INTISARI

Plastik merupakan salah satu kebutuhan yang banyak digunakan mulai dari skala rumah tangga hingga industri. Salah satu kegunaan plastik adalah sebagai bahan pengemas makanan. Sayangnya, plastik saat ini banyak menggunakan material sintetis seperti polietilen dan sebagainya yang dapat menimbulkan banyak masalah terhadap lingkungan. *Chitosan*, material yang dikaji pada penelitian ini, diharapkan dapat menggantikan plastik sintetis khususnya sebagai material pengemas makanan. Penambahan *clay* dan gliserol terhadap peningkatan sifat mekanis, termal dan aktivitas antimikroba dikaji pada penelitian ini.

Pada penelitian ini, pembuatan film *chitosan* diawali dengan pembuatan larutan *chitosan/clay*. Sebanyak 2 gram *chitosan* dilarutkan ke dalam 100 ml larutan asam asetat 1%, larutan tersebut diaduk dengan *mechanical stirrer* pada suhu 70˚C selama 24 jam. Suspensi *chitosan/clay* disiapkan dengan cara *clay* dilarutkan ke dalam 100 ml asam asetat 1% dan diaduk pada suhu kamar selama 24 jam. Kandungan *clay* divariasi dari 0,5,10, dan 15% berat. Kedua larutan dicampur dan diaduk selama 24 jam. Larutan tersebut dituangkan ke dalam cetakan akrilik untuk membuat spesimen uji. Film komposit *chitosan*/*clay*/gliserol disiapkan dengan cara mencampurkan gliserol dengan variasi 10,20, dan 30% berat ke dalam larutan asam asetat 1% dan *chitosan*. Larutan tersebut diaduk selama 24 jam pada suhu 70˚C, lalu dicampurkan dengan larutan *clay* dan asam asetat dan diaduk selama 24 jam. Karakter masing-masing film komposit dikaji dengan pengujian tarik dan *water sorption* untuk sifat mekanis¸ *Thermogravimetry Analysis* (TGA) untuk stabilitas termal, uji antimikroba dengan metode difusi padat, serta *X-Ray Diffraction* (XRD) dan *Fourier Transform Infra Red* (FTIR)

Hasil penelitian menunjukan bahwa penambahan *clay* pada film komposit *chitosan*/*clay* meningkatkan kekuatan tarik dan modulus film serta menurunkan regangan dengan perubahan terbesar pada kandungan *clay* 15 wt%. Penambahan gliserol menyebabkan penurunan kekuatan tarik dan modulus serta menaikan regangan pada kandungan gliserol 20 dan 30 wt% tetapi, penambahan sebesar 10 wt% justru meningkatkan modulus serta menurunkan regangan. Penambahan *clay* sebesar 5 wt% menyebabkan stabilitas termal pada film komposit meningkat. Penambahan *clay* sebesar 5 wt% menurunkan daya serap air film komposit *chitosan*/*clay*, sedangkan lebih dari itu justru meningkatkan daya serap air. Penambahan gliserol sebesar 10 dan 20 wt% menurunkan daya serap air, sedangkan penambahan sebesar 30 wt% justru meningkatkan daya serap air. Film komposit dengan kandungan gliserol 20 wt% memiliki daya serap air paling kecil. Film *chitosan* dan komposit *chitosan*/*clay* tidak menunjukan diameter hambatan yang signifikan pada pengujian antimikroba sehingga berpotensi sebagai pilihan alternatif plastik ramah lingkungan.

Kata kunci : *chitosan*, *clay*, film komposit, sifat mekanis, stabilitas termal, daya serap air, aktivitas antimikroba

ABSTRACT

Plastic is one of the essentials which is widely used ranging from households to industrial scale. One of the uses of plastic is as a food packaging material. Unfortunately, plastics nowadays uses synthetic material such as polyethylene etc. as its basic material which can cause many problems to the environment. Chitosan, the material studied in this study, is expected to replace synthetic plastics especially as food packaging materials. The addition of clay and glycerol to the improvement of mechanical, thermal and antimicrobial activity was assessed in this study.

In this study, chitosan composite film was initiated by making chitosan/clay solution. A total of 2 grams of chitosan dissolved into 100 ml of 1% acetic acid solution, the solution was stirred with a mechanical stirrer at 70°C for 24 hours. The chitosan / clay suspension was prepared by clay dissolved into 100 ml of 1% acetic acid and stirred at room temperature for 24 hours. Clay content is varied from 0, 5, 10, and 15% by weight. Both solutions are mixed and stirred for 24 hours. The solution is poured into the acrylic mold to prepare the test specimen. The chitosan/clay/glycerol composite film was prepared by mixing glycerol with variations of 10, 20, and 30% by weight into 1% acetic acid solution and chitosan. The solution was stirred for 24 hours at 70°C, then mixed with clay and acetic acid solution and stirred for 24 hours. The character of each composite film is studied by tensile testing and water sorption for mechanical properties, Thermogravimetry Analysis (TGA) for thermal stability, antimicrobial assay with disc agar diffusion method, as well as X-Ray Diffraction (XRD) and Fourier Transform Infra Red (FTIR)

The results showed that the addition of clay in chitosan/clay composite film increased the tensile strength and film modulus and decreased the strain with the greatest changes occured on clay content of 15 wt%. The addition of glycerol causes a decrease in tensile strength and modulus and raises strain on film with glycerol content of 20 and 30 wt% but, the addition of 10 wt% actually increases the modulus and lowers the strain. The addition of clay at 5 wt% causes the thermal stability of composite film to increase. The addition of clay of 5 wt% decreases the water absorption of chitosan/clay composite film, while more than that, it increases water absorption. The addition of 10 and 20 wt% of glycerol decreased the water absorption, while the addition of 30 wt% actually increased water absorption. Composite films containing 20 wt% of glycerol have the smallest water absorption. Chitosan film and chitosan/clay composite films did not indicate significant barrier diameter in antimicrobial testing, thus potential as an alternative choice of environmentally friendly plastics.

Keywords: chitosan, clay, composite film, mechanical properties, thermal stability, water absorption, antimicrobial activity