

**INDUCTION OF AZOREDUCTASE FROM
Aeromonas hydrophila FOR BIOLOGICAL
TREATMENT OF DYES IN WASTEWATER**

By

HEBA HAMED BAYOMY MAGHRAWY
B.Sc. Agric. Sci., (Biotechnology), Fac. Agric., Cairo Univ., Egypt, 2004

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SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. SAMIR ABD EL WAHED EL GIZAWY
Emeritus Professor of Agricultural Microbiology, Fac. Agric., Cairo University

Dr. REFAE IBRAHIM REFAE
Professor of Agricultural Microbiology, Fac. Agric., Cairo University

Dr. HUSSEIN ABD EL KAREEM AHMED
Researcher Professor of Microbiology, NC for Radiation Research and Technology

APPROVAL SHEET

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Approval Committee

Dr. ALI AHMED IBRAHIM HAMMAD.....
Emeritus Researcher Professor of Microbiology, NC for Radiation Research and
Technology

Dr. MOHAMED FAYEZ FOUAD.....
Emeritus Professor of Agric. Microbiology, Fac. Agric., Cairo University

Dr. SAMIR ABD EL WAHED EL GIZAWY.....
Emeritus Professor of Agric. Microbiology, Fac. Agric., Cairo University

Dr. REFAE IBRAHIM REFAE.....
Professor of Agric. Microbiology, Fac. Agric., Cairo University

Date: / / 2011

تحفيز إنزيم الآزوردكتيز من بكتريا إيروموناس هيدروفيللا للمعالجة البيولوجية للصبغات في مياه الصرف

رسالة مقدمة من

هبة حامد بيومي مغراوى

بكالوريوس فى العلوم الزراعية (بيوتكنولوجيا) - كلية الزراعة - جامعة القاهرة، ٢٠٠٤

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الماجستير

فى

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(ميكروبيولوجيا زراعية)

قسم الميكروبيولوجيا الزراعية
كلية الزراعة
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مصر

٢٠١١

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لجنة الحكم

دكتور/ علي أحمد إبراهيم حماد
أستاذ باحث الميكروبيولوجيا المتفرغ - المركز القومي لبحوث و تكنولوجيا الاشعاع

دكتور/ محمد فايز فؤاد
أستاذ الميكروبيولوجيا الزراعية المتفرغ - كلية الزراعة - جامعة القاهرة

دكتور / سمير عبد الواحد الجيزاوى
أستاذ الميكروبيولوجيا الزراعية المتفرغ - كلية الزراعة - جامعة القاهرة

دكتور / رفاعى إبراهيم رفاعى
أستاذ الميكروبيولوجيا الزراعية - كلية الزراعة - جامعة القاهرة

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المشرفون: دكتور: سمير عبد الواحد الجيزاوي
دكتور: رفاعي إبراهيم رفاعي
دكتور: حسين عبد الكريم أحمد
قسم: الميكروبيولوجيا الزراعية فرع: تاريخ منحة الدرجة:

المستخلص العربي

الهدف من هذا البحث هو تكسير الصبغات الناتجة من مصانع النسيج بواسطة سلالات بكتيرية معزولة من مصادر محلية. تم عزل اثنين وعشرين عزلة من نوع الإيروموناس من مصادر محلية مختلفة. أظهرت سبع سلالات القدرة على إزالة لون الصبغة في بيئة بويون مغذى بعد ٤٨ ساعة تحضين، ولكن أظهرت سلالة واحدة فقط معزولة من سمك البلطي قدرة عالية على إزالة اللون (٩٨%). تم تعريف هذه السلالة مورفولوجياً، فسيولوجياً وبواسطة rRNA 16 s على إنها إيروموناس هيدروفيل. وقد وجد أن الظروف المثلى لإزالة اللون هي شريحة الأكسجين ودرجة حرارة ٣٠°م وأس هيدروجيني ٧ وتستطيع هذه السلالة ان تزيل لون صبغة الأزو ذات المجموعة الكبريتيه (كونجو حمراء) من ٥٠ جزء في المليون فما فوق. أيضاً هذه السلالة تستطيع إزالة انواع مختلفة من صبغة الأزو بعد ٤٨ ساعة تحضين.

وجد أن زيادة تركيز مستخلص الخميرة في البيئة كمصدر للنيتروجين اكبر من ٢% لا يعمل بقوة على نحسين من كفاءة عملية ازالة اللون. اثبتت النتائج أن وجود اى نوع من الكربون بتركيزات مختلفة يعمل على تثبيط عملية ازالة اللون نتيجة لتحويل الكربون المستهلك الي أحماض عضوية تخفض من قيمة الأس الهيدروجيني للبيئة، وبالتالي تؤثر علي نمو الخلية وكفاءتها في إزالة اللون.

تستطيع السلالة إزالة اللون عند عدة تركيزات مختلفة من كلوريد الصوديوم (١٠ جم/لتر) فما فوق. تم استخدام UV- Vis, IR, TLC لاثبات أن الإزالة تمت عن طريق التكسير.

وجد أن إنزيم الأزوردكتيز مستحث، ويفرز خارج الخلية، وهو من نوع فلافوبروتين، ويستخدم NADH كمعطي للإلكترونات اثناء عملية التكسير. ووجد ان المعالجة المثالية لازالة الكاملة لصبغات الأزو هي المعاملة تحت الظروف شريحة الأكسجين تليها مرحلة معالجة تحت ظروف هوائية وفيزيائية (إشعاع).

أثبتت دراسة السمية على بذور الفول بأنه تم تكسير صبغة الكونجو الحمراء الى مركبات غير سامة بواسطة الأيروموناس هيدروفيل.

الكلمات الدالة: إيروموناس هيدروفيل- الكونجو الحمراء - تكسير الصبغة - الأزوردكتيز - اختبار السمية على النبات

Name of Candidate: Heba Hamed Bayomy Maghrawy **Degree:** M.Sc.
Title of Thesis: Induction of Azoreductase from *Aeromonas hydrophila* for
Biological Treatment of Dyes in Wastewater
Supervisors: Dr. Samir Abd-El Wahed El Gizawy
Dr. Refae Ibrahim Refae
Dr. Hussein Abdel Kareem Ahmed
Department: Agricultural Microbiology
Approval : / / 2011

ABSTRACT

The aim of this work is to evaluate textile dyes degradation by novel bacterial strains isolated from different local sources. Twenty two isolates of *Aeromonas* species were isolated from different local sources. Among those, seven showed the ability to decolorize Congo red in nutrient broth medium after 48 h incubation. The only one isolate from fish (AF) showed the highest efficiency in decolorization (98%). This isolate was identified as *Aeromonas hydrophila* (AF) based on Gram staining, morphology characters, biochemical tests and the 16S rRNA sequencing. Color removal was highest in microaerophilic culture of pH 7 at 30 °C. The isolate was able to decolorize sulphonated azo dye (Congo red) in a wide range (up to 50 ppm). This isolate could also decolorize the medium containing different types of azo dyes after 48 h incubation. High concentration of yeast extract (as a N-source) did not enhance strongly the decolorization efficiency. Similarly, carbon source inhibited decolorization activity because the consumed carbon was converted to organic acids that might decrease the pH of the culture medium, thus inhibiting the cell growth and decolorization activity. The isolate was capable to decolorize in the presence of NaCl concentrations up to 10 g/l. The biodegradation was monitored by UV-vis, IR spectroscopy and TLC. Azoreductase has shown to be inducible extracellular, flavoprotein and use NADH as electron donor. Sequential microaerophilic, aerobic and physical (radiation) treatment seemed the most logical strategy for the complete removal of azo dyes in biological systems. The phytotoxicity study revealed the degradation of Congo red into non-toxic product by *Aeromonas hydrophila* (AF).

Key words: *Aeromonas hydrophila*, Congo red, degradation of azo dyes, azoreductase, phytotoxicity.

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الدكتور / رفاعى إبراهيم رفاعى

أستاذ الميكروبيولوجيا الزراعية - كلية الزراعة - جامعة القاهرة

الدكتور / حسين عبد الكريم أحمد

أستاذ باحث الميكروبيولوجيا - المركز القومي لبحوث وتكنولوجيا الاشعاع

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