ABSTRAK

OPTIMASI PRODUKSI BIOSURFAKTAN DARI BAKTERI *Lysinibacillus boronitolerans* LKM G1 MENGGUNAKAN LIMBAH PULPA BIJI KAKAO DENGAN PENDEKATAN *RESPONSE SURFACE METHODOLOGY* (RSM)

Oleh

ANISA

Biosurfaktan merupakan senyawa aktif permukaan yang disintesis secara ekstraselular oleh mikroorganisme, seperti bakteri, jamur, atau ragi. Pada penelitian ini bertujuan untuk mempelajari manfaat limbah pulpa biji kakao sebagai sumber karbon dalam produksi biosurfaktan dari bakteri *Lysinibacillus boronitolerans* LKM G1, mengetahui kondisi optimum konsentrasi sumber karbon pulpa biji kakao (%), pH dan kadar salinitas (%) dalam produksi biosurfaktan dari bakteri *Lysinibacillus boronitolerans* LKM G1 melalui pendekatan RSM, mendapatkan ekstrak kasar dari biosurfaktan dan karakterisasi menggunakan metode FTIR.

Tahapan optimasi diawali dengan preparasi limbah pulpa biji kakao, peremajaan bakteri, dilanjutkan dengan pembuatan kurva pertumbuhan dari bakteri *Lysinibacillus boronitolerans* LKM G1 dalam memproduksi biosurfaktann dengan mengukur nilai *optical density* (OD) dan indeks emulsifikasi, selanjutnya optimasi biosurfaktan menggunakan metode RSM dengan parameter sumber karbon pulpa biji kakao dalam rentang 10%, 20% dan 30%, pH dalam rentang 6, 7 dan 8, dan kadar salinitas dalam rentang 4%, 5% dan 6% , pengujian biosurfaktan dilakukan dengan metode uji emulsifikasi, *oil spreading test* dan uji *drop collapse.*

Hasil penelitian diperoleh kondisi optimum produksi biosurfaktan pada sumber karbon pulpa biji kakao sebesar 20%, pH 7, kadar salinitas 4% dengan hasil indeks emulsi 70% serta didapatkan persamaaan polinomial dengan model *quadratic* yaitu $Y= 44.83 + 3.00A + 1.00 B - 3.00 C - 0.5000AB + 3.50 AC - 4.50 BC - 9.32 A^2 - 9.32 B^2 + 20.68 C^2$. Produksi biosurfaktan dari kondisi optimum

yang telah didapatkan diperoleh ekstrak kering bewarna putih sebanyak 1,632 mg/L dengan indeks emulsi sebesar 75%. Berdasarkan hasil analisis FT-IR yang telah dilakukan diperoleh pada puncak karakteristik biosurfaktan pada rentang 3600-3200 cm^{-1} tersebut yang mengindikasikan golongan lipopeptida.

Kata kunci: Biosurfaktan, *Response Surface Methodology* (RSM), indeks emulsi, *oil spreading test, drop collapse test, Lysinibacillus boronitolerans* LKM G1

ABSTRACT

OPTIMIZATION PRODUCTION OF BIOSURFACTANT FROM THE BACTERIA *Lysinibacillus boronitolerans* LKM G1 USING COCOA BEAN PULPA WASTE WITH A RESPONSE SURFACE METHODOLOGY (RSM) APPROACH

By

ANISA

Biosurfactants are surface active compounds that are synthesized extracellularly by microorganisms, such as bacteria, fungi or yeast. This research aims to study the benefits of cocoa bean pulp waste as a carbon source in the production of biosurfactant from the bacteria *Lysinibacillus boronitolerans* LKM G1, to determine the optimum conditions for the concentration of carbon source cocoa bean pulp (%), pH and salinity levels (%) in the production of biosurfactant from the bacteria *Lysinibacillus boronitolerans* LKM G1 using the RSM approach, obtaining crude extracts from biosurfactants and characterization using the FTIR method.

The optimization stage begins with preparation of cocoa bean pulp waste, bacterial rejuvenation, followed by creating a growth curve for the *Lysinibacillus boronitolerans* LKM G1 bacteria in producing biosurfactant by measuring the optical density (OD) value and emulsification index, then optimizing the biosurfactant using the RSM method with cocoa bean pulp carbon source parameters in the range of 10% , 20% and 30%, pH in the range of 6, 7 and 8, and salinity levels in the range of 4%, 5% and 6%, biosurfactant testing was carried out using the emulsification test method, oil spreading test and drop collapse test.

The results of the research obtained optimum conditions for biosurfactant production from cocoa bean pulp carbon sources of 20%, pH 7, salinity level 4% with an emulsion index result of 70% and obtained a polynomial equation with a quadratic model, namely Y= 44.83 + 3.00A + 1.00 B - 3.00 C - 0.5000AB + 3.50 AC - 4.50 BC - 9.32 A2 - 9.32 B2 + 20.68 C2. Biosurfactant production from the optimum conditions obtained resulted in a white dry extract of 1.632 mg/L with

an emulsion index of 75%. Based on the results of the FT-IR analysis that was carried out, it was found that the characteristic peak of biosurfactant in the range 3600-3200 cm^{-1} indicated the lipopeptide group.

Keywords: Biosurfactant, Response Surface Methodology (RSM), emulsion index, oil spreading test, drop collapse test, *Lysinibacillus boronitolerans* LKM G1