INTISARI

Gamma-aminobutyric acid (GABA) merupakan asam amino bebas yang berfungsi sebagai neurotransmitter utama dalam sistem saraf pusat. GABA memiliki berbagai manfaat kesehatan, seperti efek neuroprotektif, anti-inflamasi, dan antidiabetes. Penelitian ini bertujuan untuk menguji potensi pertumbuhan strain lokal bakteri asam laktat (BAL) pada GABA *Assay Medium* (GAM), mendeteksi keberadaan gen penyandi operon GAD (*gad*C), serta menganalisis ekspresi gen tersebut. Penelitian ini juga mengevaluasi hasil biotransformasi monosodium glutamat (MSG) menjadi GABA dan mengidentifikasi strain BAL lokal yang paling optimal dalam sintesis GABA. Penelitian dilakukan melalui beberapa tahapan, meliputi isolasi DNA, amplifikasi gen dengan metode PCR, dan deteksi gen dengan teknik elektroforesis. Identifikasi dilakukan dengan metode filogenetik berbasis gen 16S rRNA. Ekspresi gen operon GAD dianalisis menggunakan *quantitative Reverse Transcription Polymerase Chain Reaction* (qRT-PCR), dan biosintesis GABA dikonfirmasi melalui kuantifikasi dengan metode *High-Performance Liquid Chromatography* (HPLC). GAM yang diperkaya MSG digunakan untuk menguji pertumbuhan bakteri dan potensi biokonversinya. Hasil penelitian menunjukkan bahwa semua strain BAL mampu tumbuh dalam medium GAM. *Pediococcus pentosaceus* strain M103 dapat mengonversi MSG menjadi GABA. Gen penyandi operon GAD ditemukan pada strain *Pediococcus pentosaceus* strain M103 dengan ekspresi gen bersifat indusibel oleh MSG. Hasil penelitian menunjukkan bahwa *Pediococcus pentosaceus* strain M103 menghasilkan GABA yang terdeteksi secara positif, namun kuantifikasi GABA tidak dapat dilakukan secara akurat. Penelitian ini mengindikasikan potensi besar strain lokal BAL untuk dimanfaatkan dalam pengembangan pangan fungsional berbasis GABA, dengan optimasi kondisi kultur yang dapat meningkatkan efisiensi biosintesis.

Kata kunci: *Gamma-aminobutyric acid* (GABA), bakteri asam laktat, biosintesis, operon GAD, *Pediococcus pentosaceus*

ABSTRACT

Gamma-aminobutyric acid (GABA) is a free amino acid that functions as the primary neurotransmitter in the central nervous system. GABA offers various health benefits, including neuroprotective, anti-inflammatory, and antidiabetic effects. This study aims to examine the growth potential of local lactic acid bacteria local strains in GABA Assay Medium (GAM), detect the presence of the gene encoding the GAD operon (*gad*C), and analyze its gene expression. The study also evaluates the biotransformation of monosodium glutamate (MSG) into GABA and identifies the lactic acid bacteria strain with high capability for GABA synthesis. The research was conducted through several stages, including DNA isolation, PCR amplification, and gene detection through electrophoresis. Identification was carried out using a phylogenetic method based on the 16S rRNA gene. The expression of GAD operon gene was analyzed using qRT-PCR, while GABA biosynthesis was confirmed through quantification using High-Performance Liquid Chromatography (HPLC). GAM enriched with MSG was used to test bacterial growth and bioconversion potential. The results showed that all local LAB strains were able to grow in the GAM. *Pediococcus pentosaceus* strain M103 was able to convert MSG into GABA. The gene encoding the GAD operon was found in *Pediococcus pentosaceus* strain M103, with gene expression induced by MSG. The results indicated that *Pediococcus pentosaceus* strain M103 produced GABA, which was positively detected; however, GABA quantification could not be accurately performed. This study highlights the significant potential of LAB local strains for use in the development of GABA based funvtional foods, with the optimization of culture conditions to improve biosynthesis efficiency.

Keywords: Gamma-aminobutyric acid (GABA), Lactic acid bacteria local strain, biosynthesis, GAD operon, *Pediococcus pentosaceus*