

PENGARUH PENAMBAHAN NANOENKAPSULASI EKSTRAK DAUN
KETAPANG DALAM AIR MINUM TERHADAP KINERJA PERTUMBUHAN,
POPULASI MIKROBA DAN HISTOMORFOLOGI
USUS HALUS AYAM BROILER

INTISARI

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Penelitian ini bertujuan untuk mengetahui karakteristik dari nanoenkapsulasi ekstrak daun ketapang (NEEDK) serta pengaruh penambahan NEEDK dalam air minum terhadap kinerja pertumbuhan, populasi mikroba, dan histomorfologi usus halus ayam broiler. Materi yang digunakan dalam penelitian ini adalah 192 ekor DOC ayam broiler jantan yang dipelihara pada kandang *closed house*. Metode yang digunakan tersusun dari 6 perlakuan dan 4 ulangan, masing-masing ulangan berisikan 8 ekor ayam. Perlakuan terdiri dari air minum tanpa aditif pakan (P0; kontrol negatif), air minum + antibiotik *Tetracycline* 50ppm (P1; kontrol positif), air minum + 15ml/l ekstrak daun ketapang (P2), air minum + 30ml/l ekstrak daun ketapang (P3), air minum + 15ml/l NEEDK (P4), dan air minum + 30ml/l NEEDK (P5). Ransum basal yang diberikan disusun berbasis jagung-bungkil kedelai dengan kandungan protein kasar 22,09%, energi termetabolis 3155,05 kcal/kg, Kalsium 1,10%, dan Fosfor tersedia (Pav) 0,67%. Parameter yang diamati berupa karakteristik NEEDK (ukuran, potensial zeta, dan morfologi), daya hambat bakteri, kinerja pertumbuhan (konsumsi pakan, konversi pakan, pertambahan bobot badan, persentase karkas, konsumsi air minum, dan konsumsi air minum dengan pakan), populasi mikroba usus halus (bakteri asam laktat dan *Salmonella* sp.), dan histomorfologi usus halus (tinggi vili, lebar vili, kedalaman kriptas, dan rasio tinggi vili dengan kedalaman kriptas). Seluruh data yang diperoleh dianalisis statistik menggunakan rancangan acak lengkap pola searah. Data yang memiliki perbedaan yang nyata dianalisis lanjut menggunakan kontras ortogonal. Hasil penelitian menunjukkan bahwa perbandingan formulasi optimum antara ekstrak daun ketapang: kitosan: STPP adalah 1: 5: 1/60 dengan karakteristik NEEDK memiliki ukuran partikel 77,2 nm, polidispersi indeks (PI) 0,417, dan nilai potensial zeta +44,8 mV. NEEDK memiliki aktivitas antibakteri secara *in-vitro* terhadap *Escherichia coli*, *Salmonella typhimurium*, dan *Lactobacillus acidophilus*. Penambahan NEEDK dalam air minum tidak memberikan pengaruh terhadap kinerja pertumbuhan namun dapat menurunkan populasi bakteri *Salmonella* sp. ($P < 0,01$), meningkatkan populasi BAL ($P < 0,01$), tinggi vili ($P < 0,01$), dan rasio tinggi vili dengan kedalaman kriptas ($P < 0,05$). Dapat disimpulkan bahwa penambahan NEEDK dalam air minum dapat menurunkan populasi bakteri patogen dan meningkatkan populasi yang bermanfaat, serta dapat memperbaiki histomorfologi usus halus, sehingga berpotensi untuk digunakan sebagai pengganti antibiotik pada ayam broiler.

Kata kunci: Ayam broiler, Histomorfologi usus halus, Kinerja pertumbuhan, Mikroba usus halus, Nanoenkapsulasi ekstrak daun ketapang

EFFECTS OF NANOENCAPSULATED *Terminalia catappa* LEAF EXTRACT SUPPLEMENTATION IN DRINKING WATER ON GROWTH PERFORMANCE, MICROBIAL POPULATIONS, AND HISTOMORPHOLOGY OF SMALL INTESTINE IN BROILER CHICKENS

ABSTRACT

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This study was aimed to determine the characteristics of nanoencapsulated *Terminalia catappa* leaf extract (NETLE) and the effects of NETLE supplementation in drinking water on the growth performance, microbial populations and histomorphology of jejunal broiler chickens. Materials used in this study were 192 male DOC broiler chickens that distributed into 6 treatments with 4 replications, and 8 birds in each replicate pen. The treatments were consisted of drinking water only without feed additive (P0; negative control), drinking water + 50ppm tetracycline (P1; positive control), drinking water + 15ml/l *Terminalia catappa* leaf extract (P2), drinking water + 30ml/l *Terminalia catappa* leaf extract (P3), drinking water + 15ml/l NETLE (P4), and drinking water + 30ml/l NETLE (P5). Basal diet was based on yellow corn and soybean meal that contained 22.09% crude protein, 3155.05 kcal/kg metabolizable energy, 1.10% Calcium, and 0.67% available phosphorus. Diets and drinking water were supplied for *ad libitum* consumption. Parameters observed in current study were characteristics of NETLE (size, zeta potential, and morphology), bacterial inhibition, growth performance (feed consumption, feed conversion, body weight gain, carcass percentage, drinking water consumption, and drinking water to feed consumption ratio), intestinal microbial population (lactic acid bacteria and *Salmonella* sp.), and intestinal histomorphology (villus height, villus width, crypt depth, and villus height to crypt depth ratio). Data were analyzed using analysis of variance in a completely randomized design. Data that had significant differences were further analyzed using orthogonal contrast. Results showed that the optimum formulation ratio between *Terminalia catappa* leaf extract: chitosan: STPP was 1: 5: 1/60 with the characteristics of the NETLE having particle size 77.2 nm, polydispersion index (PI) 0.417, and zeta potential value +44.8 mV. NETLE has in-vitro antibacterial activity against *Escherichia coli*, *Salmonella typhimurium*, and *Lactobacillus acidophilus*. Supplementation of NETLE in drinking water did not affect growth performance but reduced *Salmonella* sp. ($P < 0.01$), increased LAB population ($P < 0.01$), villus height ($P < 0.01$), and villus height to crypt depth ratio ($P < 0.05$). It can be concluded that the use of NETLE in drinking water inhibited the population of pathogenic microbe and stimulated the population of LAB, as well as improved the intestinal histomorphology, and therefore has the potency as alternative for antibiotics in broiler chickens.

Key words: Broiler chicken, Growth performance, Intestinal microbial population, Intestinal histomorphology, Nanoencapsulation of *Terminalia catappa* leaf extract