



**Botany Department
Faculty of Women
Ain Shams University**

BIOLOGICAL PULPING OF SOME AGRICULTURAL WASTES

*Thesis
Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science in Microbiology*

By

Douaa Hussein Abdel-Aziz Ibrahim

B.Sc. (Microbiology-Chemistry), Faculty of Women for Arts-Science and
Education, Ain Shams University, 2007

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Approval sheet

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Ain Shams University- 2014

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

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Dedication

I would like to dedicate this thesis to my wonderful family (my beloved father Hussein, my beloved mother Souad, my great husband Ahmed and my dearest sister Ghada). All words of thanks and gratitudes will not be enough for all what they have done for me, and for their continuous help, support and encouragement.

Douaa Hussein Abd-El Aziz

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ABSTRACT

The present work aims to evaluate the fungal pretreatments for use in biopulping processes of agricultural wastes (rice straw). Therefore, Sixty two fungal isolates were screened for lignin peroxidase production. The most potent isolates for the lignin peroxidase production were identified as *Phanerochaete chrysosporium* and *Pleurotus ostreatus* using DNA sequence of Internal Transcribed Spacer (ITS) region. The optimization cultural conditions for the optimum production of lignin peroxidase were investigated. Of the media used, Sabouraud broth medium showed the highest production of lignin peroxidase with both fungal isolates. Lignin peroxidase production has been optimized for these isolates using the following conditions; pH 5.0, temperature 30 °C, agitation at 100 rpm and 4 days of incubation. Fungal discs have been found to be the most suitable inoculums than mycelia suspension. Urea as a sole N-source and fructose as a sole C-sources were more suitable for lignin peroxidase production at concentration of 0.30 and 3.0 %, respectively. The pretreatment of rice straw with *P. chrysosporium*, *Pl. ostreatus* or lignin peroxidase for use in biopulping process was studied. Pretreatment of rice straw with *P. chrysosporium* for 25 days resulted in a substantial decrease in pulp yield (by 9.1 %) and kappa number (by 25.6 %). Losses of pulp yield and kappa number were considerably low with lignin peroxidase treatment (3.7 and 14.1 %, respectively). However, the pretreatment of rice straw with *Pl. ostreatus* isolate caused moderate pulp yield losses (5.8 %) and preferential lignin degradation (as kappa number losses by 34.6 %). This indicated that the isolate of *Pl. ostreatus* might be superior to isolate of *P. chrysosporium* and lignin peroxidase for use in biopulping process or other processes in which preferential lignin degradation is desired.

Key words:

Biopulping, *Phanerochaete chrysosporium*, *Pleurotus ostreatus*, Lignin peroxidase, rice straw.

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List Of Abbreviations

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Abbreviation	Word
Bp	Base pair
C-source	Carbon source
CTMP	combination thermo mechanical process
DO	Dissolved oxygen
ITS	Internal transcribed spacer
KDa	KiloDalton
Lac	Laccase
LDPs	Lignin degrading peroxidase enzymes
LiP	Lignin peroxidase
MEB	malt extract broth
MnP	Manganese peroxidase
MSB	mineral salt broth
<i>P. chrysosporium</i>	<i>Phanerochaete chrysosporium</i>
PCR	Polymerase Chain Reaction
PDA	Potato dextrose medium
pI	Isoelectric point

List Of Abbreviations

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<i>Pl. ostreatus</i>	<i>Pleurotus ostreatus</i>
Rpm	Round per minute
TMP	thermomechanical pulp
VA	Veratryl alcohol
w/v	Weight per volume