

**KAJIAN POTENSI ENKAPSULASI MINYAK ATSIRI DAUN SIRIH HIJAU
DENGAN BIOPOLIMER KITOSAN SEBAGAI ANTIBAKTERI
TERHADAP *Escherichia coli* PENYEBAB MASTITIS KAMBING PERAH**

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INTISARI

Mastitis pada kambing perah yang disebabkan oleh bakteri *Escherichia coli* (*E. coli*) merupakan salah satu penyakit yang dapat menurunkan kualitas susu. Pengobatan mastitis umumnya menggunakan antibiotik, namun penggunaan yang tidak tepat dapat memicu resistensi bakteri serta meningkatkan risiko *food poisoning* akibat residu antibiotik dalam susu. Minyak atsiri daun sirih hijau (*Piper betle* L.) diketahui memiliki sifat antibakteri yang baik, namun kestabilannya dalam larutan menjadi kendala karena sifatnya yang volatil dan mudah terdegradasi. Penyusunan Tugas Akhir ini bertujuan untuk mengetahui efektivitas antibakteri dari minyak atsiri daun sirih hijau yang telah dienkapsulasi dengan kitosan terhadap bakteri *E. coli* penyebab mastitis pada kambing perah. Proses enkapsulasi dilakukan dengan metode emulsifikasi. Karakterisasi hasil enkapsulasi meliputi pengukuran pH, pengujian aktivitas antibakteri, dan komposisi senyawa aktif dari Minyak Atsiri-Kitosan 15% (MAK15%) dengan *Gas Chromatography-Mass Spectrometry* (GC-MS). Pengujian aktivitas antibakteri MAK15% dilakukan dengan metode kombinasi *disc diffusion* dengan *agar well diffusion* dan metode *minimum inhibitory concentration* (MIC) serta *minimum bactericidal concentration* (MBC). Hasil pengujian MAK15% menunjukkan nilai pH 3,64 (asam); selain itu MAK15% memiliki efektivitas antibakteri terhadap *E. coli* dengan diameter rata-rata zona hambat 11,75 mm dan kontrol positif *neomycin* 16 mm. Formulasi MAK mampu menghambat dan membunuh *E. coli* pada konsentrasi 3,75% berdasarkan nilai MIC dan MBC. Hasil analisis MAK15% dengan GC-MS menunjukkan bahwa terdapat 13 senyawa aktif yang memiliki sifat antibakteri. Enkapsulasi MAK15% memiliki aktivitas antibakteri yang efektif terhadap *E. coli* penyebab mastitis pada kambing perah, sehingga berpotensi digunakan sebagai alternatif antibakteri alami untuk pencegahan dan pengobatan mastitis.

Kata kunci: bakteri Gram negatif, infeksi ambing, keamanan pangan, teknik penyalutan, terapi alternatif

**EXAMINATION OF THE POTENTIAL OF GREEN BETEL LEAVES-
ESSENTIAL OIL ENCAPSULATED WITH CHITOSAN AS
ANTIBACTERIA AGENT AGAINST *Escherichia coli* CAUSING DAIRY
GOAT MASTITIS**

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ABSTRACT

Mastitis, a disease that reduces dairy goat milk quality, is caused by *Escherichia coli* (*E. coli*). In general, mastitis treatment involves antibiotics, but inappropriate use of it can lead to bacterial resistance and increase the risk of food poisoning due to antibiotic residues in milk. Green betel leaf essential oil (*Piper betle* L.) is known to possess good antibacterial properties; however, its instability in solution is a challenge since its volatile nature and susceptibility to degradation. The purpose of this final project is to evaluate the antibacterial effectiveness of essential oil extracted from green betel leaves, encapsulated with chitosan, against *E. coli*, a causative agent of mastitis in dairy goats. The encapsulation process was carried out by emulsification method. Afterward, the characterization of encapsulation was analyzed by detecting the particle shapes, pH measurement, antibacterial activity assay, and composition of active compounds from essential oil-chitosan 15% (MAK15%) by Gas Chromatography-Mass Spectrometry (GC-MS). The antibacterial activity assay was carried out using a combination of disc diffusion with agar well diffusion and minimum inhibitory concentration (MIC)-minimum bactericidal concentration (MBC) methods to determine the minimum concentration. The result demonstrated that MAK15% showed acid condition (pH 3.64) and exhibited antibacterial efficacy against *E. coli*, with an average diameter of the inhibition zone measuring 11.75 mm. In comparison, the positive control, neomycin, demonstrated an average diameter of 16 mm. The MAK15% formulation was capable of inhibiting and eradicating *E. coli* at a concentration of 3.75%, as determined by MIC and MBC values. The results of MAK15% analysis by GC-MS showed that there were 13 active compounds that had antibacterial properties. The encapsulation of MAK15% exhibits effective antibacterial activity against *E. coli*, the causative agent of mastitis in dairy goats, making it a potential natural antibacterial alternative for the prevention and treatment of mastitis.

Keywords : alternative therapy, coating technique, food safety, Gram-negative bacteria, udder infection