A Gravel Container Base for Control of Phytophthora Dieback in Rhododendron Nurseries

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ABSTRACT

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Under growing conditions typical of commercial nurseries, lesion incidence, dieback, and plant mortality caused by *Phytophthora* spp. was significantly less in rhododendrons grown on an infested pine-bark container base covered 5–7 cm deep with gravel than on plants grown on an infested pine-bark container base alone. The number of lesions per plant for plants grown on a pine bark or gravel container base averaged 2.8 and 0.4, respectively. Plant mortality averaged 70 and 5%, respectively, during the 4-mo growing season.

Several species of *Phytophthora* de Bary cause foliar dieback and root rot of rhododendron (2,4). *P. parasitica* Dast., *P. heveae* Thomp., *P. cactorum* (Leb. & Cohn) Schroet., and *P. citricola* Sawada are the most common dieback pathogens on rhododendron in North Carolina and most of the southeastern United States (2).

Growing conditions for rhododendrons in commercial nurseries of North Carolina provide a microclimate favorable for development and spread of *Phytophthora* spp. causing dieback. Plants are grown under shade in plastic pots and irrigated with overhead sprinklers during the warm summer months. Fertilization practices common in commercial nurseries encourage lush new growth that is highly susceptible to invasion by pathogens (2). The containers in which the plants are grown are commonly placed on a base material for weed control, usually black plastic or pine bark. Gravel is used sometimes, although the initial cost is greater.

The importance of splash dispersal and subsequent infection of ornamentals by *Phytophthora* propagules was demonstrated for *Pieris japonica* (Thunb.) D. Don. (3) and rhododendron (4,5). This study compares the effects of pine bark and gravel container bases on splash dispersal of and subsequent infection by *Phytophthora* propagules. A summary of this work has been reported (5).

MATERIALS AND METHODS

One-year-old plants of rhododendron cultivar Nova Zembla were grown in 2.5-L plastic pots in sand:soil:peat (1:1:1, v/v) in a research nursery under a lath structure providing 50% shade. Test plots of each container base were circular, 1.2 m in diameter (Fig. 1). Plants were placed on either a naturally infested pine-bark base or similar bark base area covered to a depth of 5–7 cm with gravel (average diameter 1.9 cm). Pots containing nonsusceptible azaleas (*Rhododendron obtusum* Planch. 'Hinodegiri') (average height 35–40 cm) were positioned around each test area to prevent splashing of propagules from areas outside the plot. Plants were irrigated twice daily (0.6 cm water per day) by overhead sprinklers to provide conditions favorable for *Phytophthora* dispersal and infection. Plants were fertilized twice with 19-6-12 (N-P_2O_5-K_2O) Osmocote (Sierra Chemical Co., Milpitas, CA 95035) at a rate equivalent to 100 kg/ha. A layer of gravel 5–7 cm deep was placed on the surface of the container medium in each pot to prevent puddling of water and splashing of *Phytophthora* propagules from pots onto plants. There were five plants per plot and four plots per container base. Plants were inspected and lesions typical of those caused by *Phytophthora* were counted every 2–3 days from 3 June to 11 October 1981. Leaves with lesions were removed to prevent spread of secondary inoculum.

RESULTS AND DISCUSSION

Use of gravel as a container base suppressed incidence of Phytophthora dieback. The total and average numbers of lesions were significantly less ($P=0.01$) with plants placed on an infested pine-bark base covered with gravel compared with plants placed on infested pine bark alone (Table 1). Phytophthora infection

Fig. 1. Circular test plot of five plants of rhododendron cultivar Nova Zembla on a layer of gravel 5–7 cm deep. Potted azaleas surrounding each test plot provided a barrier from splashing inoculum in the *Phytophthora*-infested container base of pine bark outside the plot.

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Table 1. Incidence of lesions on and percent mortality of 20 plants of rhododendron cultivar Nova Zembla grown 4 mo either on a container base of pine bark naturally infested with *Phytophthora* or a similar base covered with a layer of gravel 5–7 cm deep

Container base	Lesion number[a]		Percent mortality
	Total	Avg./plant	
Pine bark	55	2.8	70
Gravel	7	0.4	5

[a] Differences between treatments, as tested by analysis of variance, were significant at $P = 0.01$.

often occurred in the terminal bud, resulting in plant death even though infected portions were removed. Plant mortality averaged 70 and 5% for plants growing on pine bark and gravel, respectively (Table 1).

Wet conditions common in nurseries using sprinkler-irrigation are conducive to the survival, sporulation, and dissemination of *Phytophthora* spp. causing dieback (5). Container bases of pine bark and black plastic enhance these favorable conditions by retaining water in puddles around plants and along walkways after irrigation or rain. Gravel remains well-drained even after irrigation and heavy rain, encouraging dry nursery conditions suppressive to inoculum buildup and splash dispersal of *Phytophthora*.

Nursery workers in North Carolina control Phytophthora dieback of rhododendron by pruning out infected tissue, removing diseased plants, and applying protective fungicides (1,2). These practices are effective but labor-intensive and costly. Installation of a gravel container base in a nursery represents a considerable initial investment but may reduce the frequency of roguing and fungicide applications necessary to control *Phytophthora*.

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