بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / هناء محمد علي

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: ....

كلية معتمده

Department of Botany

Evaluating the Properties of Biofuel from Seed Cakes of *Jatropha curcas* L.

A Thesis submitted in Partial Fulfillment of the requirement for the Master Degree in Science in Botany

By

Zahraa Salah Eldin Taha Mohamed

B.Sc. (2015) – Botany

To

Faculty of Science - Ain Shams University

Supervisors

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Prof. of Plant Physiology,

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Ass. Prof. Ahmed Ibrahim Labena

Associate Prof. of Microbial Biotechnology,

Egyptian Petroleum Research Institute (EPRI).

(2022)

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بسم الله الرحمن الرحيم
(وقل ربِ زدني علماً)
(طه :١١٤)

Declaration

This thesis has not been submitted for a degree of this or any other university

Zahraa Salah eldin Taha

Dedication

I dedicate this thesis to my generous parents; to my supportive brothers; to my lovely husband and to my dearest daughter for their presence in my life and everything they have done for me.

Zahraa Salah eldin Taha

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Firstly, I thank Allah the Lord of the worlds. Praise is to Allah, who guided us to this, never could we have found guidance, if it weren't for the guidance of Allah.

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Abstract

Name: Zahraa Salah Eldin Taha Mohamed

Title: Evaluating the Properties of Biofuel from Seed Cakes of *Jatropha curcas* L.

Degree: M.Sc. Degree in Science in Botany (Plant Physiology)

Submitted to: Botany Department, Faculty of Science, Ain Shams University

This study aims to invest the value of the seed cakes of *Jatropha curcas* L. (waste by-products produced after oil extraction) by their applications in bioethanol production and removal of methylene blue dye (MB) as well as hexavalent chromium Cr (VI) from contaminated wastewater. The physiological biochemical composition of *Jatropha curcas* L. leaves and seed cakes was elevated via irrigation by the nutrient rich treated sewage water, sewage water + sludge and sewage water + sludge sprayed by different concentrations of chlorocholine chloride (cycocel or abbreviated as CCC). At the same time this study might be considered as a stepping stone for the solution of the huge amount of treated sewage water that lost daily at the drinking and sewage water treatment station in Al-Gabal Al-Asfar, Cairo, Egypt. The leaves and seed cakes were collected from the different irrigation treatments: tap water, sewage water, sewage water + sludge, sewage water + sludge sprayed with: tap water and different concentrations of cycocel. Results of the leaves showed that irrigation by sewage water and

sewage water + sludge have successfully increased the levels of photosynthetic pigments [chlorophyll (a), chlorophyll (b) and carotenoids], carbohydrates [total soluble sugars, polysaccharides and cellulose], total soluble protein, total free amino acids, proline, total phenol and lignin contents in addition to the activity levels of antioxidant enzymes [super oxide dismutase (SOD), catalase (CAT), poly phenol oxidase (PPO) and peroxidase (POX)]. Generally, the estimated fractions of carbohydrates [total soluble sugars, polysaccharides, cellulose and hemicellulose], total soluble protein, total free amino acids, proline and total phenol in addition to lignin contents have been also increased in seed cakes under irrigation by sewage water and sewage water + sludge. Results of leaves were inversely proportional to cycocel concentrations and vice versa in seed cakes.

In addition, irrigation of *Jatropha curcas* with sewage water and sewage water + sludge have produced higher ethanol quantities (36.22 and 40.63 g/100g) after fermentation of the seed cake hydrolysates by *Candida tropicalis* (Y-26). In respect to cycocel spraying, the maximum ethanol concentration (43.94 g/100g) was achieved from *Jatropha curcas* seed cake irrigated with cycocel at a concentration of 300 ppm after fermentation of the hydrolysates by *Candida tropicalis* (Y-26).

A preliminary screening experiment in dye and heavy metal removal resulted in; *Jatropha curcas* seed cake irrigated with sewage

water has achieved the highest removal efficiencies of 78.8% and 41% for MB and Cr (VI), respectively. The optimum factors for methylene blue (MB) removal efficiency were recorded as: bio-sorbent (BM), the selected *Jatropha curcas* seed cake, dose 15 g/l, conc. 50 ppm of MB, pH 7 and contact time 4h. While, the optimum factors for Cr (VI) removal efficiency were, BM dose 5 g/l, conc. 50 ppm of Cr (VI), pH 5 and contact time 2h. The adsorption of MB and Cr (VI) follows Langmuir isotherm and the pseudo-second order model.

Keywords:

Jatropha curcas, Seed Cake, Bioethanol, Methylene Blue, Hexavalent Chromium, Sewage Water, Sewage Sludge, Cycocel.

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