

ABSTRAK

FORMULASI FILM BIOKOMPOSIT BERBASIS SELULOSA KULIT KAKAO (*Theobroma cacao L.*) DAN PATI BIJI DURIAN (*Durio zibenthinus Murr*)

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Selulosa kulit kakao memiliki potensi sebagai bahan penguat mekanik namun sifatnya yang kaku perlu dikombinasikan dengan pati untuk meningkatkan fleksibilitas material biokomposit. Penelitian ini bertujuan untuk mengetahui pengaruh formulasi selulosa kulit kakao dan pati biji durian terhadap karakteristik biokomposit serta menentukan komposisi terbaik sesuai standar *Japanese Industrial Standard* (JIS Z 1707). Penelitian dilakukan menggunakan rancangan acak kelompok lengkap (RAKL) faktor tunggal dengan enam variasi perbandingan selulosa dan pati yaitu 0:10, 2:8, 3:7, 5:5, 7:3, dan 8:2 (b/b) dengan tiga ulangan. Parameter yang dianalisis meliputi kuat tarik, ketebalan, persen pemanjangan, laju transmisi uap air (WVTR), modulus elastisitas, warna, dan biodegradabilitas. Data penelitian menunjukkan bahwa variasi komposisi berpengaruh nyata terhadap seluruh parameter. Peningkatan selulosa meningkatkan kekakuan dan modulus tetapi menurunkan fleksibilitas, sedangkan peningkatan pati memberikan efek sebaliknya. Nilai kuat tarik berkisar 0,328–1,548 MPa, ketebalan 0,263–1,409 mm, persen pemanjangan 7,382–110,167%, WVTR 13,656–27,239 g/m²/hari, dan modulus elastisitas 1,372–6,894 MPa. Formulasi terbaik ditunjukkan oleh P4 (5 g selulosa kulit kakao : 5 g pati biji durian) dengan kuat tarik 0,951 MPa, persen pemanjangan 15,840%, dan WVTR 18,557 g/m²/hari (*grade* 3), serta nilai warna ΔE (44,493) dengan karakteristik film lebih gelap L^* (-44,197) dan tingkat biodegradabilitas 63,638% dalam 15 hari yang telah memenuhi standar SNI 7188.7:2016. Perlakuan terbaik (P4) berpotensi diaplikasikan sebagai bahan kemasan sekunder dan kemasan produk pangan kering berkadar air rendah yang tidak memerlukan sifat penghalang uap air yang sangat tinggi.

Kata kunci: biodegradabilitas, biokomposit, pati biji durian, selulosa kulit kakao, sifat mekanik

ABSTRACT

FORMULATION OF BIOCOMPOSITE FILM BASED ON COCOA POD HUSK CELLULOSE (*Theobroma cacao L.*) AND DURIAN SEED STARCH (*Durio zibethinus Murr.*)

By

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Cocoa pod husk cellulose has potential as a mechanical reinforcing agent, but its rigid nature needs to be combined with starch to improve the flexibility of biocomposite materials. This study aimed to determine the effect of cocoa pod husk cellulose and durian seed starch formulations on biocomposite film characteristics and to determine the best composition according to the Japanese Industrial Standard (JIS Z 1707). The study was conducted using a completely randomized block design (RCBD) with a single factor consisting of six variations of cellulose-to-starch ratios, namely 0:10, 2:8, 3:7, 5:5, 7:3, and 8:2 (w/w) with three replications. Parameters analyzed included tensile strength, thickness, elongation at break, water vapor transmission rate (WVTR), modulus of elasticity, color, and biodegradability. The results showed that the variation in composition significantly affected all parameters. Increasing cellulose content increased stiffness and modulus of elasticity but reduced flexibility, while increasing starch content had the opposite effect. Tensile strength ranged from 0.328–1.548 MPa, thickness 0.263–1.409 mm, elongation at break 7.382–110.167%, WVTR 13.656–27.239 g/m²/day, and modulus of elasticity 1.372–6.894 MPa. The best formulation was P4 (5 g cocoa pod husk cellulose : 5 g durian seed starch) with tensile strength of 0.951 MPa, elongation at break of 15.840%, and WVTR of 18.557 g/m²/day (grade 3), as well as a color value of ΔE (44.493) with darker film characteristics L^* (-44.197) and a biodegradability level of 63.638% within 15 days, which has met the SNI 7188.7:2016 standard. The best formulation (P4) has potential to be applied as secondary packaging and packaging for low-moisture dry food products that do not require very high water vapor barrier properties.

Keywords: *biodegradability, biocomposite, cocoa pod husk cellulose, durian seed starch, mechanical properties*