SIGNIFICANCE OF AIR-DRY WOOD IN CONTROLLING ROT CAUSED BY PORIA INCRASSATA

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SIGNIFICANCE OF AIR-DRY WOOD IN CONTROLLING ROT CAUSED BY PORIA INCRASSATA[1]

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The rot caused by Poria incrassata (Berk. and Curt.) Burt (sometimes erroneously called "dry rot") in individual cases is the most destructive of the building decays in the warm coastal portions of the United States and the South. The fungus usually attacks rapidly and may cause damage necessitating extensive repairs within as short a time as a year. Damage to property even in the less severe cases sometimes amounts to several hundred dollars.

It has been observed that cases of Poria incrassata decay are peculiarly sporadic in their distribution. Certain houses are found to be seriously damaged, whereas numbers of others in the same localities and apparently presenting an equally favorable opportunity for attack have remained uninfected for very long periods. Outside its important range, P. incrassata cases are extremely scattered, only one or two being known for some states and none at all for others. Moreover, although occasionally found on other material, the fungus is known to occur importantly only in buildings and stacked lumber.

These facts have led to the suspicion that spore dissemination may not be so important a factor in the distribution of P. incrassata as with a number of other decay fungi and that the occurrence of Poria rot in buildings may be in large measure traceable to the use of lumber already infected at the time it is used. Such a possibility raises the question of how long

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P. incrassata may stay alive in air-dry lumber and thus, with any subsequent resumption of favorable moisture conditions, would be in a position to resume its attack after the lumber is placed in service. The question is particularly significant at the present time since it bears directly on the decay hazard attached to the rather prevalent use of incompletely seasoned lumber for emergency construction.

The following report gives the results of tests of the longevity of a number of strains of P. incrassata in air-dry wood, with a discussion of the practical implications as regards the occurrence of building decay caused by this fungus.

Methods

The longevity tests were based both on wood infected in the laboratory with a pure culture of the fungus and on naturally infected wood obtained from buildings in the South. When a sample of naturally infected wood was received, small bits of it were planted on a special nutrient medium in test tubes. If the fungus was alive it grew out into the nutrient medium. The samples thus shown to contain live fungus were placed, freely exposed, in a special drying room with a maintained relative humidity of 65 percent and a temperature of 80° F., and the testing was repeated until the fungus was found to be no longer alive. The equilibrium moisture content of wood stored at this relative humidity and temperature averages from about 12 to 13 percent, based on the oven-dry weight of the wood.

Specimens that were infected in the laboratory were handled in the same way except that in one test some of them were also dried with relative humidities of 30 percent, and 90 percent. In this particular test, moisture samples were split out of each test piece at the time it was cultured, thus permitting a fairly accurate estimate of the moisture contents. The laboratory-infected material consisted entirely of loblolly pine sapwood sticks 1 by 1 by 10 inches, the long dimension being in the direction of the grain. Infection was brought about by placing the sticks in large-bore, cotton-plugged test tubes containing a pure culture of the fungus growing on malt-agar medium. As soon as the sticks were judged to be thoroughly infected they were sawed into small blocks, 1/2 inch long, so that equilibrium moisture contents would be reached in a short time.

Results

Laboratory-infected Wood

In all cases the material cultured was either obviously thoroughly infected before it was tested or this fact was established by microscopical examination of the wood.

In the first test of wood decayed in the laboratory, with subsequent drying at a relative humidity of 65 percent, the longest drying period survived by the fungus was between 12 days and 1 month. The shortest survival period was less than 4 days. Plainly, the strain used[4] was highly intolerant to an air-dry condition of the wood.

A second test with wood infected in the laboratory leads to a similar conclusion for other strains of Poria incrassata. Moreover, it indicates that air-drying tends to kill this fungus rather promptly even though the moisture content of the wood is as high as 20 percent.

In this test (table 1) the longest period of survival, which occurred in the blocks having the highest moisture content, was less than 10 days. The differential effect of the three drying atmospheres on the vitality of the fungus was especially striking. With drying at a relative humidity of 30 percent, none of the strains were alive in the wood after 24 hours. With drying at a relative humidity of 65 percent, marked loss of vitality in all strains was apparent at the end of 1 day. At the end of 4 days only 1 strain was alive and this barely so. With drying at a relative humidity of 90 percent, a slight loss of vitality was evident in 2 of the strains at the end of 1 day and, in general, a progressively greater loss thereafter. None of the strains were alive on the 13th day of drying.

Naturally Infected Wood

Results obtained with naturally infected wood are summarized in table 2. Although the number of cases critically studied is not large, the evidence in general agrees with that obtained from the laboratory-infected wood. The longest period of survival found was between 25 and 32 days. The somewhat longer survival in naturally infected wood is believed to be partly due to the fact that the specimens of naturally infected wood were larger and in most cases varnished or painted on one surface, both of which factors would delay drying. In four of the cases the fungus was dead when the wood was received. It is regarded as significant that in those cases the wood appeared to be quite dry.

To supplement the information of table 2, previous records of 105 cases of Poria incrassata decay, represented by samples from several regions, were examined. These samples had been cultured upon receipt at the Laboratory, and the fungus was found to be alive in 53 of them, or in only about one-half the cases. In most cases the samples were air dry when received, but there is no way to determine how long they had been in this condition. Nevertheless, it seems logical to assume that the material for the most part was sent in for diagnosis within a comparatively short time after the wood had been removed in repairing the damaged structures. In one case, in which the culturing was repeated, the fungus was viable after 32 days in the laboratory and dead 6 months later. This was the longest period of survival observed.

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[4] Isolated from southern yellow pine cottage flooring from Griffinsburg, Va.

Conclusions and Summary

A number of strains of the building-decay fungus, Poria incrassata, were found to remain alive only a comparatively short time in wood with moisture contents up to 22 percent (moisture contents greater than this usually do not occur in air-dry wood unless the atmosphere has a relative humidity in excess of about 90 percent). In laboratory-infected wood having a moisture content near but not less than 8 percent, the fungus died within 1 day. At higher moisture contents, between about 13 and 22 percent, the period of survival was found to be increasingly longer, but, in all cases, less than 13 days.

Poria incrassata was found alive for the longest period in naturally infected wood, taken from portions of decayed buildings. In tests in which the condition of drying was known after receipt of the material the maximum survival period was between 25 and 32 days. The strain of the fungus taken from this maximum-survival material and inoculated in wood in the laboratory was dead after no more than 13 days following drying from a moisture content of about 30 percent to about 22 percent in that length of time.

It is concluded from these results that P. incrassata will but rarely remain alive in air-dry wood longer than a month. In general the survival period will be much shorter, particularly if the moisture content of the wood is less than about 15 percent. This extreme sensitivity of P. incrassata to killing by air-drying of the wood is in marked contrast to other decay fungi, some of which are known to remain dormant in dry wood for several years.[5]

Since P. incrassata is so highly intolerant to drying, and there is reason to suppose that it is distributed mainly in infected lumber, additional emphasis is placed on the desirability of using well dried lumber for building construction. This would include forming and any other temporary wood parts.

Good air-drying should suffice to eliminate Poria infection in most cases. The maximum moisture content of thoroughly air-dry wood ordinarily does not exceed about 26 percent, even in the most humid sections of the United States,[6] and in most sections and seasons the maximum is less than 20 percent.

It should be emphasized that lumber dried in a region where Poria occurs should thereafter be kept dry. It is known that much of the lumber infected with P. incrassata has become infected as a result of resting on infected foundations in the dry shed. Such lumber becomes wet by water carried into it by the fungus. Obviously infected lumber should not be kept, even for rough or temporary uses. Lumber not obviously infected but that has been stored close to infected lumber should be carefully inspected for moisture content and redried if there is any evidence of an unusual moisture increase.

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[5] Hubert, E. E. Effect of kiln drying, steaming, and air seasoning on certain fungi in wood. U. S. Dept. Agr. Bul. 1262, 20 pp., illus. 1924.

[6] Peck, E. C. The sap or moisture content of wood. Forest Products Laboratory Mimeo. No. R768, 7 pp. Revised 1935.

Table 1.--Survival of three strains of Poria incrassata in laboratory-infected 1 by 1 by 1/2-inch pine blocks during the course of air-drying with three different relative humidities and a temperature of 80° F.

Length of time in drying room	Relative humidity of drying room and observation											
	30 percent				65 percent				90 percent			
	Average moisture content of blocks when cultured[2]	Cases in which fungus was alive			Average moisture content of blocks when cultured[2]	Cases in which fungus was alive			Average moisture content of blocks when cultured[2]	Cases in which fungus was alive		
		3013[1]	3042[1]	563[1]		3013	3042	563		3013	3042	563
Days	Percent	Percent			Percent	Percent			Percent	Percent		
0 (start)	Over 30	100[3]	100	100	Over 30	100	100	100	Over 30	100	100	100
1	8	0	0	0	17	40	20	7	30	93	100	87
2	8	0	0	0	14	0	0	0	27	67	72	20
3	8	0	0	0	14	0	0	0	24	87	44	47
4	9	0	0	0	13	0	7	0	23	60	72	7
6	8	0	0	0	13	0	0	0	22	40	6	0
7									23	47	22	7
8	7	0	0	0	13	0	0	0	21	40	28	13
10	8	0	0	0	13	0	0	0	22	27	6	7
13	8	0	0	0	13	0	0	0	22	0	0	0
20									21	0	0	0

[1] Strain 3013 was originally isolated from decayed southern pine flooring in a building at Richmond, Va.; strain 3042 was isolated from southern pine flooring from Kansas City, Mo.; strain 563 was isolated from southern pine flooring from Griffinsburg, Va.

[2] Based on oven-dry weight of wood.

[3] Each survival record represents no less than 5 independently decayed sticks of wood and 3 tests of each stick, making a total of at least 15 cultures per test condition.

Table 2.--Viability of different strains of Poria incrassata in naturally infected wood during the course of air-drying with a relative humidity of 65 percent and temperature of 80° F.

Kind of wood	Type of service	Locality	Condition of fungus after indicated length of time in the drying room	
			Days:	Condition
Southern pine	Exterior trim	New Orleans, La.	0	Dead when received[1]
Southern pine	Sill	Wilson, N. C.	0	Alive
			3	Dead
	Siding		0	Alive
Southern pine	Studding	Gulfport, Miss.	8	Alive
	Flooring		14	Dead
Southern pine	Flooring	Terrell, Texas	0	Alive
			17	Alive
			24	Dead
Southern pine	Flooring	Verona, N. J.	0	Dead when received[1]
Baldcypress	Lumber	Russellville, S. C.	0	Dead when received[1]
Hard maple	Flooring	Hartford, Conn.	0	Dead when received[1]
Southern red oak	Flooring	Verona, N. J.	0	Alive
			15	Alive
			25	Alive
			32	Dead

[1] In all cases where the fungus was dead when received the wood was, to all appearances, already air-dry.