

Tea tree (*Melaleuca alternifolia*) fiber as novel reinforcement material for sugar palm biopolymer based composite films

ABSTRACT

The tea tree (*Melaleuca alternifolia*) is well known for producing essential oil, which is used in medicinal and cosmetic products as a preservative, antiseptic, antibacterial, antifungal, and anti-pest additive. In this study, tea tree residues generated as agro-waste after the tea tree oil extraction process were utilized as cheap fiber material for the reinforcement of sugar palm starch (SPS)-based composite films. The crystallinity and functional groups of tea tree fiber (TTF) were investigated and the effect of TTF loading (0, 1, 3, 5, and 10 wt.%) on the tensile and morphological properties of TTF/SPS composite films were investigated. As the TTF loading increased from 0 to 10 wt.%, the tensile strength and modulus of TTF/SPS composite films were significantly increased, but their elongation at break declined. Optical microscopic and scanning electron microscopic images revealed that the TTF was randomly dispersed in all samples, and there was optimal compatibility between the fiber and matrix. Based on these findings, TTF can be considered as a potential reinforcement material for polymer composite films.

Keyword: Tea tree; *Melaleuca alternifolia*; Natural fibers; Sugar palm starch; Biocomposites