

2D NMR study on structural alterations of wood cell walls during digestion by a lower termite, *Coptotermes formosanus* Shiraki

by

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Abstract

Termites are effective in degrading wood cell walls. Although degradation of cell wall polysaccharides in the termite digestive system has been extensively studied, lignin degradation by termites remains unclear. We applied modern multi-dimensional NMR techniques to further study cell wall degradation in termite digestive system. Sugi and Buna sapwood samples were fed to workers of *Coptotermes formosanus* Shiraki, and the fecal material subjected to detailed structural analyses using high-resolution 2D NMR as well as a series of wet-chemical analyses. Cell wood residues (CWRs) isolated from the termite fecal material and the original wood sample were comparatively characterized by 2D HSQC NMR using the direct cell wall dissolution/swelling method. The results suggested that lignin signals were much augmented, while polysaccharide signals were considerably depleted in the spectra of the fecal samples, compared to those of the original wood samples. The result was in line with the compositional data obtained by thioglycolic lignin assay and neutral sugar analysis, and collectively suggest that polysaccharides were preferentially decomposed over lignin during digestion by *C. formosanus*. In both the fecal and original wood cell wall spectra, typical lignin aromatic and side-chain signals were still clearly visible, suggesting that lignin decomposition/modification during termite digestion was not drastic. However, it appeared that syringyl lignin signals were slightly depleted over guaiacyl lignin signals in Buna faces compared to original Buna wood samples

Keywords: 2D NMR, wood cell walls, termite digestive system, *Coptotermes formosanus* Shiraki