PHYTOPATHOLOGICAL NOTES

Bacterium Associated with Wetwood in White Fir

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ABSTRACT

A bacterium was consistently associated with wetwood in white fir. It is a small, slow-growing, gram-variable, facultatively anaerobic rod which produces acid but no gas on carbohydrate media; it frequently occurs in chains, and does not form spores. The bacterium has been characterized, but not identified. Growth appears to be stimulated by extracts from various plant tissues, but not by extracts from white fir wood. It can be isolated on standard media used for culturing fungi, but frequently does not survive subculturing from such media.

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The central portion of the stem of California white fir trees, *Abies concolor* (Gord. & Glend.) Lindl., particularly at the butt, usually appears much wetter than the surrounding sapwood. Little is known about the cause of this condition, but inferences can be drawn from previously reviewed data on wetwood in various tree species (7, 11). Because bacteria have been considered the cause of wetwood in some tree species, we investigated the relationship between wetwood and microorganisms in white fir. Details of the culture work have been reported elsewhere (12); this paper summarizes the information that has been developed on the only microorganism, a bacterium, that was found consistently associated with wetwood in white fir.

Thirteen white fir trees from El Dorado County, Calif., were sampled by removing complete cross-sectional discs with bark intact and transporting them to the laboratory. There, portions of the disc were removed by sawing, the outer few inches at each end of the disc were discarded, and radial strips ca. 1 inch square extending from bark to pith were sawn from the remainder. The strips were surface-sterilized by flaming, then aseptically split into small pieces and squeezed with large pliers. In addition, tissue platings were made by aseptically removing small pieces of wood from other strips and placing them on agar media.

Organisms other than the bacterium described here, primarily molds and yeasts, were isolated, but without any degree of regularity; their numbers decreased when the period between tree felling and microbiological sampling was reduced to 24 hr or less.

Results of culture experiments with over 85 different combinations of media and culture conditions indicated that the bacterium is a small, slow-growing, gram-variable, nonsporulating rod which produces acid but no gas on carbohydrate media. It is able to utilize inorganic sources of nitrogen poorly, and grows slowly in the absence of complex organic materials. It grew best on media containing an extract of tobacco leaves. Growth was not stimulated by addition of extracts of white fir wood to culture media. This fact, along with inability to produce a necrotic reaction to inoculation in tobacco plants and inability to induce anatomical changes in white fir wood in standing trees or in laboratory culture (13), suggests that the bacterium is not significantly plant-pathogenic. No white fir trees were found which did not have the symptoms of wetwood to some degree, and all trees sampled microbiologically in this study contained this bacterium; therefore, testing the bacterium's ability to reproduce symptoms of wetwood following inoculation of standing trees was impossible. It grew on malt and nutrient agar and in nutrient broth, but did not survive subculturing from these media.

The bacterium does not appear to be similar to bacteria isolated from wetwood or heart discolorations in balsam fir (1), elm: *Erwinia nimipressuralis* (4, 10), northern hardwoods (8), poplar (5, 9), or probably London plane (6), although little description of the latter organism was provided. It has a number of similarities to the bacterium isolated from birch by Campbell & Davidson (3) as described by Hartley et al. (7), and particularly to the one isolated from poplar wetwood by Seliskar (10) and identified as *Corynebacterium humiferum* (2).

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