

ABSTRAK

Amilase merupakan enzim dengan aplikasi luas di berbagai bidang industri. Amilase dapat diekstraksi dari hewan, tumbuhan, dan mikroorganisme. Bakteri amilolitik dari saluran pencernaan hewan detritivor juga dapat menghasilkan amilase. Laboratorium Mikrobiologi Fakultas Biologi Universitas Jenderal Soedirman memiliki koleksi bakteri endosimbion dari bagian pencernaan kecoak Amerika. Uji kualitatif menunjukkan 10 isolat memiliki kemampuan amilolitik, namun kemampuan hidrolitik kuantitatif dan aktivitas optimum pada berbagai suhu belum diketahui. Penelitian ini bertujuan menganalisis pengaruh jenis isolat bakteri, variasi suhu inkubasi, serta interaksinya terhadap aktivitas amilase, dan mengetahui identitas isolat bakteri amilolitik tersebut.

Penelitian ini menggunakan Rancangan Acak Lengkap (RAL) pola faktorial dengan dua faktor, yaitu isolat bakteri dan suhu. Faktor pertama terdiri atas empat taraf (isolat bakteri terpilih 1, isolat bakteri terpilih 2, kontrol positif, dan kontrol negatif) dan faktor kedua terdiri dari tiga taraf (40°C, 45°C, dan 50°C). Kontrol negatif berupa supernatan medium *Starch Broth* tanpa inokulum, sedangkan kontrol positif menggunakan ekstrak kasar amilase dari *Bacillus subtilis*. Setiap perlakuan diulang tiga kali, menghasilkan 36 unit percobaan. Kemampuan amilolitik isolat bakteri dari pencernaan kecoak Amerika diskriminasi pada medium *Starch Agar*. Isolat bakteri yang mampu menghasilkan zona bening pada tiga suhu pengujian (40°C, 45°C, dan 50°C) diukur aktivitasnya secara kuantitatif dan dikarakterisasi secara konvensional. Aktivitas amilase diukur melalui penentuan absorbansi dengan metode DNS pada variasi suhu berbeda. Parameter utama yang diamati adalah unit aktivitas amilase, sedangkan parameter pendukung meliputi indeks amilolitik dan karakteristik bakteri. Data dianalisis menggunakan ANOVA pada tingkat kepercayaan 95%. Hasil menunjukkan bahwa perlakuan berpengaruh nyata sehingga dilanjutkan dengan uji *Duncan's Multiple Range Test* (DMRT). Karakterisasi isolat bakteri merujuk pada *Bergey's Manual of Determinative Bacteriology Ninth Edition*.

Hasil penelitian menunjukkan bahwa sebanyak dua isolat bakteri asal pencernaan kecoak dengan kode ACU 16 C dan ACU 25 B menunjukkan kemampuan amilolitik pada suhu 40, 45, dan 50°C. Secara kualitatif, nilai indeks amilolitik isolat ACU 16 C berkisar antara 20,0-23,8 dan isolat ACU 25 B berkisar antara 24,8-26,0. Secara kuantitatif, nilai aktivitas amilolitik isolat ACU 16 C berkisar antara 0,312-0,446 U/mL dan isolat ACU 25 B berkisar antara 0,324-0,434 U/mL. Aktivitas amilase isolat ACU 16 C dan ACU 25 B optimum pada suhu 50°C, dengan nilai aktivitas masing-masing 0,446 U/mL dan 0,434 U/mL. Isolat bakteri amilolitik ACU 16 C teridentifikasi sebagai anggota genus *Bacillus* dan isolat bakteri ACU 25 B teridentifikasi sebagai anggota genus *Staphylococcus*.

Kata kunci: amilase, bakteri amilolitik, kecoak, pencernaan, suhu

ABSTRACT

Amylase is an enzyme with wide application in various industrial fields. Amylase can be extracted from animals, plants, and microorganisms. Amylase can be produced by amylolytic bacteria from the digestive tract of detritivor animals. The Microbiology Laboratory of the Faculty of Biology, Universitas Jenderal Soedirman has a collection of endosymbiont bacteria isolated from the digestive tract of American cockroaches. Qualitative tests showed that 10 isolates had amylolytic ability, but quantitative degradation ability and optimum activity at various temperatures are not yet known. This study aims to determine the effect of bacterial isolates, incubation temperatures, and their interaction on amylase activity, and determine the identity of amylolytic bacterial isolates.

The research used a completely randomized design (CRD) factorial pattern with two factors, bacterial isolates and temperatures. The first factor consisted of four levels (selected bacterial isolate 1, selected bacterial isolate 2, positive control, and negative control) and the second factor consisted of three levels (40°C, 45°C, and 50°C). The negative control in this test used the supernatant of Starch Broth medium without inoculum, while the positive control used crude amylase extract from *Bacillus subtilis*. Each treatment was repeated three times so that there were 36 experimental units. The amylolytic ability of bacterial isolates from the digestion of American cockroaches was screened on Starch Agar medium. Bacterial isolates that were able to produce clear zones at three test temperatures (40°C, 45°C, and 50°C) were quantitatively measured for their activity and characterized conventionally. Amylase activity was measured through absorbance illumination with DNS method at different temperature variations. The main parameter observed was amylase activity unit, while supporting parameters included amylolytic index and bacterial characteristics. Data were analyzed using ANOVA at 95% confidence level. The result showed that the treatment had a significant effect, so it was continued with Duncan's Multiple Range Test (DMRT). Characterization of bacterial isolates refers to Bergey's Manual of Determinative Bacteriology Ninth Edition.

The results indicate that of two bacterial isolates from cockroach digestion, ACU 16 C and ACU 25 B, showed amylolytic ability at 40, 45, and 50°C. Qualitatively, the amylolytic index value of isolate ACU 16 C ranged from 20.0-23.8 and isolate ACU 25 B ranged from 24.8-26.0. Quantitatively, the amylolytic activity values of ACU 16 C ranged from 0.312-0.446 U/mL and ACU 25 B ranged from 0.324-0.434 U/mL. The activity of isolates ACU 16 C and ACU 25 B was optimum at 50°C, with activity values of 0.446 U/mL and 0.434 U/mL, respectively. Amylolytic bacterial isolate ACU 16 C was identified as a member of the *Bacillus* genus and bacterial isolate ACU 25 B was identified as a member of the *Staphylococcus* genus.

Keywords: amylase, amylolytic bacteria, cockroaches, digestion, temperature