NOTE

ROOT INVASION OF PINUS RADIATA LITTER
IN TRENCHED PLOTS

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ABSTRACT

Buried PVC cylinders were not effective in excluding tree roots from soil
and litter in an unthinned Pinus radiata D. Don stand growing on pumice soil.
Within 8 years roots had entered from a depth of 85 cm and were colonising the
litter layer.

Keywords: roots; litter; mycorrhizas; trenching; Pinus radiata.

In 1976, nine PVC cylinders, each 1 m deep and 1 m in diameter, were buried
between trees in two 2-year-old Pinus radiata D. Don stands in the Puruki-ma sub-
catchment at Purukohukohu. The catchment lies in the Paeroa Range of the central
North Island volcanic plateau. The trees had been established at 2.4 × 1.8 m spacing
and were to remain free of silvicultural treatment throughout the rotation. The object
of our experiment was the long-term study of accumulation of litter isolated from the
influence of tree roots. The cylinders protruded 15 cm above the soil surface and formed
a barrier to lateral growth of roots through the (future) litter layer and through the
soil to a depth of 85 cm. At “control” sites (roots present), nine PVC rings, each 15 cm
depth and 1 m in diameter, were laid on the soil surface to arrest physical movement of
litter. In these rings accumulating litter would be subject to root penetration from the
surface soil layers.

After 8 years, accumulated litter enclosed by six cylinders and six rings was removed
and the oven-dry weight of the ignitable component was determined (Table 1). Although
the mean value for deep cylinders was lower than that for rings, the results were
variable and did not show a convincing treatment effect. During removal, mycorrhizal
roots were encountered in the litter supposedly isolated from root influence by the deep
cylinders. The amount of root material was not measured but was smaller in all the
cylinders than in the litter confined by the rings. Excavation showed that roots had
entered from below the 85-cm barrier and had grown upwards to explore the soil and
litter layer confined by the cylinders.

We had not expected root interference from this depth. Earlier studies (Gadgil &
Gadgil 1971, 1975) had shown that regular vertical cutting of plot margins to a depth
TABLE 1—Litter accumulation in a 10-year-old, untended, *Pinus radiata* stand at Purukohukohu

<table>
<thead>
<tr>
<th>Litter confinement</th>
<th>Oven-dry weight of litter (corrected for loss-on-ignition) (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep cylinders</td>
<td>Mean 10 990 ± 5645 SD</td>
</tr>
<tr>
<td>Surface rings</td>
<td>Mean 12 239 ± 2526 SD</td>
</tr>
</tbody>
</table>

...of 30 cm in an unthinned 22-year-old *P. radiata* stand was sufficient to reduce root development considerably over a period of 1 year.

Trenching studies in which soil and litter volumes are isolated to a depth of 70 cm or less (e.g., Vitousek *et al.* 1982; Harmer & Alexander 1985) may not maintain treatment specifications, or expectations, over a long period. We cannot recommend a safe depth for trenching studies.

Our observation demonstrates an unexpected soil exploration strategy. The effect of gravity on root growth can clearly be secondary to the stimulus provided by substances present in previously uncolonised soil and forest floor litter.

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REFERENCES


