

The time of infection of butt-rot fungi into larch trees¹⁾

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カラマツへの根株心腐病の侵入時期

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1. Introduction

It was generally understood that rots occur in mature forests and tend to increase as trees get older. Although several investigations have been carried out on rot of trees, there have been few investigations on the time of infection of rot fungi into trees (Basham, 1978, Shigo, 1965). We are conducting a series of investigations on the butt-rot of larch. In this paper, the time of infection of butt-rot fungi into larch and heartwood formation of larch trees are reported.

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2. Materials and Methods

Two thousand larch seedlings (age: 2 years old), seventy-one trees (6 years old), seventy-two trees (7 years old), and one hundred six trees (10 years old) were used in this investigation. Two thousand 2-year-old larch seedlings were provided from nurseries (1000 seedlings from Hata in Nagano Pref. and 1000 from Kobuchizawa in Yamanashi Pref.). The six-, seven- and ten-year-old larch trees investigated were obtained from Yatsugatake University Forest, University of Tsukuba in Minamimaki-mura, Nagano Pref. These larch trees were pulled up and then, the roots and butts were washed in water. After the fine roots were removed, all roots and butts were cut to 1–2cm length to observe discolored or decaying parts inside of them. Two hundreds of the two-year-old seedlings, twenty-eight of the six-year-old, fifteen of seven-year-old, and twenty-eight of ten-year-old trees, in which discoloration or decay was recognized, were used for the isolation of the butt-rot fungi. Small pieces of discolored or decaying wood were removed from the inner parts with a small sterilized chisel. The pieces were placed on plates of 2% malt extract agar or potato dextrose agar (PDA), containing 10ppm benomyl.

Heartwood formations of 249 larch trees six-, seven- and ten-year-old were also examined. In pre-investigations, it was proved that 1N KOH stained heartwood better than Fast blue. Three transversal sections of each larch trunk from 0 to 10cm above the ground level were stained with 1N KOH solution. Presence of heartwood was judged by the dark-brown discoloration of wood.

3. Results and discussion

The result of fungal isolation is shown in Table 1. An unidentified butt-rot fungus (basidiomycete-1) was isolated from four butts of the twenty-eight larch trees (10 years old) investigated. One butt-rot reached 30cm above the ground level in the trunk. Although the other butt-rot fungi, i.e., *Phaeolus schweinitzii* (Fr.) pat. and *Tyromyces balsameus* (Peck) Murr. were isolated from butt-rots in the area (Ohsawa et al., 1987), these fungi could not be isolated in this investigation. No butt-rot fungus was isolated from the butts of the two-, six-, and seven-year-old trees investigated.

The result of heartwood formation is shown in Table 2. Heartwood formations were recognized in ninety percent of the 6-year-old larch trees. All seven- and ten-year-old trees investigated had heartwood. Average diameters of the heartwood were 0.3 cm (6 year-old trees), 0.5cm (7 year-old trees), and 1.7cm (10 year-old trees). These results support the

Table 1 Results of isolation of butt-rot fungi in young larch trees and seedlings

Tree age (years)	Number of trees investigated	Number* of trees used for fungal isolation	Number of trees from which butt-rot fungi were isolated
2	2000	200	0
6	71	28	0
7	72	15	0
10	106	28	4**

* Number of trees observed discoloration or decay, and used for fungal isolations

**Basidiomycete-1 (unidentified fungus) was isolated from trunks of 4 trees.

Table 2 Heartwood formation of young larch trees

Tree age (years)	Number of trees investigated	Number of trees having heartwood	Average diameter of heartwood (cm)	Average diameter of butt (cm)
2	2000	—	—	—
6	71	65	0.3	2.1
7	72	72	0.5	3.2
10	106	106	1.7	4.1

report of Hirai (1952) that heartwood formation of larch trees begins when they are about 5–6 years old.

From these results, it is concluded that butt-rot fungus (basidiomycete-1) can invade larch trees more than 10 years old in which heartwood was formed. Other butt-rot fungi may also infect larch trees at about the same time. Further investigations are needed for other butt-rot fungi to clarify their infection time. The butt-rot fungi were not isolated from two-year-old seedlings. This suggests that infection of the fungi may not occur in nursery. Further investigations are also required to clarify this point using more seedlings from various places.

Many trees used in this investigation had damages which seemed to be caused by mice. The relationships between the damages caused by mice and those by butt-rot fungi were reported in Hokkaido (Sasaki, 1989). However, it could not be ascertained in this investigation whether or not the damages were those caused by mice.

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要 旨

カラマツ根株心腐病のカラマツ苗および若木に侵入し始める時期について調査した。山梨県産および長野県産2年生苗木それぞれ1000本、筑波大学八ヶ岳演習林に植栽されている幼齡木、6年生71本、7年生72本、10年生106本について、根株および根を掘りとり、細断し、内部に腐朽または変色の認められるものについて、根株心腐病菌の分離を行った。同時に6年生以上の幼齡木については、心材形成の有無を1N KOHで染色し調査した。

その結果、10年生のカラマツ4本からカラマツ根株心腐病菌の1種（未同定担子菌 basidiomycete-1）が分離された。そのうちの1本は腐朽がすでに地上30 cmまで及んでいた。2, 6, 7年生カラマツからは本病原菌は分離されなかった。心材は6年生の木で90%, それ以上では100%形成されていた。これらのことより、本病原菌はすでに心材が形成されている10年生以上のカラマツに侵入することが明らかとなった。2年生苗木が本病に感染していなかったという結果は、本病の苗畑感染の可能性に否定的であった。