

Abstract

Tomato fruit and potato tubers have an outer layer of protection called a cuticle that is deposited on their cell walls. The cuticle regulates interactions with the environment and serves as the primary barrier protecting the plant from weather, radiation, dehydration, and microbial predators. In potatoes, the suberin-wax polymer blend that comprises these cuticles is an attractive potential source of polyester- inspired bio-plastics. These materials have the potential to replace toxic synthetic polymer linings for cans that are used for long-term storage of vegetables, sauces, and other foods. Using extractive free potato periderm tissues from potato peels, we depolymerized the suberin chemically, dispersed the resulting hydroxy fatty acid monomers in ethanol, sprayed them onto an aluminum foil substrate, and polymerized them at different temperatures and time periods. Then, we acquired high-field solid-state ^{13}C Nuclear Magnetic Resonance (ssNMR) spectra using direct polarization and magic-angle spinning techniques to profile the chemical structures of these amorphous, insoluble bio-plastic materials quantitatively. We compare the ^{13}C ssNMR spectra for polymerized suberin samples produced at 150, 175, or 200 °C and for 15, 30, 45, or 60 minutes. Our Findings indicate a spike in certain suberin markers for polymerization times of 30 and 60 minutes at 200 degrees.