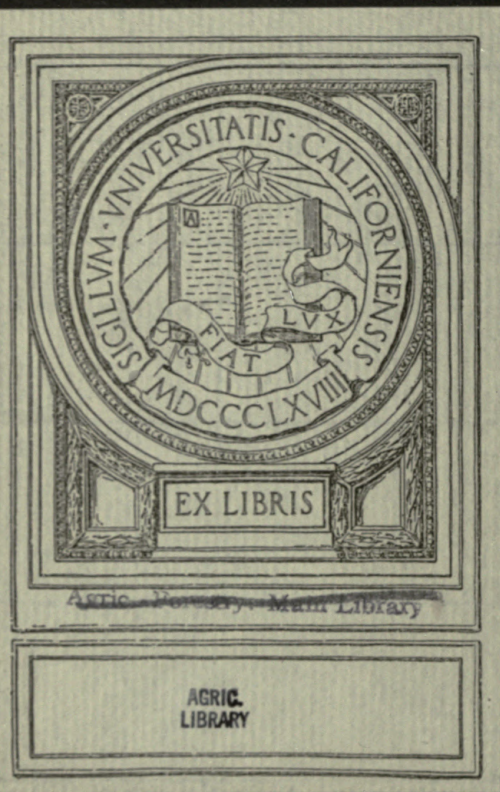


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OBSERVATIONS ON RHIZINA INFLATA

By JAMES R. WEIR



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## OBSERVATIONS ON RHIZINA INFLATA

By JAMES R. WEIR,

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Considerable doubt exists regarding the parasitism of *Rhizina inflata* (Schäff.) Sacc. (*R. undulata* Fr.). This peculiar fungus (Pl. VIII, figs. 1, 2, and 3) occurs quite abundantly on the ground in the forest-fire areas of the Northwest. Usually found as a saprophyte on the burned forest soil, it attracted little attention until the close proximity of the fruiting bodies to dead coniferous seedlings was noted to be of frequent occurrence. A close examination of the roots of the dead seedlings showed the mass of white mycelium clinging to and ramifying in the cortical tissues of the root to be in connection with the near-by fruiting structures of *Rhizina inflata*. In some cases the sporophores of this fungus surrounded the stem of the seedling.

The observations on the parasitism of this fungus are not extensive. The disease "la maladie du rond" of *Pinus sylvestris* and *P. maritima*, according to the investigations of Prillieux and De la Boulaye (1880),<sup>1</sup> is accredited to this fungus. Hartig (1891, 1892, 1894, p. 123-129) afterwards in more thorough investigations substantiated the observations of the former investigators and showed *Rhizina inflata* to be capable of living as a true parasite, causing the death of 4-year-old seedlings of *Abies pectinata*, *Pinus strobus*, *Larix europaea*, *Picea sitkaensis*, *Tsuga mertensiana*, *Pseudotsuga douglasii*, and *Castanea vesca*. Von Tubeuf (1897, p. 273) also reports the fungus as a parasite in the forest-tree nurseries of Germany and in the natural forests of *Pinus pinaster* in France.

Early in the spring of 1912 at a certain point along an old logging road in the Kaniksu National Forest, Idaho, where the brush had been burned, young 3- to 5-year-old seedlings of *Tsuga heterophylla*, *Larix occidentalis*, and *Pinus monticola* were observed to be dying in small isolated patches. The roots of the seedlings on being pulled up were closely matted together by a white mycelium, causing a quantity of earth to adhere to them. Since fungous fruiting bodies were not in evidence on any part of the diseased plants or on the ground around, the death of the seedlings was attributed to *Armillaria mellea* (Vahl) Quél., which is very abundant in this region and is frequently the cause of the death of very young growth. The mycelium had penetrated all parts of the cortical and bast tissues of the roots, causing them to become saturated with resin, a condition quite similar to that produced by *A. mellea*. The diseased areas were

<sup>1</sup> Citations to literature in parentheses refer to "Literature cited," p. 95.

from 2 to 4 feet in diameter and were irregularly circular in shape, as if the causal agent had started from the center.

Later in the season, near the borders of these areas and at the base of the stems of the dead seedlings, deep-brown, effused, undulating, fruiting structures appeared, which were at once recognized as those of *Rhizina inflata* (Pl. VIII, fig. 2). As to the connection of these fruiting structures with the mycelium beneath them in the forest mold and with that of the roots of the diseased seedlings, there seemed little room for doubt. It did not seem probable that the base of the diseased plant would be completely inclosed by the fruiting structure, with its peculiar rootlike fibrils (Pl. VIII, fig. 3) mingling with the mass of mycelium about the diseased roots, without having some connection with it. Such a seedling with fruiting body attached was carefully removed from the soil and placed in a dish of water, in order to allow the attached earth to fall gradually away. It was found that the numerous rhizoids or strands of mycelium by which the fruiting structures are attached to the substratum were continuous with the mycelium surrounding the diseased roots. These roots were microscopically examined and showed that the internal mycelial system ramifying in the cortical parenchyma and in the sieve tubes of the bast was a continuation of the mycelium which connected up the rhizoid strands of the fruit body.

By shaking in boiled water a quantity of soil which had been burned over the previous year and which showed no signs of fungous growth, a solution was prepared to which a large quantity of spores of *Rhizina inflata* was added. This solution was thoroughly sprayed about the base of several healthy 3- to 4-year-old white-pine seedlings (*Pinus monticola*) growing on burned ground in another part of the forest. The sprayed seedlings appeared slightly reduced in vigor in the fall of 1912 and by July of 1913 they were dead. The roots of each were infected by the same clinging mass of mycelium previously described. The stems and leaves were free from any other diseases. It is believed that this result, although not obtained under control conditions, furnishes some experimental proof of the parasitism of *Rhizina inflata* as it occurs in the Northwest.

Underwood (1896) reports the distribution of the species as follows: Connecticut (Thaxter), New York (Peck), Rhode Island (Bennett), Pennsylvania (Schweinitz), Wisconsin (Bundy), North Carolina and South Carolina (Curtis). The range of *Rhizina inflata* is further extended by the writer, who has collected it at the following stations: Priest River, Idaho, in Kaniksu National Forest on *Pinus monticola*, *Tsuga heterophylla*, and *Larix occidentalis*; Coeur d'Alene National Forest, Idaho, on *Pinus monticola* and *Abies grandis*; Thompson Falls, Mont., in Cabinet National Forest, on *Pinus contorta*; Missoula National Forest, Mont., on *Pinus ponderosa*; Lolo National Forest, Mont., on *Pinus monticola*; Ely, Minn., in Superior National Forest, on *Pinus divaricata*; and Salmon Arm, British Columbia, on *Pseudotsuga taxifolia*.

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PLATE VIII

Fig. 1.—Mature fruiting structure of *Rhizina inflata*, showing the undulating upper surface.

Fig. 2.—Immature fruiting structure of *Rhizina inflata*.

Fig. 3.—Fruiting structure of *Rhizina inflata*, showing the peculiar mycelial strands or fibrils by which the fruiting body is attached to the substratum.



Rhizina Inflata

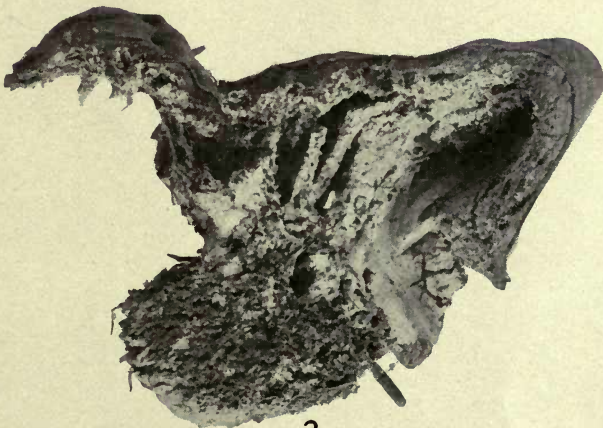
PLATE VIII



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