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**Pengaruh Penambahan Tepung Duckweed Terfermentasi Terhadap Asam Lemak Rantai Pendek, Ekspresi Gen
Barrier Function dan Produktivitas Ayam Broiler**
Salma Dani Hidayati, Ir. Muhlisin, S.Pt., M.Agri, Ph.D., IPP; Prof. Dr. Ir. Chusnul Hanim, M.Si., IPM., ASEAN Eng.
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PENGARUH PENAMBAHAN TEPUNG *DUCKWEED* TERFERMENTASI TERHADAP ASAM LEMAK RANTAI PENDEK, EKSPRESI GEN *BARRIER FUNCTION* DAN PRODUKTIVITAS AYAM BROILER

INTISARI

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Spirodela polyrhiza merupakan salah satu spesies *duckweed* yang memiliki kandungan protein tinggi serta polisakarida yang berpotensi berperan sebagai prebiotik. Fermentasi menggunakan *Lactobacillus plantarum* dan *Bacillus subtilis* diduga mampu meningkatkan kualitas nutrisi dan ketersediaan substrat fermentabel sehingga mendukung kesehatan usus dan produktivitas ayam broiler. Penelitian ini bertujuan untuk mengevaluasi pengaruh penambahan tepung *Spirodela polyrhiza* terfermentasi (DWF) dalam ransum terhadap produksi asam lemak rantai pendek (*short-chain fatty acids*/SCFA), fungsi *barrier* usus, dan produktivitas ayam broiler. Sebanyak 192 ekor ayam broiler strain Ross dipelihara selama 33 hari dan dialokasikan secara acak ke dalam tiga perlakuan, yaitu ransum basal tanpa DWF, penambahan DWF 2,5%, dan DWF 5%. Setiap perlakuan terdiri atas delapan ulangan dengan delapan ekor ayam per ulangan. Parameter yang diamati meliputi konsentrasi SCFA sekum, ekspresi gen ZO-1, TNF-α, IL-18, dan IL-10, serta produktivitas ayam broiler. Hasil penelitian menunjukkan bahwa penambahan DWF meningkatkan ($P<0,05$) konsentrasi asetat, propionat, butirat, dan total SCFA di sekum, dengan perlakuan DWF 2,5% menghasilkan konsentrasi tertinggi. Penambahan DWF juga meningkatkan ($P<0,05$) ekspresi gen yang mengkode protein *tight junction* ZO-1 dan protein sitokin antiinflamasi IL-10, serta menurunkan ($P<0,05$) ekspresi gen yang mengkode protein sitokin proinflamasi TNF-α dan IL-18. Selain itu, suplementasi DWF meningkatkan ($P<0,05$) bobot badan akhir, pertambahan bobot badan, *average daily gain* (ADG), dan indeks performa, serta memperbaiki nilai *feed conversion ratio* (FCR), dengan respons terbaik diperoleh pada penambahan DWF 2,5%. Berdasarkan data penelitian, dapat disimpulkan bahwa penambahan tepung *Spirodela polyrhiza* terfermentasi sebesar 2,5% dalam ransum merupakan level suplementasi yang optimal untuk meningkatkan produksi SCFA, memperbaiki fungsi *barrier* usus, dan meningkatkan produktivitas ayam broiler.

Kata kunci: Ayam broiler, *Barrier function* usus, *Duckweed* terfermentasi, Produktivitas, SCFA

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EFFECTS OF FERMENTED DUCKWEED MEAL ON SHORT-CHAIN FATTY ACIDS, INTESTINAL BARRIER FUNCTION GENE EXPRESSION, AND GROWTH PERFORMANCE OF BROILER CHICKENS

ABSTRACT

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Spirodela polyrhiza is a *duckweed* species characterized by its high protein content and polysaccharides with potential prebiotic properties. Fermentation using *Lactobacillus plantarum* and *Bacillus subtilis* is expected to improve its nutritional quality and increase the availability of fermentable substrates, thereby promoting intestinal health and broiler productivity. This study aimed to evaluate the effects of dietary supplementation with fermented *Spirodela polyrhiza* meal (DWF) on short-chain fatty acid (SCFA) production, intestinal barrier function, and broiler productivity. A total of 192 Ross broiler chicks were reared for 33 days and randomly assigned to three dietary treatments: a basal diet without DWF, a basal diet supplemented with 2.5% DWF, and a basal diet supplemented with 5% DWF. Each treatment consisted of eight replicates with eight birds per replicate. The parameters evaluated included cecal SCFA concentrations, the expression of genes encoding the tight junction protein zonula occludens-1 (ZO-1), the pro-inflammatory cytokines tumor necrosis factor-alpha (TNF-α) and interleukin-18 (IL-18), the anti-inflammatory cytokine interleukin-10 (IL-10), and broiler productivity. The results showed that DWF supplementation increased ($P<0.05$) cecal acetate, propionate, butyrate, and total SCFA concentrations, with the 2.5% DWF treatment producing the highest concentrations. Dietary DWF supplementation also increased ($P<0.05$) the expression of genes encoding the tight junction protein ZO-1 and the anti-inflammatory cytokine IL-10, while decreasing ($P<0.05$) the expression of genes encoding the pro-inflammatory cytokines TNF-α and IL-18. Furthermore, DWF supplementation significantly improved ($P<0.05$) final body weight, body weight gain, average daily gain (ADG), and performance index, while reducing the feed conversion ratio (FCR), with the most favorable responses observed in the DWF 2,5% group. In conclusion, dietary supplementation with 2.5% fermented *Spirodela polyrhiza* meal represents the optimal inclusion level for enhancing SCFA production, improving intestinal barrier function, and increasing broiler productivity.

Keywords**:** Broiler chickens, Intestinal barrier function, Fermented *duckweed*, Productivity, Short-chain fatty acids (SCFAs)