

TWO DECAY FUNGI ON CONIFERS IN THE HIMALAYAS

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(With Plate I and 2 Text-figures)

ABSTRACT

Lentinus lepideus and *Poria ferruginosa* causing brown cuboidal rot and white pocket rot respectively on coniferous wood in the Himalayas are recorded new in India. The two fungi have been described and their cultural characters studied.

The paper gives an account of two fungi, *Lentinus lepideus* and *Poria ferruginosa*, which principally cause decays on conifers in the Himalayas. Both the fungi are widely distributed in Europe and North America where they are of considerable economic importance. *L. lepideus* is tolerant to a comparatively light concentration of creosote (Cartwright and Findlay, 1946) and the fungus is commonly associated with the decay of timber used in service. It is not usually a parasite and is not recorded on hardwoods. *P. ferruginosa* is known abroad commonly as a decay fungus both on hardwoods and conifers. Both the fungi are recorded for the first time in India.

1. *LENTINUS LEPIDEUS* Fr.

Occurrence

Lentinus lepideus occurs commonly in the temperate regions of the western Himalayas at altitudes between 6,000—8,000 ft. in Kulu division, the Punjab, and Chakrata division, Uttar Pradesh. It occurs usually as a saprophyte on fallen logs of spruce (*Picea morinda*) and blue pine (*Pinus excelsa*) though on rare occasions it has also been recorded to grow parasitically on partly exposed healthy roots of living deodar (Pl. I, fig. 1) and spruce.

Sporophore

Fruit-body. Fleshy, tough and white when fresh, drying hard and brown. *Stalk.* Central, solid, white or brown with age, volva and annulus not found, about 2-9 cm. long, 0.5-1 cm. wide. *Pileus.* About 2-7 cm. in diameter. *Upper surface.* White when fresh, drying brown, with closely appressed brown scales (Pl. I, figs. 1 and 2), reticulately wrinkled, edge incurved. *Flesh.* Fleshy to corky, white to light buff*, about 0.7-1 cm. thick; hyphae hyaline, mostly thick-walled, with wide or narrow lumen (text-fig. 1, b), rarely thin-walled, sparsely branched, with simple septa and clamp connections (text-fig. 1, a), about 2-9 μ broad. *Gills.* White when fresh, turning brown on drying, crowded (Pl. I, fig. 2), decurrent, edge serrate. *Basidia.* Elongated clavate (text-fig. 1, c), up to 25 μ long, about

* Ridgeway (1912).

4.5–5.7 μ broad; sterigmata 4 in each basidium, upto 3 μ long. *Basidiospores*. Distinctly yellow in appearance when fresh, hyaline in old herbarium specimens, sub-cylindric or elliptical, thin-walled, with a short apiculus (text-fig. 1,d), dimension about 7–10 (12) $\times$ 2.7–3.7 (4.1) μ .

As stated by Smith (1949), the species is variable in its character. All trace of veil, said to be present in young fruit-bodies, is lost at maturity. Cystidia are said to occur in the hymenium (Smith, 1949) but in our specimens, there are no structures distinctive from the basidia to be regarded as cystidia. A sporophore of the fungus collected at Madison, Wisconsin, U.S.A. and deposited in this herbarium, also, did not reveal the presence of cystidia. Basidiospores are said to be hyaline. In our specimens, they are yellow when a fresh discharge of spores is collected in the field, while in specimens kept dry in the herbarium for about two months, spores are hyaline. This is due, evidently, to fading out of the colour.

Specimens examined

On wood of *Pinus excelsa*, Bashahr, Himachal Pradesh, Oct., 1941, 5798;* on wood of *P. excelsa*, Konain, Chakrata div., Uttar Pradesh, June, 1947, 4803; on roots of living *Cedrus deodara*, Kasol, Kulu div., the Punjab, June 1955, 6542; on wood of *P. excelsa*, Kasol, June, 1955, 6539, and 6514; on roots of a living *P. morinda*, Pulga, Kulu div., the Punjab, June, 18, 1955, 6543.

Rot

The fungus causes a brown cuboidal rot in wood. The decayed wood becomes powdery under pressure of the thumb. White mycelial felts may be present on the surface of decayed wood and also within the cracks.

Cultural characters

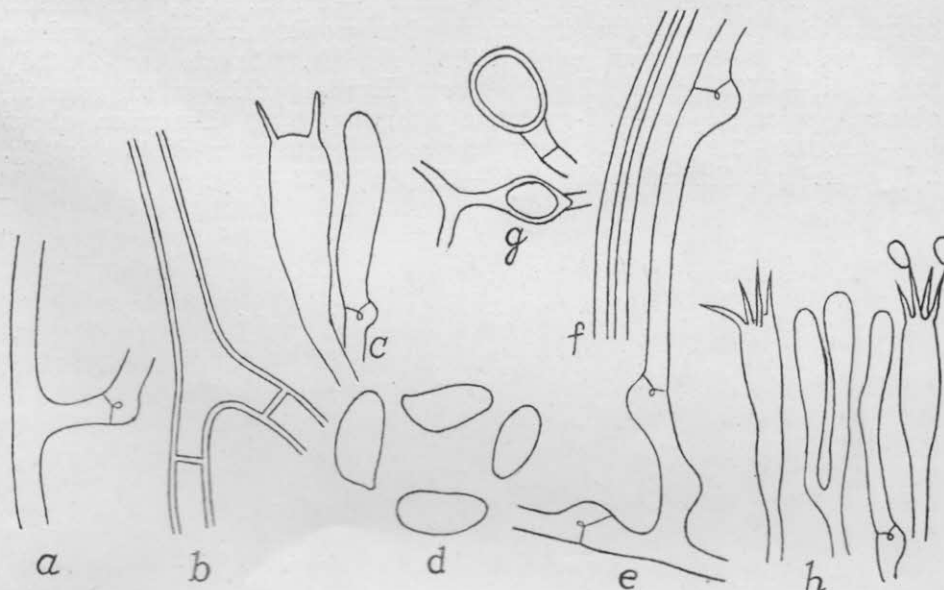
GROWTH CHARACTERS : Growth (radial) on *malt agar* 1.5 cm. in 7 days at 25°C. in darkness; mat thin, appressed; white when young, in 3 weeks becoming light buff which later deepen to warm buff; colour of the medium darkened; on gallic and tannic acid media diffusion zones present or absent, growth nil to 1 mm. in 7 days on gallic acid, nil on tannic acid.

Davidson, Campbell and Blaisdell (1938) also reported that *L. lepideus* in agar containing gallic or tannic acids sometimes formed diffusion zones and at other times the diffusion zones were absent.

HYPHAL CHARACTERS : *Aerial mycelium*—(a) hyphae hyaline thin-walled, branched, with simple septa and clamp connections (text-fig. 1, e), about 1–4.4 μ broad; (b) fibre-hyphae occur in old cultures, hyaline, but sometimes brown when very old, thick-walled, sparsely branched, distantly septate (text-fig. 1, f), about 1–2.8 μ broad; (c) chlamydospores

* Numbers in italics indicate herbarium numbers of the specimens kept in Mycology branch, F.R.I., Dehra Dun,

numerous, globose to ovoid, hyaline, sometimes with light brown contents, thick-walled, apical or intercalary (text-fig. 1,g), dimension about $9-18 \times 6.6-13\mu$. *Submerged mycelium*—(a) thin-walled hyphae and (b) chlamydospores as in the aerial mycelium; (c) crystals needle-like and hexagonal.



Text-fig. 1. a, Thin-walled context hyphae with clamp connection; b, thick-walled context hypha; c, basidium; d, basidiospores; e, hypha in culture with clamp; f, chlamydospores; g, part of hymenium from fruit-body in culture showing basidia ($\times 1250$)

Fruit-body develops readily in some cultures (Pl. I, fig. 4), completely lacking in some isolates, while in others pileus usually fails to develop (Pl. I, fig. 3) and the stalk branches in a coralloid manner. *Basidia*. Cylindric to narrow clavate (text-fig. 1, h), dimension about $8-9 \times 3\mu$, with 4 slender sterigmata on each, upto 4.5μ long. *Basidiospores*. Hyaline, elliptical, dimension about $7-8 \times 3-3.5\mu$.

2. *PORIA FERRUGINOSA* (Schard. ex Fr.) Karst.

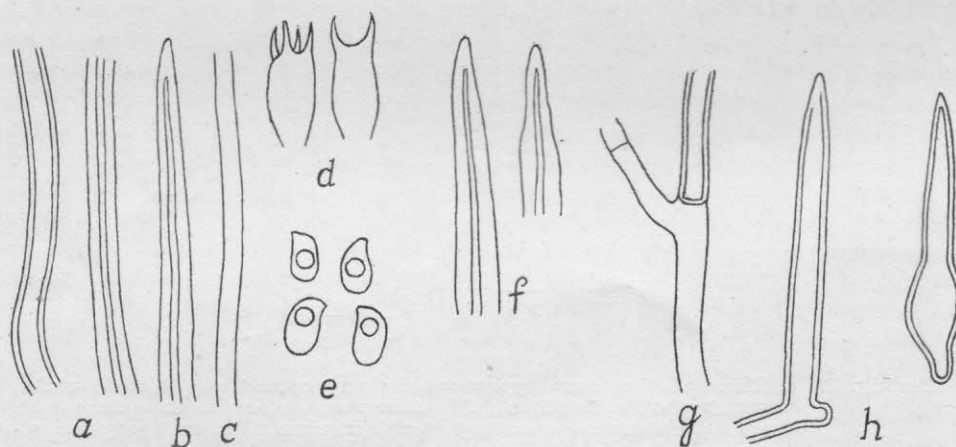
Occurrence

Poria ferruginosa has been collected, though not commonly, from the western Himalayas in the Chakrata and Kulu divisions, at altitudes of 6,000—8,000 ft. The fungus has been found growing only on coniferous wood.

Sporophore

Fruit-body. Annual, broadly effused, inseparable from the wood, corky, margin sayal brown, narrow, thin, sterile. *Subiculum*. Brown,

0.15-0.2 mm. thick; hyphae brown, thick-walled with wide or narrow lumen, unbranched, apparently aseptate (text-fig. 2,a), about $2.1-3.8\ \mu$ broad, dark brown setae-hyphae with pointed ends present (text-fig. 2,b), about $6-10\ \mu$ broad, frequent; tramal hyphae similar to hyphae of the subiculum, hyaline, thin-walled, apparently unbranched, indistinctly septate sayal brown or snuff brown; dull; pore-tubes 1-2 mm. long, pore-mouths circular to slightly angular, irpiciform when growing on vertical surfaces (Pl. I, fig. 5), 3-5 per mm., edges entire. *Basidia*. Clavate (text-fig. 2,d), about $4.3-5.1\ \mu$ broad. *Basidiospores*. Hyaline, thin-walled, smooth, oblong, apiculate, with 1-guttulate (text-fig. 2,e), dimension about $5.5-6.1 \times 3.0-3.8\ \mu$. *Setae*. Dark brown, subulate, acuminate (text-fig. 2,f), abundant, dimension about $48-68\ (102) \times 6.8-9.5\ \mu$.



Text-fig. 2. a, Thick-walled hyphae of the subiculum; b, setae like hypha from the subiculum; c, thin-walled tramal hypha; d, basidia; e, basidiospores; f, setae in the hymenium; g, hypha in culture hypha; h, setae in culture (Figs. a, c-e, g, $\times 1250$; b, & h, $\times 500$).

Specimens examined

On wood of *Pinus excelsa* in buildings, Deoban, Chakrata div., Uttar Pradesh, July, 1945, 4040(a); on *Cedrus deodara* beams, Kasol, Kulu div., the Punjab, June, 1955, 6536 and 6537.

The fungus closely resembles *Poria viticola* Schw. (= *Trametes tenuis* Karst.) from which the present species can be distinguished from the character of the spores (Overholts, 1922). Further *P. ferruginosa* produces abundant setae in culture while *Trametes tenuis* Karst. as described by Nobels (1948) has no setae in culture. The affinities of the fungus are also with *Poria ferrea* (Pers.) Bourd. & Galz. and *P. ferrugineo-fusca* Karst. from which *P. ferruginosa* is distinguished by the character of basidiospores.

Rot

The fungus causes a white spongy rot.

Cultural characters

GROWTH CHARACTERS: Growth (radial) on *malt agar* about 0.5 cm. in 7 days at 25°C in darkness; mat dirty white, loosely woolly on the inoculum, short cottony around it, becoming thin felty and developing buckthorn brown and ochraceous tawny with age which later deepen to russet in patches; reverse developing same shades below coloured areas of the mat.

The texture and the colour of the mat are dependant on temperature. At lower temperatures (18-23°C) there is satisfactory development of aerial mycelium, the mat is white for most part and the colour development is delayed and less intense. At higher temperatures (26-30°C) the aerial mycelium is scanty, colours appear quickly and the shades are more intense.

HYPHAL CHARACTERS: *Aerial mycelium*—(a) hyphae hyaline, thin-walled, branched, septate (simple), becoming pale brown and slightly thick-walled (text-fig. 2, g), about 2.2-4.4 μ broad; (b) setate dark brown, subulate (text-fig. 2 h), abundant, 61-110 $\times$ 5-10.2 μ .

Fruit-body sometimes develops in test tubes in 5-6 week old cultures, consisting of irregularly poroid raised surfaces, vinaceous buff, avellaneous to light brownish drab in colour. *Basidia*. Hyaline, broad clavate, upto 5.1 μ broad, with 4 long sterigmata. *Basidiospores*. Hyaline, thin-walled, smooth, oblong. apiculate, with 1-guttulate, dimension about 4.8-6.0 $\times$ 3.0-3.6 μ .

ACKNOWLEDGMENT

Our thanks are due to Miss E. M. Wakefield for kindly indentifying the sporophores of *L. lepideus* and to Dr. K. Bagchee for taking the photographs 3 and 4.

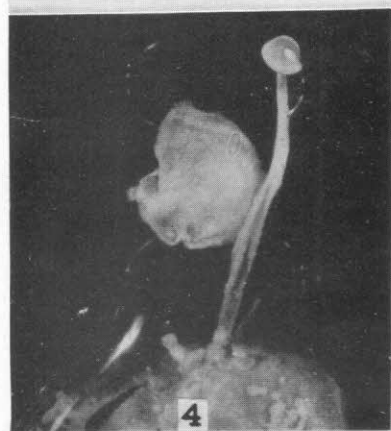
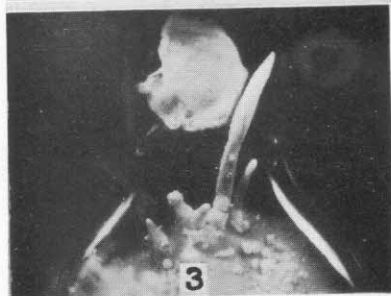
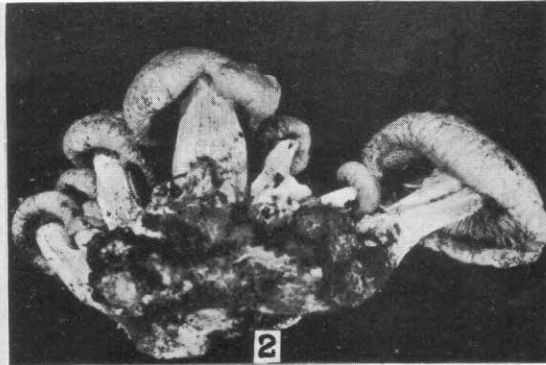
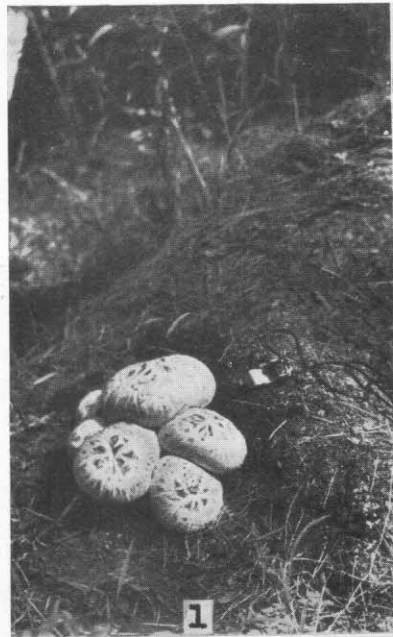
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EXPLANATION OF PLATE I

- Fig. 1. *Lentinus lepideus*, sporophores on exposed roots of a living deodar ($\times 1/5$).
Fig. 2. *Lentinus lepideus*, sporophores showing hymenial surface ($\times 3/4$).
Fig. 3. *Lentinus lepideus*, immature sporophore (with stalks only) growing on malt agar in Kolle flasks ($\times 2/5$).
Fig. 4. *Lentinus lepideus*, typical sporophore on malt agar in Kolle flasks ($\times 1/2$).
Fig. 5. *Poria ferruginosa*, sporophores showing hymenial surface ($\times 1$).



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