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# Group Dying of Conifers

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Plate 2. Fruit bodies of *Rhizina undulata*, autumn

## GROUP DYING OF CONIFERS

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### INTRODUCTION

Group Dying of conifers is caused by the fungus *Rhizina undulata* Fr., which commonly becomes established where fires have been lit in coniferous woodland or on ground recently cleared of coniferous trees. The spores of this fungus readily germinate in the soil after they have been subjected to relatively high temperatures (30–45°C), hence the association with fires.

*R. undulata* attacks the roots of conifers (but not of other trees), and may kill trees of any age up to sixty years or more. The disease was at one time quite common in Britain in areas where fires for lunch-time breaks were lit during thinning operations in pole-stage crops, but after this practice was banned in most forests and estates the disease became rare. A resumption of fire lighting in the forest would however be likely to lead to a resurgence.

### HOST RANGE

In Britain Group Dying has been recorded most often in Sitka spruce, which is the most susceptible as well as the most commonly planted conifer species. It has also been found in Norway spruce, Corsican and Lodgepole pines, and in European and Japanese larches. Douglas fir appears to be very resistant or

immune in the pole stage, but killing of young plants of Douglas fir as well as of many other conifers has been noted abroad.

### DEVELOPMENT OF THE DISEASE

The following account applies in particular to pole-stage Sitka spruce (*Picea sitchensis*), on which the disease has been most often seen and on which it has been most studied. After its establishment at the site of a fire, the fungus grows outwards through the soil and litter at the rate of about three metres a year, attacking the roots of conifers as it progresses. Fine roots are soon killed, and the larger roots are covered by yellowish-white mycelial strands (Plate 3). Small infection cushions form over the lenticels (breathing pores) which as a defensive reaction fill with resin and so appear white instead of their normal pink colour. Usually the fungus is able to bypass the resin plugs, and enters the root tissues. Sometimes the fungus is then halted by a cork barrier, and a rounded dead area surrounded by a dark line is formed on the root surface, and may be found if the bark scales covering the root are stripped off (Plate 4). If the fungus spreads unhindered, as it often does, many lesions coalesce to form large irregular dead areas, and the whole root may die.

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#### COVER PICTURE

Plate 1. Group of Sitka spruce in a young plantation in North Wales, killed by *Rhizina undulata*.





Plate 3. Strands of mycelium of *Rhizina undulata* on root of Sitka spruce  $\times 6$

Extensive damage may occur to the roots before it becomes obvious above ground that the tree is diseased. The first clear signs of the disease include premature and prolific cone production (which takes place from one to three years before the death of the tree), together with partial or complete needle loss, and resin bleeding on the trunk (Plate 5). These symptoms are indicative only, and not diagnostic, and the identity of the disease needs confirmation by a search for fruit bodies of the fungus (which are only sometimes present) and for the presence of the fungal strands and of lesions on the roots.

Fructifications, shown in Plates 2 and 5, form in summer, and are found in most years except when the summer is very cool. At first the fruit bodies are produced mainly round the edges of the original fire site, and in successive years they form in a wider and often more irregular, incomplete and discontinuous ring. The mycelium of the fungus may be present in the soil and litter up to two metres beyond the ring of fructifications. The latter are at first globular and whitish, then disc-like, and finally become irregular, rounded cushion-like bodies, hollow beneath (Plate 2). From the hollow under-surface, thick, hollow, whitish root-like structures connect the fruit body to the ground. At this stage the fruit bodies are deep chestnut brown, at first with a cream-coloured growing edge. This creamy edge disappears when growth ceases. By that time the individual fruit bodies measure up to five centimetres across, but often several fuse together in crust-like formations.

### LOSSES CAUSED

In pole-stage crops, the fungus may spread outwards from the site of the original fire for periods of up to seven years, killing more and more trees (Plate 1). By its second year of growth, only a few dead trees may occur. With time, as more trees die, groups of up to about 30 or 40 metres across may develop. Up

to 100 trees may then be killed in one group, though losses as great as this are found only in Sitka spruce. Growth of the fungus usually ceases within seven years, but windblow then often greatly extends the groups first formed by *R. undulata*.

Young plants of many conifer species are susceptible to killing by *R. undulata* and death may occur where lop and top have been burnt shortly before replanting of ground cleared of a conifer crop. As a rule, however, the fungus does not persist for more than a year or two on open ground, so death of replanted stock rarely extends beyond two or three metres from the sites of fires. Thus, if burning is concentrated in widely spaced "spot" fires, there is little risk of appreciable loss, but if a relatively large area of ground is heated, as when burning is done in shallow drifts, then the risk is correspondingly greater.

### CONTROL OF THE DISEASE

As *Rhizina undulata* is associated almost exclusively with fire sites, its growth and the losses it causes can be prevented if *no fires are lit in the forest*. This is especially important in the case of the more susceptible species. If for any reason fires are in fact lit, e.g. on rides or waste land, some protection may be gained if ditches are made to separate the fire sites from the plantations. In the same way, it may be possible to trench round the edges of newly-established groups to prevent the spread of the fungus. Unfortunately, however, if such ditches are not maintained the fungus may succeed in crossing them.

### NOTES

This Leaflet replaces Forest Record 46 (HMSO 1961) with the same title. Plate 1 is by George Pringle. All the illustrations are drawn from the Forestry Commission collection.





Plate 4. Sitka spruce root damaged by *Rhizina undulata*. Dead patches visible after the bark scales have been scraped off. Actual size.





Plate 5. Sitka spruce at the edge of a group, showing resin bleeding, and fruit bodies of *Rhizina undulata* around the base.

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