Pembuatan dan karakterisasi edible film berbasis protein ikan lele (clarias batrachus) hasil reaksi enzymatic cross-linking transglutaminase serta pengaruh penambahan nanocrystalline cellulose (NCC) terhadap karakteristik edible film = Production and characterization of catfish (clarias batrachus) protein-based edible film results of enzymatic cross-linking reaction by transglutaminase and the effect of nanocrystalline cellulose (NCC) addition on the characteristics of edible film.

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Abstrak

Keberadaan plastik petroleum menjadi permasalahan karena memiliki dampak lingkungan dengan sifatnya yang non-biodegradable sehingga membutuhkan waktu lama untuk terurai, juga dampak kesehatan dengan adanya potensi mengontaminasi jika berperan sebagai pengemas bahan pangan. Oleh karena itu, diperlukan alternatif pengganti bahan baku plastik petroleum yang lebih bersifat biodegradable dan food-grade untuk meminimalisir terjadinya permasalahan tersebut. Pada penelitian ini dilakukan pembuatan edible film berbasis biokomposit protein ikan lele dengan metode enzymatic cross-linking Transglutaminase serta penambahan Nanokristalin Selulosa (NCC) sebagai material penguat. Penggunaan metode enzymatic cross-linking Transglutaminase dapat meningkatkan sifat mekanik dan fisik dari edible film protein meliputi ketebalan (75-20 m), kelarutan (96,208-20,43%), TS (5,799-10,02 MPa) dan EAB (80-13%) dengan membentuk ikatan cross-linking -(--glutamyl) lysine iso-peptide yang terdeteksi berdasarkan pergeseran pita serapan Amida II (1550-1530 cm-1) dengan analisis FTIR. Namun, mengurangi nilai transparansi dari edible film dimana TG-05 menghasilkan nilai transparansi terendah sebesar 3,27. Formulasi TG-05 digunakan sebagai formulasi awal pembuatan edible film protein dengan penambahan NCC. Edible film protein dengan penambahan 10% mengalami peningkatan pada sifat fisik dan mekanik jika dibandingkan dengan edible film berbasis protein meliputi ketebalan, TS dan EAB, tetapi mengalami penurunan pada kelarutan terhadap air dan transparansi. Sementara edible film protein dengan penambahan 15% memiliki peningkatan pada ketebalan, namun menghasilkan efek terbalik (reversed effect) dengan mengalami penurunan pada sifat mekanik dan fisik meliputi TS dan EAB, serta kelarutan, karena terjadi aglomerasi di beberapa sisi edible film. Analisis FTIR mendeteksi adanya pergeseran panjang gelombang pada edible film berbasis protein dan NCC yang mengindikasi adanya interaksi intermolekular via ikatan hidrogen antara protein dengan NCC pada daerah 3400-3200 cm-1.

......The existence of petroleum plastics is a problem because its non-biodegradable thus it takes a long time to decompose, as well as health effect with a potential to contaminate if it is as a food packaging. Therefore, it needs an alternative to substitute the petroleum plastic’s raw material with biodegradable and food grade material to minimize these problems. In this research, catfish protein-based edible film was made using enzymatic cross-linking method by Transglutaminase enzyme and the addition of Nanocrystalline Cellulose (NCC) as reinforcement. Using enzymatic cross-linking method by Transglutaminase could improve mechanical dan physical properties of protein edible films including thickness (75-20 m), solubility (96,208-20,43%), TS (57,99-10,02 MPa) and EAB (80-13%) by forming cross-linking bond of -(--glutamyl) lysine iso-peptide which was detected based on the wavelength shift in Amide II (1550-1530 cm-1) by FTIR

analysis. However, it reduced the transparancy value of edible film where TG-05 is the lowest value of 3,27. TG-05 formulation was used as the main formulation for protein-based edible film with NCC addition. Protein-based edible film with 10% addition of NCC had an increased in physical and mechanical properties when it compared to protein-based edible film including thickness, TS and EAB, but had an decreased in water solubility and transparency. Meanwhile, 15% addition of NCC had an increased in thickness but it obtained the reversed effect by decreasing TS and water solubility also increasing EAB because the agglomeration which occurred on the several sides of edible film. FTIR analysis detected a wavelength shift on protein-NCC edible film which indicated an intermolecular interaction via hydrogen bonds between proteins and NCC in 3400-3200 cm-1 region.