

## ABSTRAK

Jambal roti merupakan produk fermentasi ikan yang cukup terkenal di masyarakat Indonesia dengan bahan baku ikan manyung (*Arius thalassinus*). Proses pembuatan secara tradisional meliputi penggaraman (50%) dilanjutkan pengeringan dengan sinar matahari. Proses pembuatan jambal roti melibatkan peran bakteri asam laktat dalam degradasi protein ikan. Bakteri asam laktat berpotensi menghasilkan peptida bioaktif *Angiotensin I Converting Enzyme inhibitor* berperan dalam menurunkan tekanan darah. Penelitian ini mempelajari karakteristik jambal roti dari Desa Bonang, Kecamatan Rembang Jawa Tengah, mengisolasi dan mengidentifikasi bakteri asam laktat proteolitik serta aktivitas penghambatan terhadap ACE.

Tujuan umum penelitian adalah mengisolasi dan mengkarakterisasi Bakteri Asam Laktat dari jambal roti yang memiliki aktivitas penghambatan ACE. Tujuan khusus adalah mengkarakterisasi produk tradisional jambal roti, mengisolasi dan mengidentifikasi Bakteri Asam Laktat dari jambal roti serta mengkarakterisasi produk jambal roti yang disuplementasi dengan bakteri asam laktat proteolitik hasil isolasi dan aktivitas penghambatan ACE. Tahapan penelitian meliputi karakterisasi (mikrobiologi, kimia serta nilai aktivitas penghambatan ACE) dari jambal roti, isolasi dan identifikasi bakteri asam laktat, aplikasi bakteri asam laktat proteolitik pada pembuatan jambal roti serta pengukuran aktivitas penghambatan ACE. Aplikasi pembuatan jambal roti menggunakan 3 bakteri asam laktat proteolitik hasil isolasi. Rancangan penelitian menggunakan Rancangan Acak lengkap faktorial dengan faktor 1 : kadar garam (20%, 25% dan 30%) dan faktor 2 : Jenis bakteri asam laktat (kontrol, *Lactobacillus plantarum* 307, *Pediococcus acidilactici* 306 dan *Pediococcus pentosaceus* 328). Parameter penelitian meliputi analisis mikrobiologi, analisis kimia (kadar air, kadar abu, kadar protein, kadar lemak, pH, Aw, kadar peptida, kadar NaCl, serta analisis aktivitas penghambatan ACE. Data yang diperoleh, selanjutnya dianalisis menggunakan uji sidik ragam pada jenjang nyata 0,05 (aplikasi SPSS versi 20).

Produk tradisional jambal roti memiliki karakteristik kadar air 48,53%, kadar abu 18,02%, kadar NaCl 18,17%, dan jumlah jamur 3,15 log cfu/gram, dimana masih memungkinkan jamur tumbuh pada produk selama penyimpanan. Aktivitas air (0,72), kadar protein total (5,49%), kadar lemak (0,21%), jumlah *Coliform* (negatif) dan jumlah bakteri *Salmonella-Shigella* (negatif) sudah memenuhi standar SNI. Aktivitas penghambatan terhadap ACE sebesar 33,33 %. Bakteri asam laktat dari jambal roti teridentifikasi sebagai *Lactobacillus plantarum* 307, *Pediococcus acidilactici* 306 dan *Pediococcus pentosaceus* 328. Bakteri asam laktat memiliki aktivitas proteolitik yang cukup baik, yaitu aktivitas protease kualitatif (diameter zona jernih lebih dari 3 cm) dan aktivitas protease secara kuantitatif (lebih dari 2 U/ml).

Karakteristik kimia produk jambal roti yang ditambah kultur stater bakteri asam laktat proteolitik, meliputi kadar air (22,35-51,34%), Aw (0,65-0,77), Kadar NaCl (26,34-43,96%), kadar abu (27,44-43,96%), pH (5), Kadar lemak (0,26-3,03%), Protein total (43,55-58,81%), protein terlarut (8,77-15,21%), dan kadar peptida (25,11-61,15%). Jumlah bakteri *Coliform*, jamur yeast dan jumlah bakteri *Salmonella-Shigella* masih melebihi standar yang ditetapkan,

sehingga perlu perbaikan proses untuk menekan bakteri patogen. Aktivitas penghambatan terhadap ACE 13,80%-76,65%, sehingga jambal roti memiliki potensi sebagai agen terapi antihipertensi.

Produk terbaik dari penelitian ini adalah jambal roti dengan kadar garam 20% dan perlakuan kontrol, dimana memiliki aktivitas penghambatan ACE sebesar 69,64% serta kadar NaCl 37,27% disamping kadar air 51,34%. Kondisi proses tersebut pertumbuhan bakteri *coliform*, *Salmonella-Shigella* serta jamur dapat ditekan walaupun tidak menunjukkan beda nyata dengan perlakuan yang lain. Aktivitas penghambatan ACE perlakuan kultur stater *Lactobacillus plantarum* 307 dengan kadar garam 25% dan perlakuan kontrol dengan kadar garam 30% menunjukkan tidak beda nyata dengan perlakuan terbaik. Kadar garam yang rendah pada proses pembuatan jambal roti memberikan nilai lebih pada produk, sehingga produk akhir tidak terlalu asin.

Kata kunci : Jambal roti, bakteri asam laktat, fermentasi ikan, aktivitas ACE inhibitor

## ABSTRACT

Jambal Roti is a fermented fish product that is quite well known in Indonesian society with the raw material of catfish (*Arius thalassinus*). The tradisional manufacturing process includes salting (50%) followed by sun drying. The process of making jambal roti involves the role of lactic acid bacteria in the degradation of fish protein. Lactic acid bacteria have the potential to produce bioactive peptides Angiotensin I Converting Enzyme inhibitor plays a role in lowering blood pressure. This research studied the characteristics of jambal roti from Bonang Village, Rembang District, Central Java, isolate and identify proteolytic lactic acid bacteria and their inhibitory activity against ACE.

The general objective of the study was to isolated and characterized Lactic Acid Bacteria from Jambal Roti which has ACE inhibitory activity. The specific objectives were to characterized traditional jambal roti products, isolated and identified Lactic Acid Bacteria from jambal roti and to characterized jambal roti products supplemented with isolated proteolytic lactic acid bacteria and ACE inhibitory activity. The research stages included characterization (microbiological, chemical and ACE inhibitory activity values) of jambal roti, isolation and identification of lactic acid bacteria, application of proteolytic lactic acid bacteria in the manufacture of jambal roti and measurement of ACE inhibitory activity. The application of making jambal roti used 3 isolated proteolytic lactic acid bacteria. The study design used a completely randomized factorial design with factor 1: salt content (20%, 25% and 30%) and factor 2: Types of lactic acid bacteria (control, *Lactobacillus plantarum* 307, *Pediococcus acidilactici* 306 and *Pediococcus pentosaceus* 328). The research parameters included microbiological analysis, chemical analysis (moisture content, ash content, protein content, fat content, pH, Aw, peptide content, NaCl content, and analysis of ACE inhibitory activity. The data obtained were then analyzed using a variance test at the real level. 0.05 (SPSS version 20 application).

Jambal Roti traditional product has the characteristics of water content of 48.53%, ash content of 18.02%, NaCl content of 18.17%, and the amount of fungus 3.15 log cfu/gram, which still allows mold to grow on the product during storage. Water activity (0.72), total protein content (5.49%), fat content (0.21%), the number of *Coliforms* (negative) and the number of *Salmonella-Shigella* bacteria (negative) had met the SNI standard. The inhibitory activity ACE was 33.33%. Lactic acid bacteria from jambal roti were identified as *Lactobacillus plantarum*, *Pediococcus acidilactici* and *Pediococcus pentosaceus*. Lactic acid bacteria have good proteolytic activity, namely qualitative protease activity (clear zone diameter more than 3 cm) and quantitative protease activity (more than 3 cm). than 2 U/ml).

Chemical characteristics of jambal roti products added with proteolytic lactic acid bacteria starter culture, included water content (22.35-51.34%), Aw (0.65-0.77), NaCl content (26.34-43.96%), ash content (27.44-43.96%), pH (5), fat content (0.26-3.03%), total protein (43.55-58.81%), soluble protein (8.77-15.21%), and peptide levels (25.11-61.15%). The number of *Coliform* bacteria, yeast fungi and the number of *Salmonella-Shigella* bacteria still exceeds the

established standards, so it is necessary to improve the process to suppress pathogenic bacteria. The inhibitory activity ACE was 13.80%-76.65%, so jambal roti has potential as an antihypertensive therapy agent.

The best product from this study was jambal roti with 20% salt content and control treatment, which had ACE inhibitory activity of 69.64% and NaCl content of 37.27% in addition to water content of 51.34%. Under these conditions, the growth of *Coliform* bacteria, *Salmonella-Shigella* and fungi could be suppressed although it did not show a significant difference with other treatments. The ACE inhibitory activity of the starter culture treatment of *Lactobacillus plantarum* 307 with a salt content of 25% and the control treatment with a salt content of 30% showed no significant difference with the best treatment. The low salt content in the jambal roti making process gives more value to the product, so the final product is not too salty.

Keyword : Jambal roti. Lactic acid bacteria, Fermented Fish, ACE inhibitor activity