X-Ray Investigation on the Change in Orientation of Cellulose in Sound and Infected Tracheids of Chir (*Pinus longifolia*)

J. Sen and B. K. Banerjee[1]

Botanical Laboratory, University College of Science, Calcutta, and Indian Association for the Cultivation of Science, Calcutta

X-ray study of cellulose orientation in wood has developed into an interesting field of investigation. The cellulose content in wood varies from 40% to 60% and other components include lignin, resin, and fat. Clark (*3*) has made x-ray studies of wood of many species and has obtained the typical cellulose pattern in every case, but he found a considerable variation in the degree of preferred orientation. The tangential, radial, and cross-sectional structures are distinctly different. The orientations of cellulose may fluctuate considerably in different parts of the same tree and in different layers of the same cell wall, and frequently, in some tracheids, in different lamellae of the same layer as well (*2*).

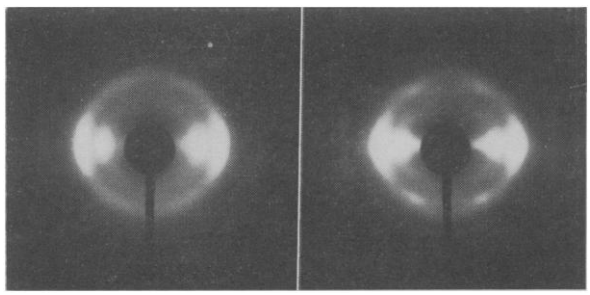

FIG. 1. *Left*—sound sample. *Right*—infected sample.

Bailey and Vestal (*1*), and Bailey and Berkley (*2*) made an interesting observation establishing that in certain ubiquitous fungi enzymatic hydrolysis progresses along the long axes of the fibrils of cellulose, and that the cavities so produced by the fungi are oriented with their long axes parallel to the long axes of the fibrils. It has since been microscopically noted (*4*), following the anatomical methods of Bailey and Vestal, that in chir (*Pinus longifolia*) sapwood infected by *Lenzites striata* there is no constant correlation between the orientation of cellulose and the plane of enzyme action. In the present investigation, small pieces of untreated chir sapwood, both sound and infected by *Lenzites striata* have been sampled from a block of chir sapwood (about 4 in. × 2 in.) and studied by x-rays. Photographs are taken in a cylindrical camera with the x-ray beam normal to the tracheal axis of the tangential section (Fig. 1). As such, the broad central layers of the secondary walls of chir tracheids are prominently exposed to x-rays.

It is evident from the photographs that the patterns, shape, and size of the two spots are not the same. In the case of the sound sample, the spots from the 101 and 10$\bar{1}$ planes are diffuse and tend to merge into one interference ring and they are drawn into a long diffuse arc along the Debye-Scherrer ring. Similarly 002 interference is drawn into a long arc. But in the case of the infected sample, the corresponding spots are sharp and the other spots on the layer ring are also distinct. Consequently, the degree of disorientation of cellulose crystallites from the tracheal axis is much greater in the case of the sound sample of chir wood than that of the infected sample of the same wood, as has also been confirmed by critical microscopic examination of the central layer of secondary wall of chir tracheids. This clearly shows that the cellulose orientation can be changed by means of enzymatic hydrolysis.

Work is in progress to determine the degree of disorientation of the structural units of cellulose from the fiber axis by measuring the distribution of intensities along the length of the 002 spot with chir wood at various stages of decay.

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A Preliminary Note on Naturally Occurring Organic Substances in Sea Water Affecting the Feeding of Oysters[1]

Albert Collier, Sammy Ray, and Wayne Magnitzky[2]

In studying the role of certain industrial wastes in the ecology and physiology of oysters, we have found a significant correlation between the pumping rate of the oyster and a hitherto unreported factor naturally present in minute amounts in sea water. We designate this factor as carbohydrate because it is measured photometrically with the *N*-ethyl-carbazole reagent which can be used quantitatively for estimating minute amounts of carbohydrates.[3] The active agent may be a true carbohydrate, or it may be some other compound which happens to be quantitatively associated with the carbohydrates responding to the test.

The characteristics of the substance as it occurs in the natural sea water supply of this laboratory are as follows: It passes bacteriological filters and is not thrown down by the ordinary laboratory centrifuge. The con-

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[2] Temporary address (all authors): 205 Moulton Building, Pensacola, Florida.

[3] We wish to acknowledge the assistance of Dr. J. Gordon Erdman, of the Mellon Institute, in suggesting the method as well as adapting it to our particular needs.