

Application of ^{13}C NMR to investigate the transformations and biodegradation of organic materials by wood- and soil-feeding termites, and a coprophagous litter-dwelling dipteran larva

Abstract

Solid-state ^{13}C nuclear magnetic resonance spectroscopy has been used to characterize the C in samples of the food (wood), gut contents and faeces from the wood-feeding termite, *Microcerotermes parvus*; soil in the guts and mound material from the soil-feeding termite, *Thoracotermes macrothorax*; and the food and faeces from the litter-feeding, coprophagous larvae of the dipteran fly, *Bibio marci*. Spectra from the wood-feeding termite indicated preferential loss of polysaccharide and accumulation of lignin with some modification to the O-aromatic-C and methoxyl-C (O-methyl-C) components during passage through the gut. Spectra for the soil-feeding termite indicated little change in the distribution of ^{13}C between resonances following passage through the gut, except for some evidence of preferential polysaccharide loss. Interpretation of the spectra from these organisms was restricted by the relatively low C content of the soils and mound material, and by the large contribution to the NMR spectra from the gut tissue rather than the gut contents. Spectra for the litter-feeding dipteran larvae indicated preferential feeding on the polysaccharide-rich component of the litter and then overall loss of polysaccharide-C and accumulation of both aromatic-C and methoxyl-C in the gut. These changes were greater for the second passage than for the first passage through the gut, suggesting that principally mechanical and physical changes occurred initially and that chemical digestion was prevalent during the second passage.