

IDENTIFIKASI AKTIVITAS ENZIM LIPASE YANG DIHASILKAN OLEH BAKTERI *Lactobacillus* sp. YANG DIFERMENTASI PADA PAKAN IKAN

Oleh

Rahel Matoe Nim 2253021009

Jurusan Biologi dan Perikanan Kelautan

ABSTRAK

Biaya pakan dalam budidaya ikan mencapai 60-70% dari total biaya produksi, namun efisiensi pemanfaatan lemak masih rendah akibat keterbatasan enzim lipase endogen pada ikan. Fermentasi pakan menggunakan bakteri asam laktat *Lactobacillus acidophilus* berpotensi menghasilkan enzim lipase ekstraseluler yang dapat meningkatkan pencernaan lemak. Penelitian ini bertujuan untuk mengidentifikasi keberadaan dan mengukur aktivitas enzim lipase yang dihasilkan oleh *Lactobacillus acidophilus* pada pakan ikan selama proses fermentasi, serta menentukan waktu fermentasi optimum. Penelitian menggunakan desain Rancangan Acak Lengkap (RAL) dengan tiga perlakuan waktu fermentasi: P0 (0 jam/kontrol), P1 (12 jam), dan P2 (24 jam), masing-masing dengan tiga ulangan. Pakan komersial difermentasi dengan kultur *Lactobacillus acidophilus* 10% (b/b) pada suhu ruang (28-30°C). Aktivitas enzim lipase diukur secara titrimetri menggunakan substrat Tween 20 1% dengan titrasi NaOH 0,05 M. Hasil penelitian menunjukkan bahwa *Lactobacillus acidophilus* mampu menghasilkan enzim lipase pada semua waktu fermentasi. Aktivitas lipase tertinggi terdapat pada kelompok kontrol (P0) sebesar $2,014 \pm 0,126$ U/ml, diikuti P1 (12 jam) sebesar $1,944 \pm 0,126$ U/ml, dan terendah pada P2 (24 jam) sebesar $0,972 \pm 0,139$ U/ml. Penurunan aktivitas lipase ekstraseluler seiring bertambahnya waktu fermentasi disebabkan oleh penurunan pH akibat produksi asam laktat, konsumsi asam lemak hasil hidrolisis oleh bakteri, dan kemungkinan degradasi enzim. Meskipun demikian, pakan terfermentasi tetap bermanfaat karena meningkatkan protein terlarut dan menyediakan probiotik hidup yang memproduksi enzim secara in situ di usus ikan. Waktu fermentasi optimum yang direkomendasikan adalah 6-12 jam untuk menyeimbangkan produksi enzim dengan viabilitas probiotik dan profil nutrisi pakan.

Kata kunci: *Lactobacillus acidophilus*, enzim lipase, fermentasi pakan, pakan ikan, aktivitas enzim, probiotik

IDENTIFICATION OF LIPASE ENZYME ACTIVITY PRODUCED BY *Lactobacillus acidophilus* FERMENTED IN FISH FEED

By

Rahel Matoe

Student ID: 2253021009

Department of Biology and Marine Fisheries

ABSTRACT

Feed costs account for approximately 60–70% of the total production costs in aquaculture, yet the efficiency of lipid utilization remains relatively low due to the limited endogenous lipase activity in fish. Feed fermentation using the lactic acid bacterium *Lactobacillus acidophilus* has the potential to produce extracellular lipase enzymes that can enhance lipid digestibility. This study aimed to identify the presence and measure the activity of lipase enzymes produced by *Lactobacillus acidophilus* during fish feed fermentation, as well as to determine the optimum fermentation time. The experiment employed a Completely Randomized Design (CRD) with three fermentation time treatments: P0 (0 hours/control), P1 (12 hours), and P2 (24 hours), each with three replications. Commercial fish feed was fermented with a 10% (w/w) culture of *Lactobacillus acidophilus* at room temperature (28–30°C). Lipase enzyme activity was determined using a titrimetric method with 1% Tween 20 as the substrate and 0.05 M NaOH as the titrant. The results demonstrated that *Lactobacillus acidophilus* was capable of producing lipase enzymes at all fermentation periods. The highest lipase activity was observed in the control treatment (P0), reaching 2.014 ± 0.126 U/mL, followed by P1 (12 hours) with 1.944 ± 0.126 U/mL, while the lowest activity was recorded in P2 (24 hours) at 0.972 ± 0.139 U/mL. The decline in extracellular lipase activity with increasing fermentation time was attributed to the decrease in pH caused by lactic acid production, the utilization of fatty acids released during lipid hydrolysis by the bacteria, and the possible degradation of the enzyme. Nevertheless, fermented feed remains beneficial because it increases soluble protein content and provides viable probiotic bacteria capable of producing digestive enzymes *in situ* within the fish intestine. Based on the findings, the recommended optimum fermentation time is 6–12 hours to achieve a balance between enzyme production, probiotic viability, and the nutritional quality of the feed.

Keywords: *Lactobacillus acidophilus*, lipase enzyme, feed fermentation, fish feed, enzyme activity, probiotics.