

RINGKASAN

Industri tahu dalam proses pengolahan tahu menghasilkan limbah cair dengan kandungan bahan organik tinggi yang dapat mencemari lingkungan perairan. Limbah ini menyebabkan peningkatan kadar *Chemical Oxygen Demand* (COD), *Total Suspended Solid* (TSS) serta penurunan kadar *Dissolved Oxygen* (DO) dan pH. Penelitian ini bertujuan untuk mengetahui efektivitas *Bacillus subtilis*, EM₄ dan kombinasi keduanya dalam menurunkan kadar polutan limbah cair tahu serta menentukan agen bioremediasi yang paling efektif. Penelitian ini dilakukan selama 8 hari dengan pengamatan terhadap parameter COD, TSS, DO, pH, Suhu dan fase pertumbuhan bakteri *Bacillus subtilis*. Penelitian dilakukan secara eksperimental kuantitatif menggunakan Rancangan Acak Lengkap (RAL) dengan 4 perlakuan yaitu: perlakuan Kontrol (K0), *Bacillus subtilis* (L1), EM₄ (L2) dan Kombinasi *B. subtilis* + EM₄ (L3). Data dianalisis menggunakan *Statistical Package for the Social Sciences* (SPSS). Hasil penelitian menunjukkan bahwa limbah cair tahu awal memiliki kadar polutan yang tinggi yaitu COD sebesar 894,28 mg/l dan TSS sebesar 820 mg/l serta kadar DO yang rendah sebesar 0,63 mg/l dan pH berkisar 3,5. Setelah dilakukan proses bioremediasi selama 8 hari, semua agen bioremediasi mampu menurunkan kadar polutan limbah cair tahu secara signifikan. Perlakuan L1 (*Bacillus subtilis*) paling efektif dalam menurunkan COD menjadi 386,57 mg/l dan TSS menjadi 256,66 mg/l serta Perlakuan L2 (EM₄) paling efektif dalam meningkatkan kadar DO hingga 6,57 mg/l. Kombinasi L3 (*B. subtilis* + EM₄) memberikan hasil signifikan terhadap seluruh parameter, meskipun tidak selalu lebih unggul dibandingkan perlakuan agen secara tunggal.

Kata Kunci: *Bacillus subtilis*, Bioremediasi, EM₄, Kualitas Air, Limbah cair tahu.

SUMMARY

The tofu industry produces liquid waste with high organic content during the tofu processing process, which can pollute the aquatic environment. This waste causes an increase in *Chemical Oxygen Demand* (COD), *Total Suspended Solids* (TSS) levels, as well as a decrease in *Dissolved Oxygen* (DO) and pH levels. This study aims to determine the effectiveness of *Bacillus subtilis*, EM₄, and a combination of both in reducing pollutant levels in tofu liquid waste and to identify the most effective bioremediation agent. The study was conducted over 8 days, with observations of COD, TSS, DO, pH, temperature, and the growth phase of bacteria *Bacillus subtilis*. The study was conducted using a quantitative experimental design with a completely randomized design (CRD) and four treatments: Control (K0), *Bacillus subtilis* (L1), EM₄ (L2), and the combination of *B. subtilis* + EM₄ (L3). Data were analyzed using the *Statistical Package for the Social Sciences* (SPSS). The results showed that the initial soybean curd wastewater had high pollutant levels, with COD at 894.28 mg/l, TSS at 820 mg/l, low DO at 0.63 mg/l, and low pH ranging from 3.5. After the bioremediation process for 8 days, all bioremediation agents were able to significantly reduce the pollutant levels in soybean curd wastewater. Treatment L1 (*Bacillus subtilis*) was most effective in reducing COD to 386.57 mg/l and TSS to 256.66 mg/l, while Treatment L2 (EM₄) was most effective in increasing DO levels to 6.57 mg/l. The combination of L3 (*B. subtilis* + EM₄) yielded significant results for all parameters, although it was not always superior to the single-agent treatments.

Keywords: *Bacillus subtilis*, Bioremediation, EM₄, Tofu liquid waste, Water Quality.