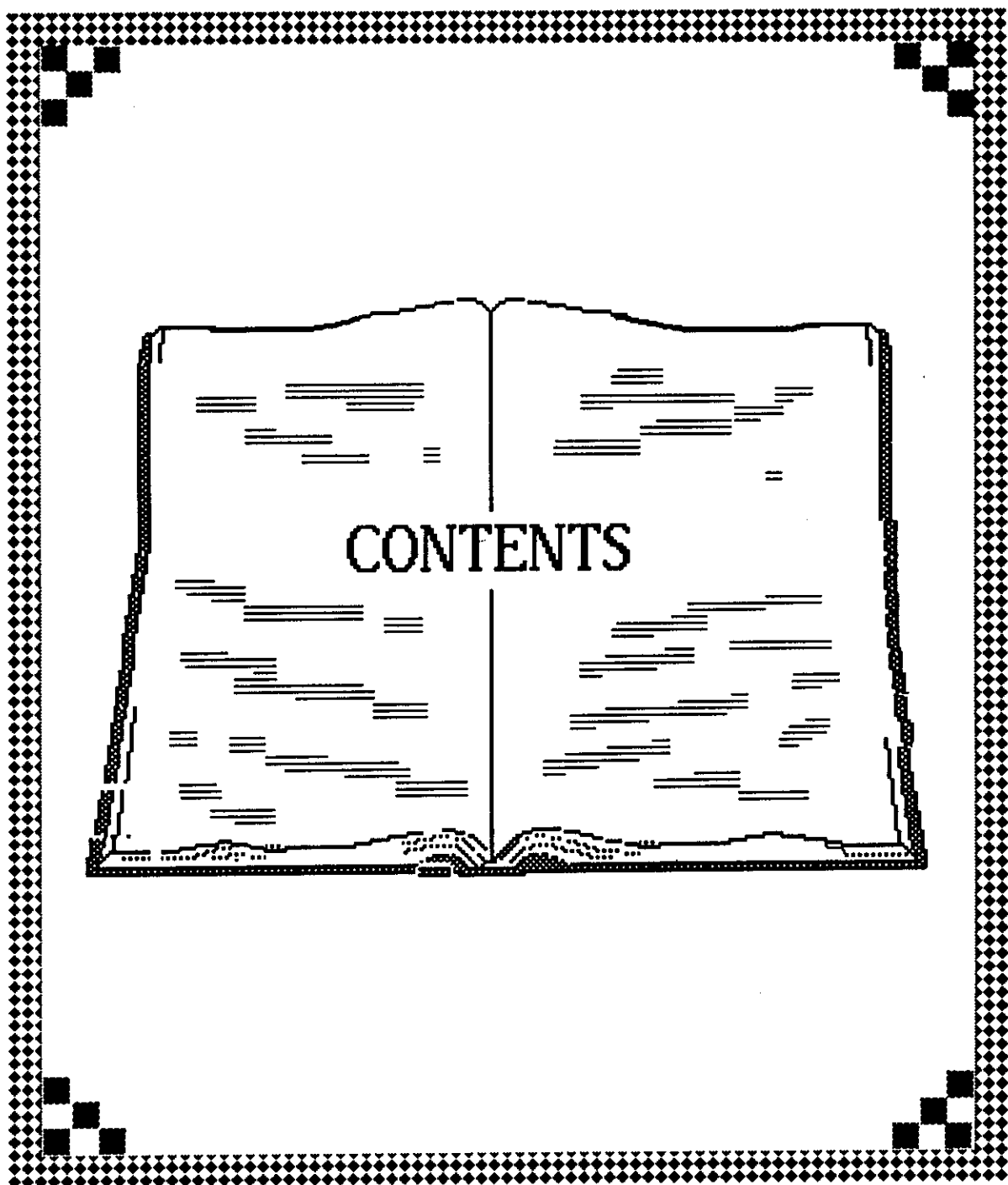




CONTENTS

	PAGE
ACKNOWLEDGMENT	
PREFACE	
INTRODUCTION	1
• Problem With Black Liquor	3
• Recovery of Black Liquor	3
A- Concentration and evaporation	4
B- Desilication of black liquor	5
C- Recovery of sodium hydroxide	9
D- Delignification	10
• Bioconversion of Wastes Into Valuable Substances.	11
• The RAKTA Waste Water Problem	15
• Utilisation of Black Liquor Spent in Pulp Industry as A National Project Funded by the Academy of Science and Technology	19
MATERIAL AND METHODS	24
A- DESILICATION AND DELIGNIFICATION OF BLACK LIQUOR	24

1- Preparation of Black Liquor From Rice Hulls - - -	24
2- Desilication of Black Liquor Using Different	
Electrolytes - - - - -	24
i - Use of electrolytes with monovalent cations	24
a- Use of NaCl - - - - -	24
b- Use of different mineral acids for the desilication of black liquor - - - - -	25
c- Use of sulphuric acid for the desilication of black liquor - - - - -	25
d- Use of other sodium salts - - - - -	25
e- Use of other monovalent cations for desilicaiton of black liquor - - - - -	26
* Use of sodium and potassium chloride - - - -	26
f- Effect of the use of ammonium chloride- - - - -	26
g- Use of other ammonium salts - - - - -	26
ii - Use of Di- or Trivalent cations for desilication of black liquor - - - - -	27
3- Delignification of Black Liquor - - - - -	27
B- MICROBIOLOGY PART - - - - -	28
1- Media - - - - -	28
2- Soil Samples - - - - -	29
3- Soil Dilution - - - - -	30
4- Isolation of Black Liquor Consuming	
Microorganisms - - - - -	30
5- Identification of Isolated Fungi - - - - -	30

6- Linear Growth Test - - - - -	31
7- Growth Intensity of Fungal Isolation on Black	
Liquor - - - - -	31
8- Assay of Enzymatic Activities - - - - -	31
a - Cultivation technique in liquid culture - - - - -	31
b- Production of enzymes - - - - -	32
c- Determination of Amylase activity - - - - -	32
d- Determination of Protease activity - - - - -	33
e- Determination of Lipase activity - - - - -	35
f- Determination of Xylanase activity - - - - -	38
g- Determination of Cellulase activity - - - - -	38
h- Determination of Keratinase activity - - - - -	40
9- Consumption of Black Liquor Sugars by the	
selected Fungi - - - - -	42
a- Cultivation technique - - - - -	42
b- Consumption course of black liquor sugars - - - - -	42
c- Determination of total carbohydrates - - - - -	42
d- Determination of reducing sugars - - - - -	42
e- Determination of hexosamines - - - - -	44
10 - Extraction of Aflatoxins - - - - -	45
1- Extraction of Aflatoxins From YES Medium - - - - -	45
a- Purification - - - - -	45
b- Separation - - - - -	46

2- Thin Layer Chromatography of Extracts	
YES Cultures - - - - -	46
a- Preparation of the TLC Plates ; - - - - -	46
b- Solvent systems - - - - -	47
c- Detection of Aflatoxins. - - - - -	47
3- Qualitative Estimation of Aflatoxin Extracts - - -	48
11- Determination of Total Protein of The Biomass	
of The Used Fungi	48

EXPERIMENTAL RESULTS

PART I

- DESILICATION AND DELIGNIFICATION	
OF BLACK LIQUOR - - - - -	49
A- Desilication of Black Liquor - - - - -	49
- Difficulties encountered in obtaining Black Liquor	
samples from RAKTA - - - - -	49
- Preparation of black liquor from rice hulls for	
desilication studies - - - - -	49
- New Nonconventional Method of Fractionation	
of Black Liquor - - - - -	50
- Difficulties encountered in the extraction of silica - -	51
- Aim of the new nonconventional methods of	
desilication - - - - -	51

- Some Scientific Bases of Silicate Behaviour in	
Solution and Coagulation - - - - -	52
- Use of Different Electrolytes For Separation of	
Silica from Black Liquor - - - - -	54
I - Use of Electrolytes With Monovalent Cations - - - -	54
1- Use of NaCl - - - - -	54
2- Use of different mineral acids for the desilication	
of black liquor - - - - -	59
3- Use of sulfuric acid for the desilication of	
black liquor containing different	
NaCl concentration- - - - -	60
4- Use of other sodium salts - - - - -	64
II- Use of Other Monovalent Cations for Desilication	
of Black Liquor - - - - -	66
a- Use of potassium chloride for desilication of	
black liquor - - - - -	66
b- Use of ammonium chloride for desilication of	
black liquor - - - - -	70
c- Use of other ammonium salts - - - - -	75
III- Use of Di or Trivalent Cations For Desilication	
of Black Liquor - - - - -	76
B- Delignification of Black Liquor - - - - -	79
1- Delignification using mineral acids - - - - -	79
2- Delignification using ammonium chloride - - - - -	81
3- Delignification using di or trivalent salts - - - - -	81

PART II

- BICONVERSION OF BLACK LIQUOR HEMICELLULOSES INTO SINGLE CELL PROTEIN USING FUNGI - - - - -	83
- Isolation of Black Liquor Hemicelluloses	
Consuming Fungi - - - - -	83
- Differentiation of Isolates Into Genera - - - - -	84
- Taxonomical identification of identification of Fungal Species - - - - -	84
- Choice of Most Active Black Liquor Consuming Fungal Isolates - - - - -	88
A- Linear Growth Test - - - - -	89
B- Biomass Production Test - - - - -	89

PART III

- PATTERN OF CONSUMPTION OF BLACK LIQUOR SUGARS AND SOME ENZYMATIC ACTIVITIES BY SELECTED SPECIES OF THE STUDIED FUNGI - - -	97
A- Pattern of Consumption of Black Liquor Sugars by Selected Species of The Studied Fungi - - - - -	97
1- Consumption Course of Black Liquor Sugars by <u>Fusarium oxysporum</u> - - - - -	97
1- Consumption course of carbohydrates - - - - -	99

2- Consumption course of reducing sugars - - - - -	99
3- Consumption course of hexosamines - - - - -	99
2- Consumption Course of Black Liquor Sugars	
by <u><i>Alternaria humicola</i></u> - - - - -	102
1- Consumption course of carbohydrates - - - - -	102
2- Consumption course of reducing sugars - - - - -	102
3- Consumption course of hexosamines - - - - -	102
3- Consumption Course of Black Liquor Sugars by	
<u><i>Botryotrichum piluliferum</i></u> - - - - -	107
1- Consumption course of carbohydrates - - - - -	107
2- Consumption course of reducing sugars - - - - -	107
3- Consumption course of hexosamines - - - - -	107
4- Consumption Course of Black Liquor Sugars by	
<u><i>Scopulariopsis brevicaulis</i></u> - - - - -	112
1- Consumption course of carbohydrates - - - - -	112
2- Consumption course of reducing sugars - - - - -	112
3- Consumption course of hexosamines - - - - -	112
5- Consumption Course of Black Liquor Sugars by	
<u><i>Monilia acremonium</i></u> - - - - -	117
1- Consumption course of carbohydrates - - - - -	117
2- Consumption course of reducing sugars - - - - -	117
3- Consumption course of hexosamines - - - - -	117
6- Consumption Course of Black Liquor Sugars by	
<u><i>Paecilomyces divaricata</i></u> - - - - -	122
1- Consumption course of carbohydrates - - - - -	122

2- Consumption course of reducing sugars - - - - -	122
3- Consumption course of hexosamines - - - - -	122
7- Consumption Course of Black Liquor Sugars by	
<u>Paecilomyces silvatica</u> - - - - -	127
1- Consumption course of carbohydrates - - - - -	127
2- Consumption course of reducing sugars - - - - -	127
3- Consumption course of hexosamines - - - - -	127
8- Consumption Course of Black Liquor Sugars by	
<u>Aspergillus clavatus</u> - - - - -	132
1- Consumption course of carbohydrates - - - - -	132
2- Consumption course of reducing sugars - - - - -	132
3- Consumption course of hexosamines- - - - -	132
9- Consumption Course of Black Liquor Sugars by	
<u>Aspergillus flavus</u> - - - - -	137
1- Consumption course of carbohydrates - - - - -	137
2- Consumption course of reducing sugars - - - - -	137
3- Consumption course of hexosamines - - - - -	137
10- Consumption Course of Black Liquor Sugars by	
<u>Aspergillus fumigatus</u> - - - - -	142
1- Consumption course of carbohydrates - - - - -	142
2- Consumption course of reducing sugars - - - - -	142
3- Consumption course of hexosamines - - - - -	142
B - Comparative Production of Enzymes by Black	
liquor Sugars Consuming Fungi - - - - -	147
1- Comparative production of Xylanases - - - - -	147

2- Comparative production of Lipases - - - - -	147
3- Comparative production of Proteases - - - - -	152
4- Comparative production of Keratinases - - - - -	152
5- Comparative production of Cellulases - - - - -	152
6- production of Amylases - - - - -	157
- Production of Aflatoxins by The Used	
Funig - - - - -	158
- Single Cell Protein Production by The Selected	
Fungi - - - - -	160

PART IV

BIOCONVERSION OF BLACK LIQUOR HEMICELLULOSES INTO SINGLE CELL PROTEIN USING ACTINOMYCETES - - - - - 161

1- Isolation of black liquor hemicelluloses consuming actinomycetes. - - - - -	161
2- Generic identification of isolated actinomycetes. - - - - -	161
- Biomass Production By The Used	
Actinomycetes - - - - -	171
- Single Cell Protein Production By The	
Selected Actinomycetes - - - - -	172
- Aflatoxin Production By The Selected	
Actinomycetes - - - - -	173

DISCUSSION 174

SUMMARY..... 180

REFERENCES 186

ARABIC SUMMARY