using 21 g of inoculum per pot. After three days, soil mix in each pot was drenched with 100 ml Ridomil (25% wettable powder) at either 25, 50 or 100 p.p.m. a.i. Treatments were replicated six times and randomized. Soil mix in the lower half of each pot was waterlogged for one day each week.

After 12 weeks, the percentage of roots rotted was visually assessed and roots were air-dried and weighed. At the same time, three 50 ml samples of soil mix from each pot in the *Phytophthora*-infested series were assayed by the pear fruit baiting technique (1) for *P. cinnamomi.* An additional two 5 g samples from each pot drenched with Ridomil at 50 and 100 p.p.m. were wet-sieved and washed onto selective medium to determine numbers of chlamydospores of *P. cinnamomi* (1).

The soil mix affected root weights and severity of root rot. In untreated mixes infested with *P. cinnamomi,* root weights were greater (Table 1A) and disease severity less with increasing amounts of PM. Root rot estimates in the untreated 0, 16.7, 33.3 and 50.0% PM mixes were 97, 86, 82 and 53%, respectively. The addition of PM to the mix may have improved the drainage, and therefore reduced root rot.

Ridomil at 25, 50 and 100 p.p.m. was effective in controlling root rot in each *Phytophthora*-infested mix. It increased root weights (Table 1A) to levels similar to those for corresponding treatments in mixes without *P. cinnamomi* (Table 1B), and reduced root rot in each mix to less than 2.5%. Furthermore, *P. cinnamomi* was not recovered from Ridomil-treated soil mixes, except in two out of 18 samples baited from the 50% PM mix drenched with Ridomil at 25 p.p.m. Baiting detected *P. cinnamomi* in all 18 samples from each untreated *Phytophthora*-infested mix.

Table 1. Root weights of peach seedlings in soil mixes drenched with Ridomil at different concentrations.

A. In the presence of *P. cinnamomi*

%PM in mix	Untreated	Root dry wt (g) 25 p.p.m. Ridomil	50 p.p.m. Ridomil	100 p.p.m. Ridomil
0	0.27	1.75	1.79	1.12
16.7	0.52	1.87	1.79	1.36
33.3	0.82	1.92	1.85	1.66
50.0	0.92	1.99	2.05	2.16

B. In the absence of *P. cinnamomi*

%PM in mix	Untreated	Root dry wt (g) 25 p.p.m. Ridomil	50 p.p.m. Ridomil	100 p.p.m. Ridomil
0	1.61	1.57	1.57	0.89
16.7	1.80	1.79	1.51	1.12
33.3	1.98	2.11	2.06	1.57
50.0	1.98	2.00	2.20	2.01

	LSD P=0.05	P=0.01
Between any two values in A and B	0.29	0.38

1. Ridomil concentrations in p.p.m. active ingredient.

Ridomil at 100 p.p.m. in the 0, 16.7 and 33.3% PM mixes was phytotoxic to the seedlings. It reduced root weights (Table 1B) and caused interveinal chlorosis and marginal necrosis of the leaves. The fungicide at 50 p.p.m. in the 0 and 16.7% PM mixes was also phytotoxic to the foliage.

Results showed that phytotoxicity of Ridomil was reduced with increasing levels of PM in the potting mix, whilst efficacy of Ridomil at the concentrations tested was not significantly affected by organic matter. Ridomil is possibly adsorbed to organic matter, but provides good control of root rot at concentrations as low as 25 p.p.m.

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Phytophthora cinnamomi Rands in Proposed Softwood Plantation Areas on the Central Tablelands of New South Wales

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The importance of disease asscociated with *Phytophthora cinnamomi* Rands in eucalypts and pines has been reviewed (4). This pathogen has been isolated from the root zone of plants that were diseased or apparently healthy from many locations along the coastal and near-coastal areas of Australia and was found to be associated with diseased *Pinus radiata* D. Don at Sunny Corner, on the Central Tablelands of N.S.W. (2, 3).

The isolation of *P. cinnamomi* from roots of *P. radiata* nursery stock at Oberon (Keirle, unpublished data) raised the possibility of the transfer of the pathogen from the nursery to the field. The main consequences of such transfer are transplant losses with the subsequent cost of replanting, and the risk of spreading a potentially serious pathogen to other forest areas (5). It was decided to investigate whether *P. cinnamomi* was already present in two N.S.W. plantations before the introduction of *P. radiata* seedlings.

Area 1. Located in Gurnang State Forest, the first area consisted of 299 ha of cleared, hilly country, 1200-1270 m above sea level, and the soils were derived from sedimentary shales. Previous dominant vegetation included *Eucalyptus dalrympleana* Maiden (mountain gum), *E. dives* Schau. (broadleaved peppermint), and *E. pauciflora* Siev. ex Spreng. (snow gum). At the time of sampling in May 1977 the site had been windrowed and some cultivation done between windrows. Sixteen samples, comprising four samples on four transects were taken across the northerly slope of this area to include ridge, slope and gully aspects. A further nine samples were taken from cleared areas near gullies adjoining native forest. Final site preparations were completed after sampling, and the area was planted with *P. radiata* in June and July 1977.

Area 2. The second area of 433 ha in Extension 16 of Vulcan State Forest 900 to 1100 m above sea level consisted of similar country to Area 1 with soils derived from the same sedimentary shales. The area included very steep country that would be left under natural forest to avoid soil erosion.

The dominant eucalypt species were *E. dalrympleana, E. dives, E. macrorhyncha* F. Muell. ex. Benth (red stringybark) and *E. mannifera* Mudie subsp. *maculosa* (R. T. Bak.) L. Johnson (brittle gum). Thirty samples were taken from an area selectively logged some years previously and from compartments where the remaining vegetation has been burnt in March 1977. A further eleven samples were taken from a cleared area where site preparation was well advanced. Area 2 was sampled in October 1977 and was planted with *P. radiata* in August 1978.

Area 3. The last area of 393 ha adjoined Area 2 and samples were taken from it in October 1977. Most of this area was open forest that had been logged but not burnt.

In both areas 2 and 3, soil samples were collected from the root zone of apparently healthy trees or shrubs at depths of 50 to 100 mm along transects taken over slopes and gullies. All samples were tested for the presence of *Phytophthora* spp. using the modified lupin baiting technique (6).

The recovery of *P. cinnamomi* by lupin baiting is summarized in Table 1.

Table 1. Occurrence of *Phytophtora cinnamomi* Rands in 1977 in State Forests at Oberon N.S.W. allocated for planting with *Pinus radiata* D. Don during 1977-79.

Planting Year	Area (ha)	No. samples taken	Samples with *P. cinnamomi*	Location of soils with *P. cinnamomi*
1977	299	25	7	Upper slope, gully
1978	103	11	1	Gully
	330	30	0	—
1979	393	33	4	Gully

In the first area, *P. cinnamomi* appeared to be distributed throughout the planting area but was restricted, in the second and third areas to the gully locations that would not be planted because they were too wet. In the third area, *P. cinnamomi* was isolated mainly from the root zone of *E. dalrympleana* and once only from *E. dives* and *E. macrorhyncha. Pythium* spp. were obtained in association with *P. cinnamomi* in three sampling positions in the first areas. However, *Pythium* spp. alone was isolated from two positions in Area 3.

In the Oberon area, it appears that *P. cinnamomi* is already present in plantation sites before any *Pinus radiata* is introduced. Despite this, a high standard of nursery stock must be maintained to minimize transplant losses and avoid possible disease transfer of pathogens other than *P. cinnamomi* to the plantation areas. For this reason, the Oberon nursery has been closed, and planting stock taken from nurseries that do not have *P. cinnamomi.* Closure of nurseries known to be infected with *P. cinnamomi* and very strict quarantine measures in other nurseries have become standard practice in Queensland but it is possible that *P. cinnamomi* may have been present on infected roots of *Pinus clausa* (Chapm.) Vasey subsequently planted on Fraser Island (9). Although *Phytophthora* spp. were found in pine nurseries in South Australia, disease transfer was considered unlikely, and there have been very few isolations of *P. cinnamomi* from pine plantations in that state (1).

Because the Oberon planting areas are well drained it is unlikely that disease of pines will occur due to *Phytophthora* spp. However, the plantations will be kept under surveillance for those years in which the pines are most susceptible, and in years of unusually high rainfall.

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