

TABLE OF CONTENTS

TITLE SHEET	i
APPROVAL SHEET	ii
DECLARATION OF AUTHENTICITY	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDIXES	xi
INTISARI	xii
ABSTRACT	xiii
CHAPTER I INTRODUCTION	1
1.1. Background	1
1.2. Objectives	3
1.3. Benefits	4
1.4. Expected Outcomes	4
CHAPTER II LITERATURE REVIEW	5
2.1. Xylooligosaccharides	5
2.1.1 Method of xylooligosaccharide production	5
2.1.2 Xylooligosaccharides application	6
2.2. Xylanase	7
2.2.1 Xylanase production	7
2.2.2 Xylanase application	8
2.3. <i>Bacillus subtilis</i>	9
2.3.1 Role of <i>Bacillus subtilis</i> in enzyme production	10
2.4. Agricultural Waste	10
2.4.1 Soybean waste	10
2.4.2 Corn cob	11
2.4.3 Sugarcane bagasse	11
2.5. Yeast Extract	11
CHAPTER III MATERIALS AND METHODS	13
3.1. Materials	13
3.1.1 Microbial strain	13
3.1.2 Media and chemicals	13
3.2. Methods	15
3.2.1 Research design	15
3.2.2 Bacterial cultivation and culture stock	16
3.2.3 Xylanase production in solid-state fermentation	16
3.2.4 Xylanase extraction	17
3.2.5 Xylose standard curve	17
3.2.6 Yeast extract production	17
3.2.7 BSA standard curve	18
3.2.8 Protein assay on yeast extract	18
3.2.9 Xylanase activity assay	18
3.2.10 Effect of various substrates	19
3.2.11 Effect of various incubation periods	19
3.2.12 Effect of supplementation of yeast extract	20
3.2.13 Xylooligosaccharides production	20

3.2.14	Enzymatic hydrolysis time	20
3.2.15	Total number of used solid xylanase enzyme	20
3.2.16	Thin-layer chromatography analysis	21
3.3.	Statistical Analysis	21
3.4.	Time and Location of Research	21
CHAPTER IV RESULTS AND DISCUSSION		22
4.1.	Xylanase Production	22
4.1.1	Effect of various substrates	22
4.1.2	Effect of various incubation periods	24
4.1.3	Effect of yeast extract supplementation	25
4.2.	Xylooligosaccharides Production	26
4.2.1	Enzymatic hydrolysis time	26
4.2.2	Total number of used solid xylanase enzyme	27
4.2.3	Thin-layer chromatography analysis	28
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS		30
5.1.	Conclusions	30
5.2.	Recommendations	30
REFERENCES		31
APPENDIX		34

LIST OF TABLES

Table 4.1. Xylanase activity of <i>Bacillus subtilis</i> J12 from various substrates	22
--	----

LIST OF FIGURES

Figure 2.1. <i>Bacillus subtilis</i> under microscope	9
Figure 3.1. Overall research design	15
Figure 4.1. Xylanase activity of <i>Bacillus subtilis</i> J12 from various incubation periods in 37°C at 12, 24, 48, and 72 hours	24
Figure 4.2. Xylanase activity of <i>Bacillus subtilis</i> J12 from various concentrations of yeast extract supplementation in 37 °C for 24 hours	25
Figure 4.3. Reducing sugar released from enzymatic hydrolysis with <i>Bacillus subtilis</i> J12 solid xylanase enzyme at 3, 6, 12, 24, 48, and 72 hours in 50°C	26
Figure 4.4. Reducing sugar released from three times of <i>Bacillus subtilis</i> J12 solid xylanase enzyme usage at 24 hours hydrolysis in 50°C	27
Figure 4.5. Thin-layer chromatography of hydrolyzed products from <i>Bacillus subtilis</i> J12 xylanase enzyme	28

LIST OF APPENDIXES

Appendix 1. Xylose Standard Curve	34
Appendix 2. BSA Standard Curve	35
Appendix 3. Yeast Extract Soluble Protein Content	35
Appendix 4. Xylanase Activity from Various Substrates	36
Appendix 5. Statistical Analysis of Xylanase Activity from Various Substrates	37
Appendix 6. Xylanase Activity from Various Incubation Periods	39
Appendix 7. Statistical Analysis of Xylanase Activity from Various Incubation Periods	40
Appendix 8. Xylanase Activity with Supplementation of Yeast Extract	42
Appendix 9. Statistical Analysis of Xylanase Activity with Supplementation of Yeast Extract	43
Appendix 10. Enzymatic Hydrolysis Time in Xylooligosaccharides Production	45
Appendix 11. Statistical Analysis of Enzymatic Hydrolysis Time in Xylooligosaccharides Production	46
Appendix 12. Total Number of Used Solid Enzyme in Xylooligosaccharides Production	48
Appendix 13. Statistical Analysis of Total Number of Used Solid Enzyme in Xylooligosaccharides Production	48
Appendix 14. Research Documentation	50