

ABSTRACT

Characteristics of Bioplastics Based on Chitosan (*Penaeus monodon*) and Kraft Lignin Derived from *Acacia mangium*

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Biodegradable plastic or bioplastic is a type of plastic that can decompose or degrade naturally and is made of biopolymers derived from the nature, which are polymers composed of biomass and renewable resources. This study aims to characterize bioplastics made from chitosan and lignin, as well as the use of organic solvents. Bioplastics are made using the casting method and characterized by analyzing the mechanical properties like tensile strength, Young's modulus, and elongation at break, all data were analyzed descriptively. Evaluation on the linkage formation between lignin and chitosan during film preparation was evaluated by FTIR while the thermal properties was assessed by thermogravimetry analysis. The water vapor permeability tests and transparency as well as biodegradability of bioplastics were also carried out. Analysis of the best mechanical properties was found in the treatment using 3% acetic acid solvent, the mechanical properties' of bioplastics shows a tensile strength value of 34.82 MPa, Young's modulus of 18.54 MPa, and elongation at break of 2.74%. Chitosan-lignin bioplastic shows that the interaction between chitosan and lignin affects the intensity of the absorption peak, leading to reduce transparency and increased thermal stability. The chitosan-lignin interaction also influences the crystalline size, making it easier to degrade and more flexible rather than rigid. The contact angle shows the bioplastic's ability to resist water absorption for 4 minutes. In the biodegradation test, the sample began to degrade after 30 days of observation. Bioplastics have the potential to be developed for single use packaging, shopping bags, and agricultural mulch.

Keywords: Bioplastic, chitosan, lignin, acetic acid, *biodegradable*

ABSTRAK

KARAKTERISTIK BIOPLASTIK BERBASIS KITOSAN KULIT UDANG (*Penaeus monodon*) DAN LIGNIN KAYU AKASIA (*Acacia mangium*)

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Salah satu penyebab pencemaran lingkungan adalah banyaknya limbah plastik yang menumpuk dan sulit terurai. Plastik *biodegradable* atau bioplastik adalah jenis plastik yang dapat terurai atau terdegradasi secara alami terbuat dari biopolimer yang bersumber dari alam. Penelitian ini bertujuan mengkarakterisasi bioplastik yang berbahan dasar kitosan dan lignin serta penggunaan pelarut organik. Bioplastik dibuat dengan teknik *casting method* dan dikarakterisasi dengan analisis sifat mekanis bahan (*tensile strength*, *modulus young*, dan *elongation at break*), *Fourier Transform Infra Red* (FTIR), termogravimetri, permeabilitas uap air, spektrofotometer ultra violet visible, X-Ray *diffraction*, sudut kontak, transparansi bioplastik dan biodegradabilitas, keseluruhan data dianalisis secara deskriptif. Analisis sifat mekanis terbaik pada perlakuan dengan penggunaan pelarut asam asetat konsentrasi 3% yang menunjukkan nilai *tensile strength* 34,82 MPa, *modulus young* 18,54 MPa, dan *elongation at break* 2,74%. Bioplastik kitosan-lignin menunjukkan interaksi antara kitosan dan lignin berpengaruh terhadap intensitas puncak gelombang serapan cahaya pada penurunan transparansi dan peningkatan stabilitas termal. Interaksi kitosan-lignin juga mempengaruhi laju kristalisasi membuatnya mudah untuk terurai dan menjadi lebih fleksibel serta tidak kaku. Sudut kontak menunjukkan kemampuan bioplastik untuk menahan serapan air selama 4 menit. Uji biodegradasi, sampel mulai mengalami degradasi setelah 30 hari pengamatan. Bioplastik berpotensi untuk dikembangkan sebagai kemasan produk segar, kantong belanja dan mulsa pertanian.

Kata kunci: Bioplastik, kitosan, lignin, asam asetat, *biodegradable*