



OPTIMASI MEDIUM PRODUKSI LIPID DARI KHAMIR *OLEAGINOUS* ASAL INDONESIA

Ummi Mahmudah Darist
16/406860/PBI/01448

INTISARI

Khamir *oleaginous* merupakan mikroorganisme yang dapat memproduksi lipid pada medium kaya sumber C dan minim sumber N. Pada penelitian sebelumnya telah berhasil mengisolasi khamir *oleaginous* dari tanaman *Piper nigrum* dan *Piper betle* di daerah Bali dan Jawa Barat diantaranya adalah *Candida orthopsilosis*, *Candida luteolus*, dan *Cryptococcus oleophila*, dll. Namun, hingga saat ini belum dilakukan proses optimasi produksi lipidnya. Maka dari itu, penelitian ini bertujuan untuk mengoptimasi medium dan kondisi pertumbuhan guna meningkatkan produksi lipid menggunakan alat statistik berupa metode Taguchi dan RSM (*Response Surface Methodology*). Penelitian menggunakan objek *C. orthopsilosis* InaCC Y302, *C. luteolus* InaCC Y265, dan *C. oleophila* InaCC Y306. Langkah penelitian ini meliputi pengayaan khamir, penumbuhan ketiga khamir pada medium awal, optimasi menggunakan taguchi untuk *screening* faktor signifikan dan optimasi menggunakan RSM (Box-Behnken) menggunakan *software* Minitab v.17 dengan 3 faktor dan 3 level untuk mendapatkan model persamaan polinomial. Kemudian uji validasi prediksi berdasarkan persamaan polinomial serta uji validasi kecocokan medium optimal pada isolat lainnya. Dilakukan penentuan kadar berat kering, kadar lipid, kadar nitrogen total, dan kadar gula reduksi. Hasil penelitian ini diperoleh 3 faktor signifikan terhadap persentase produksi lipid yaitu $(\text{NH}_4)_2\text{SO}_4$, KH_2PO_4 dan waktu inkubasi. Model persamaan polinomial hasil optimasi yaitu persentase lipid (Y) = $39,4 - 15,23 A + 26,6 B - 15,00 C + 1,096 A*A - 8,00 B*B + 2,113 C*C + 2,63 A*B + 0,549 A*C - 0,30 B*C$. Medium dan kondisi optimum meningkatkan persentase produksi lipid dan tidak mempengaruhi profil pertumbuhan. Medium dan kondisi optimal tidak berlaku untuk *C. oleophila* dan *C. luteolus*.

Kata kunci: lipid, optimasi, khamir *oleaginous*, Taguchi, *Response surface methodology* (RSM).



MEDIUM OPTIMIZATION OF LIPID PRODUCTION BY OLEAGINOUS YEAST FROM INDONESIAN

Ummi Mahmudah Darist
16/406860/PBI/01448

ABSTRACT

Oleaginous yeast is a microorganism that can produce lipids in medium with high carbon sources and limited nitrogen sources. The previous study has successfully isolated oleaginous yeast from *Piper nigrum* and *Piper betle* in Bali and West Java that they are *Candida orthopsilosis*, *Cryptococcus luteolus*, *Candida oleophila*, and others. However, the optimization process of lipid production has not been carried out. Therefore, the aim of this study was to optimize the medium and growth condition to increase lipid production by using statistical tools such as Taguchi method and RSM (Response Surface Methodology). The research objects were *C. orthopsilosis* InaCC Y302, *C. luteolus* InaCC Y265, and *C. oleophila* InaCC Y306. Then, the procedures of this research were enriching the yeast, growing the three yeasts on initial medium, the optimization of lipid production used *C. orthopsilosis* Taguchi design with 9 factors and 3 levels was used for screening significant factors and the RSM method was used to optimize the significant factors using Box-Behnken design with 3 levels to obtain the polynomial equation, the validation process of the statistical model and regression equation was conducted to confirm the suitability of the model. In addition, the validation process of the optimal medium also was conducted to other isolates (*C. oleophila* and *C. luteolus*) to know the compatibility. The next steps were to determine cell dry weight, lipid content, total nitrogen, and total sugar. The significant factors were found $(\text{NH}_4)_2\text{SO}_4$, KH_2PO_4 , and incubation period. The optimization process with RSM produced an equation model to predict the lipid content was $Y = 39.4 - 15.23 A + 26.6 B - 15.00 C + 1.096 A * A - 8.00 B * B + 2.113 C * C + 2.63 A * B + 0.549 A * C - 0.30 B * C$. The optimal medium increased the lipid content and was not affected to the growth profiles. The optimal medium was suitable for *C. orthopsilosis* and was not suitable for *C. oleophila* and *C. luteolus*.

Keywords: lipid, optimization, *oleaginous* yeast, Taguchi, *Response surface methodology* (RSM).