

**ISOLASI, SKRINING, DAN KARAKTERISASI PARSIAL BAKTERI
TERMOFILIK PENGHASIL PROTEASE NETRAL DARI SUMBER AIR
PANAS PARIANGAN KABUPATEN TANAH DATAR**

SKRIPSI SARJANA BIOLOGI

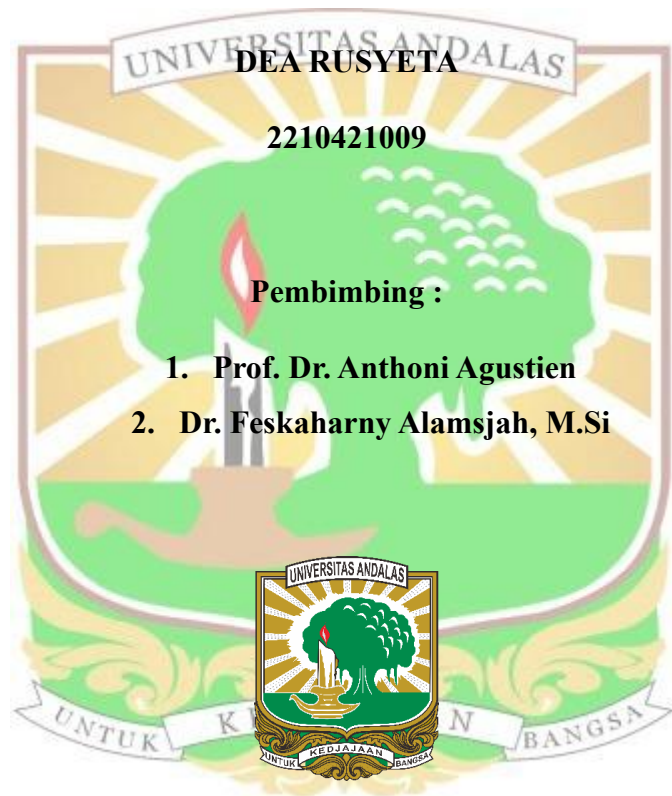
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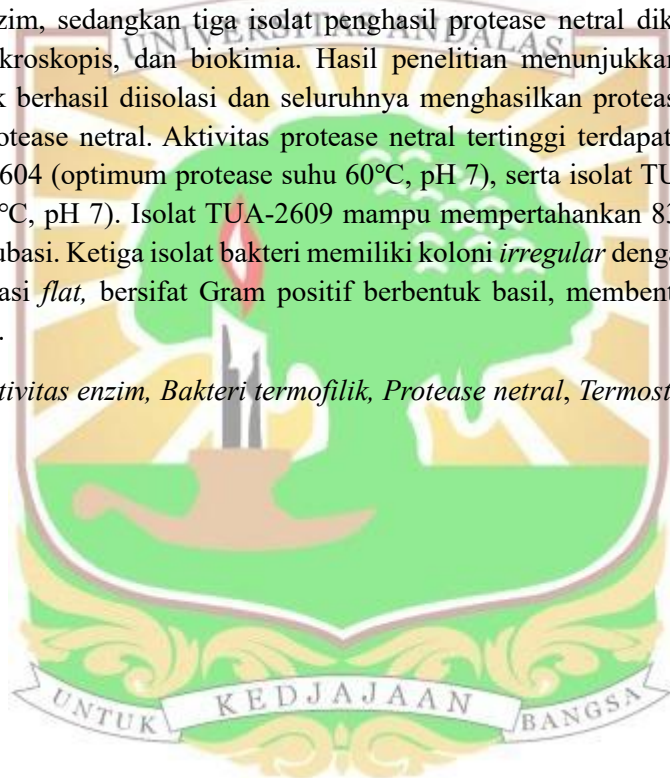
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ABSTRAK

Enzim merupakan produk bioteknologi penting yang banyak dimanfaatkan di berbagai industri, namun Indonesia masih bergantung pada enzim impor. Protease netral termostabil merupakan enzim yang banyak dibutuhkan dan dapat dihasilkan oleh bakteri termofilik. Penelitian ini bertujuan mengisolasi bakteri termofilik penghasil protease netral dari sumber air panas Pariangan, Kabupaten Tanah Datar (48–50°C; pH 7,32–8,02). Bakteri diisolasi dari tiga titik pengambilan sampel menggunakan metode survei dengan teknik purposive sampling, kemudian diseleksi, diuji aktivitas proteasenya, dan dioptimasi pada berbagai suhu dan pH menggunakan Rancangan Acak Lengkap. Data dianalisis dengan ANOVA dan DMRT 5%. Isolat dengan aktivitas protease netral tertinggi digunakan untuk analisis profil pertumbuhan dan stabilitas enzim, sedangkan tiga isolat penghasil protease netral dikarakterisasi secara makroskopis, mikroskopis, dan biokimia. Hasil penelitian menunjukkan bahwa 13 isolat bakteri termofilik berhasil diisolasi dan seluruhnya menghasilkan protease, dengan 9 isolat menghasilkan protease netral. Aktivitas protease netral tertinggi terdapat pada isolat TUA-2609 dan TUA-2604 (optimum protease suhu 60°C, pH 7), serta isolat TUA-2608 (optimum protease suhu 50°C, pH 7). Isolat TUA-2609 mampu mempertahankan 83% aktivitas relatif setelah 9 jam inkubasi. Ketiga isolat bakteri memiliki koloni *irregular* dengan margin *undulate* atau *lobate*, elevasi *flat*, bersifat Gram positif berbentuk basil, membentuk spora, katalase positif, dan motil.

Kata Kunci : *Aktivitas enzim, Bakteri termofilik, Protease netral, Termostabil*



ABSTRACT

Enzymes are important biotechnological products that are widely used in various industries; however, Indonesia still depends on imported enzymes. Thermostable neutral protease is one of the most widely required industrial enzymes and can be produced by thermophilic bacteria. This study aimed to isolate thermophilic bacteria producing neutral protease from the Pariangan hot spring, Tanah Datar Regency (48–50°C; pH 7.32–8.02). Bacterial isolates were obtained from three sampling sites using a survey method with purposive sampling, followed by screening, protease activity assays, and optimization under different temperature and pH conditions using a Completely Randomized Design (CRD). The data were analyzed using analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) at a 5% significance level. The isolate with the highest neutral protease activity was further evaluated for bacterial growth profile and enzyme stability, while the three neutral protease-producing isolates were characterized based on their macroscopic, microscopic, and biochemical properties. The results showed that 13 thermophilic bacterial isolates were successfully obtained from the Pariangan hot spring, all of which produced protease, while nine isolates produced neutral protease. The highest neutral protease activity was observed in isolates TUA-2609 and TUA-2604, with optimum activity at 60°C and pH 7, and in isolate TUA-2608, with optimum activity at 50°C and pH 7. Isolate TUA-2609 retained 83% of its relative protease activity after 9 hours of incubation. The three bacterial isolates formed irregular colonies with undulate or lobate margins and flat elevation, and were characterized as Gram-positive, rod-shaped, spore-forming, catalase-positive, and motile bacteria.

Keywords: *Enzyme activity, Thermophilic bacteria, Neutral protease, Thermostable*

