Isolation and identification of bacteriocin *Lactobacillus plantarum* S12 for food biopreservatives application

Linda Sukmarini¹, * Mey Kurnia Wibowo², Apon Zaenal Mustopa¹

¹Research Center for Biotechnology, Indonesian Institute of Sciences (LIPI), Jl. Raya Bogor Km. 46 Cibinong 16911 Bogor West Java Indonesia, ²Department of Biochemistry, Bogor Agricultural University, IPB Darmaga Campus Bogor 16680 Bogor West Java Indonesia

*Corresponding author: me_sukmarini@yahoo.com; linda.sukmarini@lipi.go.id

Abstract

Bacteriocin-producing lactic acid bacteria were isolated from bekasam, an Indonesian traditional fermented meat. One isolate producing potential bacteriocin (S12) was identified and named *Lactobacillus plantarum* based on 16S rRNA sequencing. The 16S rRNA sequence of S12 had 98% homology with those of other *Lactobacillus plantarum* strains. Bacteriocin S12 exhibited inhibition ability against mainly pathogenic bacteria *Listeria monocytogenes* and *Staphylococcus aureus*. Production of the bacteriocin S12 was growth-associated manner, started at the early exponential and reached its maximum activity at the early stationary phase. Bacteriocin S12 tended stable at high temperature up to 121 °C for 15 minutes. The molecular weight of bacteriocin S12 was estimated 10.79 kDa by SDS-PAGE analysis. Moreover, the genes encoding bacteriocin S12 have been identified as plantaricin genes *pln*F and *pln*J. Therefore, these results suggest that the bacteriocin (plantaricin) S12 might belong to Class II (b) bacteriocin that has potential in food biopreservative.

**Keywords**: Bacteriocin, Food biopreservatives, *Lactobacillus plantarum*, Plantaricin.

Introduction

Bacteriocins are antimicrobial peptides secreted by bacteria that inhibit the growth of closely related microorganisms. Bacteriocins produced by lactic acid bacteria (LAB) have received special attention due to their potential use as food preservatives (Cotter *et al.* 2005). They offer several desirable properties that make them suitable for food preservation, (i) are generally recognized as safe substances, (ii) are not active and non-toxic on eukaryotic cells, (iii) become inactivated by digestive proteases, having little influence on the gut microbiota, (iv) are usually pH and heat-tolerant, (v) they have a relatively broad antimicrobial spectrum, against many food-borne pathogenic and spoilage bacteria, (vi) they show a bactericidal mode of action, usually acting on the bacterial cytoplasmic membrane: no cross resistance with antibiotics, and (vii) their genetic determinants are usually plasmid-encoded, facilitating genetic manipulation (Galvez *et al.* 2007).

Numerous strains of bacteriocin-producing *Lactobacillus* in particular *L. plantarum* have been isolated from different ecological niches including meat, fish, fruits, vegetables, milk and cereal products.

There is increasing interest in using these bacteriocins as natural food preservatives. The majority of these bacteriocins are small-heat stable cationic peptides belong to class II, which have the best potential for industrial applications (Nes *et al.* 1996).

Previous study reported that a bacteriocin-producing LAB isolated from traditionally fermented meat (bekasam), called S12 had shown inhibition activity against pathogenic bacteria mainly *Listeria monocytogenes* and *Staphylococcus aureus* (Mustopa *et al.* 2010). This study aimed to isolate and identify bacteriocin S12 which had antimicrobial activity. Therefore, in the present study, strain S12 was identified, the bacteriocin produced was isolated and the genes encoding bacteriocin S12 were also determined.

The use of bacteriocin for controlling food pathogens is the best ways to improve food safety. The bacteriocin S12 isolated from local traditionally fermented bekasam was chosen for possible development as natural food preservative. The genetics information on the genes encoding bacteriocin S12 may useful for facilitating genetic molecular manipulation to be further applied in development biopreservatives in food industry.

**Materials and Methods**

**Bacterial strains, media and growth**

Strain S12, the bacteriocin producer used in this study, was isolated from bekasam, a traditionally fermented meat from Way Kanan, Province of Lampung, Indonesia. It was grown in deMan Rogosa Sharpe (MRS) broth (Oxoid Ltd., England) and...