شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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HANAA ALY

BACTERIAL PRODUCTION OF PIGMENTS

By

SOHILA GAMAL EL-SAYED AHMED
B.Sc. Agric. Sc. (Agric. Microbiology), Fac. Agric., Ain Shams University, 2015

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ABSTRACT

Sohila Gamal El-Sayed Ahmed "Bacterial production of pigments. "Unpublished M.Sc. Thesis, Department of Agric. Microbiology, Faculty of Agriculture, Ain shams University, 2021.

Among 46 local bacterial isolates capable synthetized pigments, 26% produced extra cellular of blue green and fluorescent whereas 74% produced intra-cellular pigments of red, brown, yellow, orange, and rose. Extraction of intracellular pigments revealed that ethyl acetate solvent and ultrasonication are more effect to extract pigment from other solvents. Production of fluorescent, blue green, red, brown, orange, yellow, and rose with showed maximum absorbance at 400, 520, 530, 320, 440, 460, and 470 nm, with an optical density of 0.62, 1.42,1.35, 1.11, 0.45, 0.98, and 0.40, respectively. Antibacterial activity of pigments was studied against 7 bacterial pathogenic strains namely *Pseudomonas aeruginosa* ATCC27853, *Escherichia coli* O157:H7 ATCC25922, *Klebsiella pneumoniae* ATCC00607, *Salmonella typhimurium* ATCC25566, *Listeria monocytogenes* ATCC19115, *Staphylococcus aureus* ATCC29737, and *Bacillus cereus* ATCC33018. The last tested strain behaved high significant ($p \leq 0.05$) sensitivity for blue green, fluorescent, brown, and rose pigments while, *L. monocytogenes* ATCC19115 was more susceptible for red, and yellow pigments and *S. aureus* ATCC29737 had more inhibited by orange pigment. Six strains namely SG1, LRe6, SB1, AO2, WY12, WRo5 were selected as a potential candidate for the synthesis of pigments. They were identified as strains of *Pseudomonas aeruginosa*, *Serratia marcescens*, *Azotobacter chroococcum, Micrococcus kristinae*, *M. luteus*, and *M. roseus* after their cultural, morphological and biochemical studies. These bacterial pigments seemed to have antioxidant activity which inhibited the formation of diphenyl-2-picrylhydrazyl radicals with percentage ranged from 40 % to 80 %. Allergy assay revealed that no erythema or oedema were noticed on the rats' skin throughout the most six efficient bacterial strains. The cytotoxicity assessment using Wi38 human

lung normal cell lines showed that IC_{50} value of brown, red, rose, blue green, and yellow pigments were 145, 113.5, 37.6, 47.0, and 593.0 µg/ml, respectively, but orange pigment showed any cytotoxicity. Dying cotton fabrics as application experiment showed that red pigment had pretty deep shade on cotton than other pigments. The most efficient *Serratia marcescens* producing red pigment LRe6 was identified genotypically to be 99.8 % similar with *Serratia marcescens* strain NBRC 102204. The characterization of red pigment called prodigiosin by Fourier transform infrared spectroscopy showed the presence of some functional groups from hydroxyl, amine, methyl, methylene, carboxylic and aromatic rings. Optimization of prodigiosin synthesis from *S. marcescens* LRe6 was carried out by 2 optimization steps. The first step was including one at a time investigation for the best agro-industrial waste and by-product (oil sesame) as carbon source and various nitrogen sources, it was found that 1% sesame oil, 1% peptone, and 0.5% NaCl were promising nutrition sources enhancing the production yield of red pigment as incubated at 28°C with pH 7 and inoculum size 2% for 48h at 120 rpm with optical density (O.D) pigment yield of 0.847. Followed by second step optimization approaches using response surface methodology including minimum run resolution IV (MRR-IV) and central composite split plot (CCSP) design investigation the production of red pigment followed by production yield maximization. Among 9 factors studied for production of prodigiosin synthesis from *S. marcescens* LRe6, only 4 factors significant namely peptone, temperature, pH, and incubation period Production yield for red pigment was enhanced about to 1.25.

Keywords: Antibacterial agent, Bacterial pigments, Diphenyl-2-picrylhydrazyl scavenging activity, Fourier transform infrared (FT-IR), Response surface methodology, Allergy, Prodigiosin, Identification, 16s DNA, Pathogenic bateria, *Pseudomonas aeruginosa*, *Serratia marcescens*, *Azotobacter chroococcum* and *Micrococcus* spp**.**

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