

ABSTRAK

Mastitis atau peradangan kelenjar ambing pada sapi umumnya disebabkan oleh infeksi bakteri seperti *Staphylococcus aureus* dan *Escherichia coli*. Mastitis menyebabkan penurunan kualitas dan produksi susu. Pengobatan dengan antibiotik menyebabkan resistensi, sehingga perlu dikembangkan obat antibakteri menggunakan bahan alam. Infusa daun sirih (*Piper betle* L.) memiliki aktivitas antibakteri yang dapat dimanfaatkan untuk penanganan mastitis. Formulasi nanopolimer diharapkan dapat meningkatkan stabilitas dan aktivitas antibakteri. Tujuan penelitian ini adalah memformulasikan dan mengevaluasi *spray* nanopolimer infusa daun sirih serta mengetahui aktivitas antibakteri terhadap bakteri *Staphylococcus aureus* dan *Escherichia coli*.

Nanopolimer dibuat dengan metode gelasi ionik menggunakan kitosan dan tripolifosfat. Formula nanopolimer infusa daun sirih yang baik ditetapkan berdasarkan ukuran partikel, indeks polidispersitas dan persen *entrapment efficiency*. Pengujian aktivitas antibakteri dengan metode difusi diperoleh diameter zona hambat. Data dianalisis menggunakan *software* SPSS dengan taraf kepercayaan 95%.

Formula nanopolimer dengan konsentrasi infusa daun sirih 35%, kitosan 0,4% dan tripolifosfat 0,01% memberikan karakteristik nanopolimer yang paling baik, yaitu ukuran partikel $246,9 \pm 3,63$ nm, indeks polidispersitas $0,360 \pm 0,05$ dan *entrapment efficiency* $23,36 \pm 0,72\%$. *Spray* nanopolimer memiliki pH 4,99-5,05, viskositas 17,60-19,73 mPas dan bobot penyemprotan seragam. Formula nanopolimer mempunyai diameter zona hambat lebih baik daripada infusa daun sirih itu sendiri yaitu $7,85 \pm 0,68$ mm terhadap *Staphylococcus aureus* dan $7,44 \pm 0,15$ mm terhadap *Escherichia coli*. Kesimpulannya, infusa daun sirih yang diformulasikan menjadi nanopolimer memiliki aktivitas antibakteri yang termasuk dalam kategori sedang, selanjutnya perlu diteliti kadar hambat dan kadar bunuh minimum.

Kata kunci : Nanopolimer, gelasi ionik, infusa daun sirih (*Piper betle* L.), antibakteri

ABSTRACT

Mastitis or inflammation of mammary gland is generally caused by bacterial infections such as *Staphylococcus aureus* dan *Escherichia coli*. Mastitis causes a decrease of milk's production and quality. Treatment with antibiotics caused resistance, therefore it is necessary to developed antibacterial drugs using natural ingredients. Infusion of betel leaf (*Piper betle* L.) has an antibacterial activity that can be used for the treatment of mastitis. The formulation of nanopolymer is expected to improve stability and antibacterial activity. The aims of this study are to formulate and evaluate the spray nanopolymer of betel leaf infusion and determine the antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* bacteria.

Nanopolymer was made by ionic gelation method using chitosan and tripolyphosphat. The good nanopolymer of betel leaf infusion formulas determined by particle size, polydispersity index and percent of entrapment efficiency. Antibacterial activity testing with the diffusion method obtained inhibition zone diameters. The results analyzed using SPSS software with a confidence level of 95%.

The nanopolymer formula with 35% infusion of betel leaf, 0.4% chitosan and 0.01% tripolyphosphat gave the best nanopolymer characteristics, namely particle size 246.9 ± 3.63 nm, polidispersity index 0.360 ± 0.05 and entrapment efficiency $23.36 \pm 0.72\%$. The spray nanopolymer has a pH of 4.99-5.05, viscosity 17,60-19,73 mPas and the equal amount of spraying weights. The nanopolymer formula gave a better inhibition zone diameter than the betel leaf infusion itself, which are 7.85 ± 0.68 mm against *Staphylococcus aureus* and 7.44 ± 0.15 mm against *Escherichia coli*. Finally, the betel leaf infusion formulated into nanopolymers has an antibacterial activity which is included in the medium category, then it is necessary to examine the minimum inhibitory and minimum bactericidal concentration.

Keywords: Nanopolymer, ionic gelation, infusion of betel leaf (*Piper betle* L.), antibacterial