# ABSTRAK

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**IDENTIFIKASI DAN KARAKTERISASI KEMAMPUAN DEKOLORISASI PEWARNA TEKSTIL SECARA ENZIMATIK OLEH MIKROORGANISME RAGI TAPAI**

Skripsi, Fakultas Sains dan Teknologi (2022).

(xv + 103 halaman, 10 tabel, 32 gambar, 24 lampiran)

Limbah pewarna pada industri tekstil telah menjadi masalah bagi ekosistem dan kesehatan makhluk hidup. Kemampuan senyawa pewarna untuk menghalangi cahaya matahari dan menghambat fotosintesis ekosistem perairan serta sifatnya yang toksik, bahkan karsinogenik menimbulkan kekhawatiran untuk mengurangi polusi limbah pewarna. Upaya penghilangan senyawa warna yang dinamakan dekolorisasi, telah dilakukan secara fisik, kimiawi dan biologis. Tujuan penelitian ini adalah mengisolasi dan mengidentifikasi isolat dari makanan ragi tapai yang dapat mendekolorisasi pewarna sintetik menggunakan enzim ekstraseluler. Metode dalam penelitian dibagi menjadi isolasi, karakterisasi kemampuan dekolorisasi dan identifikasi mikroorganisme. Ditemukan sebuah isolat bernama BMG-G1 yang mampu mendekolorisasi *malachite green* (MG) secara enzimatik. *Crude enzyme* pada supernatan dapat mendekolorisasi sebesar 37,62% pada 5 ppm ketika diinkubasi 1 jam dan 51,70% pada 50 ppm ketika diinkubasi 1 jam. Enzim yang berperan dalam dekolorisasi MG diduga merupakan *copper oxidase* seperti *laccase* dan *tyrosinase* berdasarkan uji oksidasi yang positif terhadap *pyrogallol* dan 1-*naphthol* tanpa penambahan $H_2O_2$. Hanya dalam waktu 1 hari, isolat berhasil mendekolorisasi MG pada konsentrasi 250 ppm hingga 88,43%. Konsentrasi maksimum yang masih dapat didekolorisasi oleh isolat adalah 500 ppm, dengan persentase 96,53% pada hari ke-4 dengan konsentrasi inokulum 40% (OD awal 0,1-0,2). Berdasarkan identifikasi molekuler, dengan menggunakan gen 16S rRNA, isolat diidentifikasi sebagai *Ralstonia mannitolilytica*. Berdasarkan pencarian gen, keterlibatan *multicopper oxidase* diduga berperan dalam dekolorisasi MG.

Kata Kunci : Dekolorisasi, Enzim Ekstraseluler, M*alachite Green*

Reference : 206 (1929-2022)

# ABSTRACT

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**IDENTIFICATION AND CHARACTERIZATION OF TEXTILE DYE DECOLORIZATION CAPABILITY BY MEANS OF EXTRACELLULAR ENZYME BY THE MICROORGANISM OF TAPAI YEAST**
Thesis, Faculty of Science and Technology (2022).

(xv + 103 pages, 10 tables, 32 figures, 24 appendices)

Textile dye waste has been an issue to the ecosystem and organism well-being. Diminishing light-penetration by the absorption of dye molecules in aquatic ecosystems hinder photoautotroph photosynthesis. Even more, toxic or even carcinogenic characteristics of synthetic dye raised concerns to mitigate the pollution. Efforts of dye removal, termed decolorization, have been made by means of physical, chemical or biological methods. The objective of the research was to isolate, characterize and identify microorganisms in the starter culture of "ragi tapai" that has the capability to decolorize synthetic dye, using extracellular enzymes. To achieve the objective, isolation of extracellular-enzyme dye-decolorizing microorganism, characterization of the decolorization capability and the taxonomical identification of the isolate was performed. An isolate, named BMG-G1, was isolated with the capability to degrade malachite green (MG) by means of extracellular enzyme. The crude enzyme was able to, in the course of 1 hour, degrade 37,62% of 5 ppm MG as well as 51,70% of 50 ppm MG. Suspected enzyme produced by BMG-G1 was copper oxidase, such as laccase and tyrosinase, based on positive oxidoreductase detection test using pyrogallol as well as 1-naphthol as oxidation substrate in the absence of $H_2O_2$. The isolate was capable of decolorizing 250 ppm MG in the span of 1 day, up to 88,43%. The maximum MG concentration decolorizable by the isolate was measured to be 500 ppm with 96,53% decolorization achieved in only 4 days. Using 16S rRNA, the isolate was identified as *Ralstonia mannitolilytica*. Based on genomic search for oxidase genes, the assumption of the involvement of multicopper oxidase was further strengthened to be the causal of MG degradation.

Keywords : Decolorization, Extracellular Enzyme, M*alachite Green*

Reference : 206 (1929-2022)