation method used, ***Septoria*** was consistently pathogenic. However, inoculation trials with other fungi have not been repeated sufficiently under different conditions to either confirm or refute their pathogenicity (Table 1). *Botrytis cinerea* was associated with fruit rot and blighting of associated pedicels and leaves in mid- to late summer. ***Gnomonia*** sp. was associated with a circular to oval brown necrotic spot which was prevalent in

[1] Pacific Forestry Centre, Forestry Canada, *506* West *Burnside Rd.,* Victoria, *B.C.* V8Z *1M5.*

Accepted for publication April *3,* 1990.

Table 1. Collections of thimbleberry diseases in southern British Columbia.

Disease organism isolated	Location#	Number of inoculation trials	Incubation period (weeks)	Maximum disease rating*
Angular leaf spot				
Septoria *rubi* West.	1,2,4,9,10	11	4	3
Powdery mildew				
Sphaerotheca *macularis* (Wallr. ex Fr.) Lind.	2,9,10	-	-	-
Leaf rust				
Phragmidium *occidentale* Arth.	1,2,9	-	-	-
Other foliage diseases				
Alternaria sp.	1,5,8	1	2	1
Botrytis cinerea Pers.	2,5,8,10	1	2	2
Discosia sp.	2	1	2	1
Gnomonia sp.	10	-	-	-
Seimatosporium sp.	7	2	-	0
Root rots				
Cylindrocarpon destructans (Zinf.) Scholten	6,10	2	2	2
Fusarium oxysporum Schlecht.	6,10	2	2	2
Naematoloma fasciculare (Huds. ex Fr.) Kar.	10	1	-	0
Resinicium bicolor (Alb. & Schw. ex Fr.) Parm.	10	1	-	0
Verticillium sp.	6,10	2	-	0

Collections were made near Campbell River (1), Victoria (2), Vancouver (3), Hope (4), Barriere (5), Revelstoke (6), Meadow Creek (7), Nakusp (8), Crawford Bay (9), and Castlegar (10).

* Diseases rated on a 0 - 5 system, 0 = healthy, 1 = occasional leaf spots or other mild foliar discoloration, 2 = readily visible foliar disease, 3 = about 50% of leaf area lost to disease, 4 = 60 - 90% loss of foliage, 5 = plants dead.

19 9. Powdery mildew was quite common, especially on the newer foliage and was particularly damaging to thimbleberry in warm greenhouses or growth chambers (day temperatures of 25°C or higher). Phragmidium leaf rust also occurred widely but was not associated with foliar necrosis during the main part of the growing season. No virus or mycoplasma diseases were confirmed, but symptoms suggesting their presence were observed in several locations.

No conspicuous shoot blights have been found on thimbleberry to date. Dieback was common in mid- to late summer in canes which had flowered and borne fruit. Another frequent cause of dieback was the thimbleberry gallmaker (Diastrophus *kinkaidii* Gillette), a hymenopterous insect which causes large stem galls on current year's shoots (Wangberg 1975). Superficial stem lesions were often observed, but they did not appear to affect the xylem and no particular organisms were consistently cultured. Dasyscyphus spp. were often found fruiting on dead stems.

Root diseases were collected in late summer and autumn from shrubs which showed signs of decline. Naematoloma fasciculare was cultured both from decaying rhizomes and from spores cast from mushrooms found growing around unhealthy looking plants. Resinicium bicolor mycelium, recognized by the abundance of stellate cystidia (Nobles 1953), was observed on the surface of root crowns of shrubs with root rot and was readily cultured from adjacent tissues. Cylindrocarpon destructans, Fusarium oxysporum and *Verticillium* sp. were cultured from discolored feeder roots. C destructans and *F.* oxysporum were isolated in numerous cultures from roots of plants which had recently been treated with the herbicide glyphosate.

The list of thimbleberry diseases is by no means complete. For instance Phytophthora spp., to which this shrub is reported to be moderately susceptible (Bristow et al. 1988) were not isolated by our culture methods. None of the shoot blight or canker diseases commonly reported on commercial *Rubus* cultivars were collected, although a Gnomonia sp. was

cultured from leaf spots. Some fungi previously reported on thimbleberry but not collected in this study were Armillaria spp. (Toms 1964), *Coleroa chaetomium* (Kunze) Rab. (Barr 1953), Peronospora*rubi* Rahb. and Schroet. (Toms 1964) and *Pucciniastrum arcticum* Tranz. (Lowe 1977). Shaw (1973) lists many other fungi, not all of which are pathogens. It is likely that most of the reported diseases occur sporadically and cause very little damage. Thimbleberry, like other indigenous species has co-evolved with most of the pathogens to which it is normally exposed and is therefore resistant or otherwise adapted to escape infection.

Acknowledgements

We wish to thank Forest Insect and Disease Survey staff of the Pacific Forestry Centre as well as C. Dorworth for several collections and B. Callan, D. Chu, A. Funk and L. Sigler for identification of cultures.

Literature cited

1. Anonymous. 1960. Index of plant diseases of the United States. U.S.D.A. Agric. Handb. No. 165. 531 p.
2. Barr, M.E. 1953. Pyrenomycetes of British Columbia. Can. J. Bot. 31:810-830.
3. Bristow, P.R., H.A. Daubeny, T.M. Sjulin, H.S. Pepin, R. Nestby and G.E. Windom. 1988. Evaluation of *Rubus* germplasm for reaction to root rot caused by *Phytophthora erythroseptica*. J. Am. Soc. Hort. Sci. 113:588-591.
4. Conners, I.L. 1967. An annotated index of plant diseases in Canada. Can. Dept. Agric. Publ. 1251. 381 p.
5. Credi, R., J.L. Shier and R. Stace-Smith. 1986. Occurrence of raspberry bushy dwarf virus in native thimbleberry in British Columbia. Acta Hort. 186:17-21.
6. Farr, D.F., G.F. Bills, G.P. Chamuris and A.Y. Rossman. 1989. Fungi on plants and plant products in the United States. Am. Phytopath. Soc. Press. St. Paul, Minn. 1252 p.
7. Ginns, J.H. 1986. Compendium of plant disease and decay fungi in Canada, 1960 – 1980. Agric. Can. Publ. 1813. 416 p.
8. Greene, H.C. 1957. The fungi parasitic on plants in Wisconsin. Litho Productions, Inc. Madison, WI. 228 p.
9. Haeussler, S. and D. Coates. 1986. Autoecological characteristics of selected species that compete with conifers in British Columbia: a literature review. Canada – B.C. For. Res. Dev. Agreement Rep. # 001. 180 p.
10. Leach, C.M. 1962. The sporulation of diverse species of fungi under near-ultraviolet radiation. Can. J. Bot. 40:151-161.
11. Lowe, D.P. 1977 (rev. 1989). Check list and host index of bacteria, fungi and mistletoes of British Columbia. Can. For. Serv. Inf. Rep. BC-X-32. 315 p.
12. Nobles, M.K. 1953. Studies on wood-inhabiting hymenomycetes. I. Odontia *bicolor*. Can. J. Bot. 31:745-749.
13. Shaw, C.G. 1973. Host fungus index for the Pacific Northwest. I. Hosts. Wash. Agric. Exp. Stn. Bull. 765. 121 p.
14. Stace-Smith, R. 1958. Studies on Rubusvirus diseases in British Columbia. V. Thimbleberry ring spot. Can. J. Bot. 36:385-388.
15. Stace-Smith, R. and J.L. Shier. 1988. Some properties of apple mosaic virus isolated from thimbleberry in British Columbia. Proc. 5th Int. Symp. Small Fruit Virus Diseases.
16. Toms, H.N.W. 1964. Plant diseases of southern British Columbia. Can. Plant Dis. Surv. 44143-225.
17. Wangberg, J.K. 1975. Biology of the thimbleberry gallmaker, *Diastrophus kinkaidii*. Pan-Pac. Entomol. 51:39-48.