

INTISARI

Lidah buaya (*aloe vera*) dan kitosan merupakan bahan polimer alam yang banyak diteliti dewasa ini, di mana kedua bahan tersebut memiliki keunggulan yang banyak digunakan di bidang biomedis, salah satunya diaplikasikan sebagai membran pembalut luka (*wound dressing*). Namun, dari penelitian yang selama ini dilakukan, masih belum ada penelitian tentang pembuatan membran pembalut luka dari penggabungan *aloe vera* dan nanoemulsi kitosan menggunakan elektrospinning. Tujuan dari penelitian ini adalah untuk membuat membran hibrid nanofiber *Aloe vera*/PVA/nanoemulsi kitosan menggunakan elektrospinning dan mengetahui pengaruh konsentrasi larutan spinning *Aloe vera*/PVA/nanoemulsi kitosan terhadap morfologi serta sifat tarik membran *Aloe vera*/PVA/nanoemulsi kitosan.

Larutan spinning *Aloe vera*/PVA/nanoemulsi kitosan dibuat melalui tiga tahap yaitu pembuatan larutan Polivinil Alkohol (PVA) (10% berat), pembuatan matriks *Aloe vera*/PVA (5% w/w) dan penambahan *filler* nanoemulsi kitosan kedalam matriks *Aloe vera*/PVA dengan konsentrasi 0, 3, 10, dan 15% (wt %). Selanjutnya membran hibrid nanofiber *Aloe vera*/PVA/nanoemulsi kitosan difabrikasi dengan metode elektrospinning pada kondisi yang telah dioptimasi, yaitu pada tegangan 15 kV, jarak jarum ke kolektor (TCD) 16,5 cm, dan diameter jarum 0,8 mm. Viskositas larutan spinning diukur dengan viscometer. Morfologi membran dikarakterisasi dengan *scanning electron microscope* (SEM) dan uji tarik membran dilakukan menggunakan *universal testing machine* (Zwick 0,5 Jerman, ASTM D 882).

Hasil penelitian menunjukkan bahwa kenaikan konsentrasi nanoemulsi kitosan dari 0% sampai 15% menurunkan diameter serat (366 nm – 180 nm) dan mempengaruhi struktur serat. Hasil pengujian sifat tarik membran hibrid nanofiber dengan penambahan konsentrasi nanoemulsi kitosan 0, 3, 10, dan 15% pada matriks *Aloe vera*/PVA memiliki nilai kuat tarik antara 2,3 – 5,49 MPa, regangan antara 127,89 – 200,44% dan modulus elastisitas berkisar antara 6,5 – 17,91 MPa. Hasil pengujian sifat tarik membran hibrid nanofiber dengan penambahan konsentrasi kitosan nano-emulsi 0, 3, 10, dan 15% berpotensi digunakan sebagai kandidat bahan pembalut luka (*wound dressing*), karena memiliki nilai kuat tarik, regangan, dan modulus elastisitas yang termasuk dalam standar material medis dengan nilai kuat tarik antara 1 – 24 MPa, nilai regangan (*elongasi*) antara 17 – 207%, dan nilai modulus elastisitas berkisar 2,9 – 54 MPa.

Kata Kunci : *Aloe vera*, kitosan, elektrospinning, nanofiber, sifat tarik, SEM

ABSTRAK

Aloe vera and chitosan are the most widely studied natural polymer materials in the world today, both of which have advantages widely used in the biomedical field, one of which is applied as a wound dressing membrane. However, from the research that has been done, there is still no research on the production of wound dressing membrane from incorporation of aloe vera and chitosan nanoemulsion using electrospinning. The purpose of this research is to make a hybrid membrane of Aloe vera/PVA/chitosan nanoemulsion using electrospinning and to know the effect of Aloe vera/PVA/chitosan nanoemulsion spinning solution on morphology as well as Aloe vera/PVA/chitosan nanoemulsion membrane properties.

Aloe vera/PVA/chitosan nanoemulsion spinning solution was made through three steps: making of Polyvinyl Alcohol (PVA) solution (10% wt), making Aloe vera/PVA (5% ^w/_w) matrix and addition of chitosan nanoemulsion filler into Aloe vera/PVA matrix with concentrations of 0, 3, 10, and 15% (wt%). Furthermore, the hybrid membrane nanofiber Aloe vera/PVA/chitosan nanoemulsion was fabricated by electrospinning method under optimized conditions, ie at 15 kV voltage, 16.5 cm needle to collector distance (TCD) and 0.8 mm needle diameter. The viscosity of the spinning solution was measured by viscometer. Membrane morphology was characterized by scanning electron microscope (SEM) and membrane tensile test was performed using universal testing machine (Zwick 0.5 Germany, ASTM D 882).

The results showed that the increase of chitosan nanoemulsion concentration from 0% to 15% decreased fiber diameter (366 nm - 180 nm) and affected fiber structure. The result of testing of nanofiber hybrid tensile membrane properties with the addition of 0, 3, 10, and 15% chitosan nanoemulsion concentration in Aloe vera / PVA matrix has a tensile strength value between 2.3 MPa - 5.49 MPa, strain between 127.89 - 200 , 44% and elastic modulus ranged from 6.5 to 17.91 MPa. The results of testing of tensile membrane properties of nanofiber hybrids with the addition of nano-emulsion chitosan concentration of 0, 3, 10, and 15% are potential to be used as wound dressing candidates, since they have tensile strength, strain, and elasticity modulus values included in the standard medical materials with a tensile strength value between 1 - 24 MPa, strain values (elongation) between 17-207%, and elasticity modulus value ranges from 2.9 to 54 MPa.

Keywords: Aloe vera, chitosan, electrospinning, nanofiber, SEM, tensile properties.