

CONTENTS

	PAGE
ACKNOWLEDGEMENTS	i
ABSTRACT	ii
CONTENTS	iii
LIST OF TABLES	
LIST OF FIGURES	
LIST OF PLATES	
LIST OF ABBREVIATIONS	
CHAPTER ONE	
GENERAL INTRODUCTION	
PHOTOTROPHIC BACTERIA	1
PURPLE NON-SULPHUR BACTERIA (PNB)	4
Classification and Growth	4
Carbon assimilation	7
APPLICATION OF PHOTOTROPHIC BACTERIA IN BIOTECHNOLOGY	12
Purification of wastewater and production of single cell protein (SCP)	12
<i>A Pineapple wastes</i>	14
<i>B Soybean wastes</i>	14
<i>C Starch wastes</i>	14
<i>Cassava starch</i>	14
<i>Sago starch</i>	15

<i>D</i>	<i>Mandarin orange peel wastes</i>	15
<i>E</i>	<i>Seafood processing wastes</i>	15
<i>F</i>	<i>Cow dung and swine wastes</i>	16
IMMOBILIZATION OF PNB		18
	Whole cell immobilization versus enzyme immobilization	18
	Immobilized cell fermentations versus conventional fermentations	19
	Cell supports	21
HYDROGEN PRODUCTION FROM WASTEWATERS USING IMMOBILIZED PNB		22
 CHAPTER 2		
CHARACTERIZATION AND OPTIMIZATION OF GROWTH OF <i>Rhodopseudomonas palustris</i> STRAIN B1		
INTRODUCTION		27
MATERIALS AND METHODS		28
	Bacteria	28
	Inoculum Preparation	28
	Characterization of <i>Rhodopseudomonas palustris</i> Strain B1	29
	<i>Morphological studies</i>	29
	<i>Electron microscopy</i>	30
	<i>Growth studies</i>	30
	<i>Absorption spectra of intact cells</i>	31
	<i>In saturated sucrose</i>	31
	<i>In 25% bovine serum albumin (BSA)</i>	33

Optimization of Growth of <i>Rhodopseudomonas palustris</i> Strain B1	34
(a) Nutritional requirements	34
(i) Utilization of complex organic compounds	34
(ii) Utilization of simple organic compounds	34
(iii) Effect of starch	35
(iv) Growth factor requirements	35
(b) Effects of physical parameters on cell growth	36
Growth Profile of Strain B1 and ATCC 17001 Under Optimized Conditions	37
Statistical Analysis	38
RESULTS AND DISCUSSIONS	38
General morphological and cultural characteristics	38
Growth Studies	44
Absorption Spectrum of Intact Cells	48
<i>In saturated sucrose</i>	48
<i>In 25% bovine serum albumin</i>	50
A Comparison Between <i>R. palustris</i> Strain B1 and <i>R. palustris</i> ATCC 17001 Based on Morphology, Growth Studies and Photopigments	53
Utilization of Carbon Sources and Electron Donors	54
Growth on Starch	60
Physiological and Biochemical Characteristics	63
Effect of Temperature on Growth	65
Effect of pH on Growth	67
Effect of Light Intensity on Growth	68

Effect of Salinity on Growth	70
Effects of Inoculum Size and Age on Growth Rates	71
Comparison of Growth of <i>R. palustris</i> Strain B1 under Optimized Conditions	73
Comparison of Growth of <i>R. palustris</i> ATCC 17001 under Optimized Conditions	75

CHAPTER 3

IMMOBILIZATION OF *Rhodopseudomonas palustris* STRAIN B1 FOR THE POLLUTION REDUCTION OF SAGO EFFLUENT

INTRODUCTION	77
MATERIALS AND METHODS	78
Pre-culture preparation	78
Cell mass determination	79
Immobilization of cells	79
(i) <i>Calcium-alginate method</i>	79
(ii) <i>Carrageenan method</i>	80
(iii) <i>Agar method</i>	80
Properties of the Immobilized Cells	81
<i>Electron microscopic studies</i>	81
Immobilized Phototrophic Cells for the Treatment of Sago Effluent	81
<i>Substrate</i>	81
<i>Reduction in Chemical Oxygen Demand of Unsettled and Settled Sago Effluent</i>	82

<i>Effect of sago effluent concentration on COD reduction</i>	83
<i>Effect of mixing on COD reduction</i>	83
<i>Effect of inoculum on COD reduction</i>	84
<i>Reusability of beads</i>	84
Statistical Analysis	85
RESULTS AND DISCUSSIONS	85
Immobilization of <i>Rhodopseudomonas palustris</i> Strain B1	85
<i>In calcium- alginate</i>	85
<i>In carrageenan</i>	86
<i>In agar</i>	86
SEM observation	88
The Chemical Oxygen Demand (COD) removal of sago effluent	93
Effect of sago effluent concentration on COD reduction	98
Effect of mixing on COD reduction	100
Effect of inoculum concentration on COD reduction	103
Reusability of immobilized cells of <i>R. palustris</i> strain B1	106
CHAPTER FOUR	
SUMMARY AND CONCLUSION	109
Description of <i>Rhodopseudomonas palustris</i> Strain B1	111
FUTURE RESEARCH WORK	115
Nonsterile Culture System	115
Optimization of Temperature and pH	115
Optimizing the Mechanical Strength of the Immobilized Cell	116

Optimizing the Production of Hydrogen	117
CONCLUSIONS	118
REFERENCES	120
APPENDIX A : ANALYTICAL METHODS	142
APPENDIX B : MEDIA, REAGENTS AND BUFFERS	149
APPENDIX C : EXPERIMENTAL AND STATISTICAL DATA	155