بسم الله الرحمن الرحيم

∞∞∞

تم رفع هذه الرسالة بواسطة / حسام الدين محمد مغربي

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

ملاحظات : لا يوجد

MICROBIOLOGICAL MANAGEMENT OF SOME AGRICULTURAL WASTES

By

SODAF AHMED AHMED KARMANY MAAN
B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2011
M.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2017

A Thesis Submitted in Partial Fulfillment
Of

The Requirement for the Degree of

DOCTOR OF PHILOSOPHY
in

Agricultural Sciences
(Agric. Microbioloy)

Department of Agricultural Microbiology
Faculty of Agriculture
Ain Shams University

2022

Approval Sheet

MICROBIOLOGICAL MANAGEMENT OF SOME AGRICULTURAL WASTES

By

SODAF AHMED AHMED KARMANY MAAN

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2011
M.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2017

This thesis for Ph. Degree has been approved by:

Dr. Hassan Moawad Abdel AL …….
Prof. Emeritus of Agric. Microbiology, National Research Centre.

Dr. Sohair Ahmed Ibrahim Nasr …….
Prof. Emeritus of Microbiology, Faculty of Agriculture, Ain Shams University.

Dr. Enas Abd El-Tawab Hassan …….
Prof. of Microbiology, Faculty of Agriculture, Ain Shams University.

Dr. Abd El-Wahab Mohamed Abd El- Hafez …….
Prof. Emeritus of Microbiology, Faculty of Agriculture, Ain Shams University.

Date of Examination: / / 2022

MICROBIOLOGICAL MANAGEMENT OF SOME AGRICULTURAL WASTES

By

SODAF AHMED AHMED KARMANY MAAN
B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2011
M.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Ain Shams University, 2017

Under the supervision of:

Dr. Abd El-Wahab Mohamed Abd El- Hafez
Prof. Emeritus of Agric.Microbiology, Department of Microbiology, Faculty of Agriculture, Ain Shams University (Principal supervisor)

Dr. Enas Abd El-Tawab Hassan
Prof. of Agric. Microbiology, Department of Microbiology, Faculty of Agriculture, Ain Shams University

ABSTRACT

Sodaf Ahmed Ahmed Karmany Maan "Microbiological Management of Some Agricultural Wastes." Unpublished Ph.D. Thesis, Department of Agric. Microbiology. Faculty of Agriculture, Ain Shams University, 2022.

To avoid negative environmental and economic impact of agricultural wastes, the reuse of agricultural waste is necessary. The problem of agriculture wastes becomes very obvious and aggregated after the harvest of crops. Therefore, utilization of agriculture wastes in any other environmentally friendly way is very important. This study was performed to evaluate the used hydrolyses of agro-wastes as low cost carbon and nitrogen source for use in enzymes and bioethanol production. Some agricultural wastes (Corn cobs, corn stover, sugar can bagasse, sugar beet pulp) were chosen in this study as a carbon source. The chemical analyses of tested wastes showed different composition of cellulose, lignin, hemicellulose, organic matter, organic carbon, nitrogen, ash, fat and total solid. Thirty-five fungal, 25 actinomycetes and 20 bacterial isolates were isolated and investigated for lignocellulotic enzyme activity plate assay. The selected cultures were grown on tested agricultural wastes (5g/100 ml medium) to evaluate their efficiency of biodegradation of these wastes as carbon source by determining soluble sugar and protein in fermentable broth. The results showed that the enzymatic activities were indeed the highest on corn cobs and sugar beet pulp. The selected cultures (3 fungal, 2 bacterial and 3 actinomycetes isolates) were grown of medium containing soybean okara and sesame husk (0.1%N) as nitrogen source with corn cobs and sugar beet pulp as a carbon sources. *Aspergillus* sp. F24, *Bacillus* sp. B5 and actinomycetes A25 showed high degradation efficiency. These isolates were inoculated on low–cost-medium containing corn cobs or sugar beet pulp as carbon source and various concentrations (0.2, 0.3 and 0.4%) of soybean okara and sesame husk as a nitrogen source. As a secondary screening, the maximum yield of soluble sugar and protein were obtained on sugar beet pulp and corn cobs mixed with soybean okara (0.3%) or sesame husk (0.3% and 0.4%) inoculated with tested microbial

cultures. Different concentrations of corn cobs and sugar beet (5, 10, 15, g/100ml medium) were mixed with optimal concentrations of nitrogen sources and inoculated by fungal (F_7, F_{24}) & bacterial (B_5) and actinomycetes (A_{25}) isolates. The results showed that ten gram of sugar beet and 10 and 15 g of corn cobs as carbon source achieved high soluble sugar and protein in fermentable broth. The most efficiency fungal *Aspergillus* sp. F24 and actinomycetes A25 isolates were genetically identified for *Aspergillus niger* and *Streptomyces cellulase*. The cellulase, xylanase, laccase activities and soluble sugar were determined in fermentable broth of *Aspergillus niger* F24, *Streptomyces cellulase* A25 growing under optimal concentrations of carbon and nitrogen sources during 16 days. The results indicated that cellulase, xylanase and laccase were maximum at 10 - 14 days on sugar beet pulp (10g) or corn cobs (10 & 15) with soybean okara or sesame husk as nitrogen sources, whereas soluble sugar was at 14 days with the same treatments. The sugars content of fermentable broth were identified by HPLC RI Detector. The efficiency of four strains of *S. cerevisiae* for bio-ethanol production was evaluated on **Cheng *et* al., (2009)** medium and sterilized fermentable broth of selected culture. *S. cerevisiae* (AUMC 14720) gave the highest value of bio-ethanol on fungal fermentable broth after 4 days. Fermentable broth with or without sterilization was used for producing bioethanol by *S. cerevisiae* (AUMC 14720). It was found that autoclaved fermentable broth achieved the maximum bioethanol production. The low-cost medium was supplemented by salt solution to assay its effect on bioethanol production. Adding of salt solution improved the production by 1.7 & 1.2 fold when using sugar beet pulp and soybean okara for growing the fungal and bacterial strains respectively. Under the optimal condition, *S. cerevisiae* AUMC 14720 produced the maximum production (16.6 g /L bioethanol) after 72 h. with 41.59% conversion coefficient, 36.36% bioethanol yield and 87.42% sugar utilizing efficiency.

Keywords: Lignocellulosic wastes, Biological degradation, Fermentable broth, Bioethanol, *Saccharomyces cerevisiae*, *Aspergillus niger* and *Streptomyces cellulase.*

ACKNOWLEDGMENT

Special thanks are due to **Prof. Dr. Abd El Wahab Abd El Hafez**, Professor Emeritus of Agric. Microbiology, Department of Agric. Microbiology, Faculty of Agric. Ain Shams University for his fatherhood, teaching, guidance, kindness, valuable advises and the very important scientific support.

Great thanks are to **Prof. Dr. Enas Abd El-Tawab Hassan**, head of Department of Agric. Microbiology, Faculty of Agric. Ain Shams University, for her accurate supervision, faithful attitude to me from the beginning to the end of this work, for her valuable time, sisterhood, close guidance and keen interest.

I would also like to thank all the fallows in Department of Agric. Microbiology, of Agriculture, Ain Shams University, for support during this study.

Sincere thanks also extended to all my colleagues and staff members of the Unit of Biofertilizers, Fac. Agric., Ain Shams Univ. for providing facilities and encouragement.

Thanks from my deep heart and appreciation to my family for their precious understanding, helpful support, patience, and encouragement over my life.

CONTENTS

LIST OF TABLES