

OPTIMIZATION PHYTASE PRODUCTION BY PHYTATE DEGRADING BACTERIA ISOLATE FROM POULTRY FARM SOIL

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ABSTRACT

The aim of the research was to determine optimum conditions for phytase production by phytate degrading bacteria isolated from poultry farm soil. The research was conducted in three steps; selection of phytate-degrading bacteria isolate, identification of isolate, and optimization of phytase production which consisted of temperature, pH, and substrate concentration adjustment. Selection of bacteria were using phytase screening medium with sodium phytate as substrate. Isolate with hydrolysis efficiency above 50% and the highest phytase activity was selected for optimization. Identification of isolate was carried out by Gram staining and biochemical test. Optimization of phytase production were carried out on temperature variation (27, 32, 37, 40, and 45°C), on pH variation (5, 5.5, 6, 6.5, 7, 7.5, and 8) and on substrate concentration variation (0.1, 0.2, 0.3, 0.4, 0.5, and 0.6%). Crude enzyme from each optimization were measured for phytase activity. The collected data were analyzed using one way ANOVA. If there were significant difference on each parameter, Duncan's New Multiple Range Test (DMRT) was tested. The results showed that C8 isolate had the highest hydrolysis efficiency and phytase activity compared to other seven isolates. Biochemical test results showed that C8 isolate was *Enterobacter cloacae* which had rod shaped and was Gram negative bacteria. Temperature, pH, and substrate concentration showed significant difference on phytase production ($P < 0,01$). The highest phytase activity of C8 isolate was at temperature of 37°C, pH of 5.5, and substrate concentration of 0.4%, resulting activity of 7.26 U/ml, 10.84 U/ml, and 6.62 U/ml, respectively. To conclude, optimum conditions of phytase production by *Enterobacter cloacae* was at 37°C, pH 5.5, and substrate concentration 0.4%.

Key word: phyate degrading bacteria, phytase, phytate, production optimization, *Enterobacter cloacae*

OPTIMASI PRODUKSI ENZIM FITASE OLEH ISOLAT BAKTERI PENDEGRADASI FITAT DARI TANAH DI SEKITAR PETERNAKAN AYAM

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INTISARI

Penelitian ini bertujuan untuk mengetahui kondisi optimum untuk produksi enzim fitase oleh bakteri pendegradasi fitat yang diisolasi dari tanah di sekitar peternakan ayam. Penelitian terdiri dari 3 tahap yaitu seleksi isolat bakteri pendegradasi fitat, identifikasi isolat, dan optimasi produksi fitase yang terdiri dari pengaturan suhu, pH, dan konsentrasi substrat. Bakteri diisolasi dan diskriminasi dengan menggunakan medium *phytase screening medium* dengan substrat natrium fitat. Isolat dengan efisiensi hidrolisis diatas 50% dan aktivitas fitase tertinggi dipilih untuk dioptimasi. Identifikasi isolat dilakukan dengan pengecatan Gram dan uji biokimia. Optimasi produksi fitase dilakukan pada variasi suhu (27, 32, 37, 40, dan 45°C), variasi pH (5; 5,5; 6; 6,5; 7; 7,5; dan 8), dan variasi konsentrasi substrat (0,1; 0,2; 0,3; 0,4; 0,5; dan 0,6%). Ekstrak enzim kasar dari setiap optimasi diuji aktivitas fitase. Data dianalisis dengan menggunakan metode analisis variansi Rancangan Acak Lengkap pola searah. Apabila terdapat parameter yang berbeda nyata karena perlakuan, dilakukan uji *Duncan's New Multiple Range Test* (DMRT). Hasil penelitian menunjukkan bahwa isolat C8 memiliki nilai efisiensi dan aktivitas fitase tertinggi dibandingkan 7 isolat lainnya. Hasil uji biokimia menunjukkan bahwa isolat C8 adalah *Enterobacter cloacae* yang termasuk bakteri Gram negatif berbentuk batang. Suhu, pH, dan konsentrasi substrat berpengaruh pada produksi enzim fitase ($P < 0,01$). Aktivitas fitase isolat C8 tertinggi pada suhu 37°C, pH 5,5, dan konsentrasi substrat 0,4% sebesar 7,26 U/ml, 10,84 U/ml, dan 6,62 U/ml secara berturut-turut. Kesimpulan dari penelitian adalah kondisi optimum produksi fitase oleh *Enterobacter cloacae* pada suhu 37°C, pH 5,5, dan konsentrasi substrat 0,4%.

Kata kunci : Bakteri Pendegradasi Fitat, Fitase, Asam Fitat, Optimasi Produksi, *Enterobacter cloacae*