

BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE STRESS IN ROOT OF SALT TOLERANT AND SALT- SENSITIVE THAI RICE (ORYZA SATIVAL. SPP. INDICA)

POL. MAJ. TREERIN MONGKOL

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (BIOTECHNOLOGY)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2009

#

COPYRIGHT OF MAHIDOL UNIVERSITY

2.5 cm.

3.75 cm.

Example of Spine of the Thesis / Thematic Paper

Example of t	Example of Spine of the Thesis / Thematic Paper		
	BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE STRESS IN ROOT OF SALT TOLERANT AND SALT-SENSITIVE THAI RICE (ORYZA SATIVAL. SPP. INDICA)		
	POL. MAJ.TREERIN MONGKOL 2009		



Thesis entitled

BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE S

	RESS IN ROOT OF SALT TOLERANT AND SALT- SENSITIVE THAI RICE (<i>ORYZA SATIVAL</i> . SPP. <i>INDICA</i>)		
	Pol. Maj. Treerin Mongkol Candidate		
	Asst. Prof. Kanyaratt Supaibulwatana, Ph.D. Major advisor		
	Asst. Prof. Sittiruk Roytrakul, Ph.D. Co-advisor		
	Prof. M.R. Jisnuson Svasti, Ph.D. Co-advisor		
Prof. Banchong Mahaisavariya, M.D. Dean Faculty of Graduate Studies Mahidol University	Assoc. Prof. Chuenchit Boonchird, Ph.D. Program Director Doctor of Philosophy Program in Biotechnology Faculty of Science, Mahidol University		

3.75 cm.

2.5 cm.



Thesis entitled

BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE STRESS IN ROOT OF SALT TOLERANT AND SALT- SENSITIVE THAI RICE (ORYZA SATIVAL. SPP. INDICA)

#

was submitted to the Faculty of Graduate Studies, Mahidol University for the degree of Doctor of Philosophy (Biotechnology)

on January 1, 2009

Pol. Maj. Treerin Mongkol Candidate Mr.Chalermpol Kirdmanee, Ph.D. Chair Asst. Prof. Kanyaratt Supaibulwatana, Ph.D. Member Prof. M.R. Jisnuson Svasti, Ph.D. Asst. Prof. Sittiruk Roytrakul, Ph.D. Member Member Prof. Banchong Mahaisavariya, M.D. Prof. Skorn Mongkolsuk, Ph.D. Dean Dean Faculty of Graduate Studies Faculty of Science Mahidol University Mahidol University

2.5 cm.

3.75 cm.



Fac. of Grad. Studies, Mahidol Univ.

3.75 cm.

Thesis / iv

lacksquare	
BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE STRESS IN ROOT OF	
SALT TOLERANT AND SALT- SENSITIVE THAI RICE (ORYZA SATIVAL. SPP.	
INDICA)	
#	
POL.MAJ. TREERIN MONGKOL 4936000 SCBT/D	
#	
Ph.D.(BIOTECHNOLOGY)	
#	
THESIS ADVISORY COMMITTEE : KANYARATT SUPAIBULWATANA, Ph.D.	
SITTIRUK ROYTRAKUL, Ph.D., M.R. JISNUSON SVASTI, Ph.D.	
#	
ABSTRACT	2.
#	
KEY WORDS: RICE / ROOT / SUGARS / BIOCHEMICAL RESPONSES /	
PROTEOMICS	
#	
125 pages	
1	

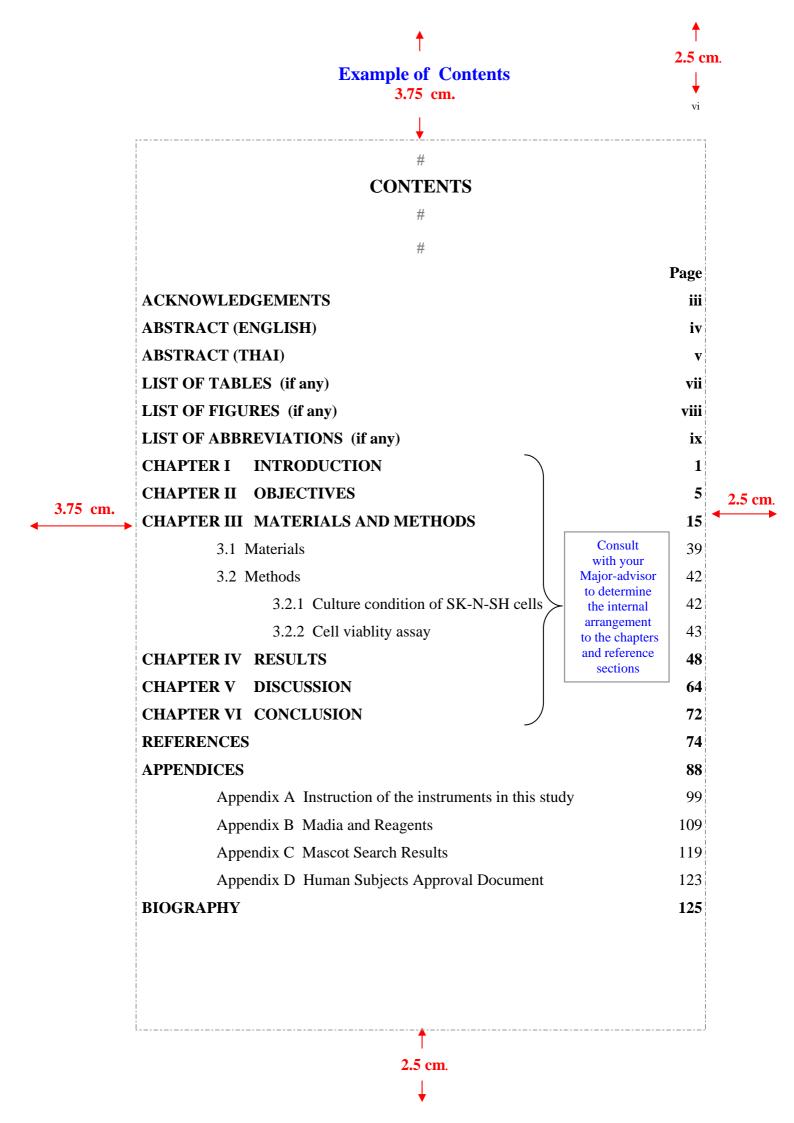


Fac. of Grad. Studies, Mahidol Univ.

•			
การตอบสนองทางชีวเคมีต่อเกลือโซเดียมคลอไรค์ของรากข้าวสายพันธุ์ไทยที่ทนเค็มและไม่ทนเค็ม			
BIOCHEMICAL RESPONSES TO SODIUM CHLORIDE STRESS IN ROOT OF SALT			
TOLERANT AND SALT- SENSITIVE THAI RICE (ORYZA SATIVAL. SPP. INDICA)			
#			
พ.ต.ต. ตรีริน มงคล 4936000 SCBT/D			
#			
ปร.ค. (เทคโนโลยีชีวภาพ)			
#			
คณะกรรมการที่ปรึกษาวิทยานิพนธ์: กัณยารัตน์ สุไพบูลย์วัฒน, Ph.D., สิทธิรักษ์ รอยตระกูล,			
Ph.D., ม.ร.ว. ชิษณุสรร สวัสดิวัตน์, Ph.D.			
#			
บทคัดย่อ			

3.75 cm

#		
บทคัดย่อ		
#		
125 หน้า		





LIST OF TABLES

#

	#	
Table		Page
3.1	Common types of dementia and their typical characteristics	17
4.1	Types of reactive oxygen species	29
4.2	Compared differences between necrosis and apoptosis	39
		İ
5.13	Cytotoxicity of H_2O_2 at 24 hours and the protection from mangosteen	65
	extract 200 and 400 μg/ml by Trypan blue assay	
5.14	Cytotoxicity of H ₂ O ₂ at various exposure times by MTT assay	67
5.15	Cytotoxicity from various concentrations of H ₂ O ₂ at 24 hours	69
	incubation measured by MTT assay	
5.16	Cytotoxicity from mangosteen extract on SK-N-SH cells various	70

3.75 cm.

2.5 cm.

times by MTT assay



LIST OF TABLES (cont.)

#

#

-	#		!
Table		Page	
5.17	Cytotoxicity screening of mangosteen extract at various concentrations on	72	
	SK-N-SH cells at 24 hours incubation by MTT assay		
5.18	Protective effects from various incubation times of mangosteen	74	
	extract against H ₂ O ₂ 150, 300 μM induced SD-N-SH cells toxicity		
	measured by MTT assay		
5.19	Protective effects from mangosteen extract 25-800 $\mu g/ml$ against	77	
	H_2O_2 cytotoxicity at 75, 150 and 300 μM on SK-N-SH cells		2.5 cm
5.20	The percentages of cell population measured by flow cytometry	80	
6.1	Presumed caspase-3 activities from the protection of mangosteen	84	
	extract 200 $\mu g/ml$ against H_2O_2 150 μM at 3,6 and 24 hour ixposure		
6.2	ROS production decreased from the protection of mangosteen extract	87	
	$200~\mu g/ml$ against $150\text{-}600~\mu M~H_2O_2$ induced cell death during $0\text{-}180$		
	min exposure		
6.3	ROS production after pretreated with mangosteen extract 200 µg/ml,	89	
	vitamin C 25-100 μM and vitamin E 5-25 μM against 150 μM		
	H_2O_2 exposusre		 - -

Fac. of Grad. Studies, Mahidol Univ.

3.75 cm.

Ph.D.(Biotechnology) / 15

	II .	
	CHAPTER III	
	MATERIALS AND METHODS	
	#	
	#	
	3.1 Chemicals and reagents	
	Chemicals and reagents used in this study	
2.75		2.5 cm.
3.75 cm.	#	2.5 CIII.
	#	
	3.2 Plant Materials	
	Thai rice (Oryza satival. spp. indica)	
		I .



Fac. of Grad. Studies, Mahidol Univ.

Number of tables should be sorted, in accordance with chapter. The table title should be placed at the top of the table

If the text in the table is more than one page, the rest should be continued on the next page. However, the table title in the continuing page should be the same as in the preceding page, and followed with the word "Cont." the reference of footnote of the table are left, shorten the preceding page so that at least two lines are placed on the continuation page, and followed with the reference or footnote of the table.

The dimensions of the table should not exceed the assigned page margins. To present a very large table, omit unnecessary portion of the table, or reduce the size of the table in any way that is appropriate.

Sample table

3.75 cm.

6.1 The flower images in training phase

No	Name of flower trained	Number of flower images
1	AungGab (Philipinviolet)	30
2	Pink Chuanchom (Impala Lily Adenium)	30
3	Doareang (Marigold)	31
4	CheangDoa (Aster)	30
5	Kadum Tong (Family: Malvaceae)	30
6	Khem Muang (Family: Acanthaceae)	30
7	Dendrobium Pattra	30
8	Lanthom, Temple tree	30
	Total	241

Fac. of Grad. Studies, Mahidol Univ.

REFERENCES

#

#

#

- 1 Zybailov, B.L., & Washburn, M.P. (2005). Mass spectrometry-based methods of proteome analysis. In R.A. Meyers (Ed.), *Encyclopedia of Molecular Cell Biology and Molecular Medicine* (Vol. 8). Kanasa City, MO, USA: Stowers Institute for Medical Research.
- 2 Finney D. Probit analysis, third endition .London: Cambridge University Press1971
- Watananonta, W. (2006). Present Situation and its Future Potential of Cassava Production and Utilization in Thailand. Paper presented at the FEALAC Inter-regional Workshop on Clean Fuels and Vehicle Technologies: the role of Science and Innovation.
- 4 Gakh, O., Cavadini, P., & Isaya, G. (2002). Mitochondrial processing peptidases. Biochimica et Biophysica et Biophysica Acta 1592 63-77.
- 5 Chen, J., Wan, J., Jiang, H., Gao, X., Wang, P., Xi, J., et al. (2006). Cloning and Expression Analysis of OsNADPH1 Gene from Rice in Drought Stress Response. *Rice Science*, 13(3),149-154.

3.75 Cm.

2.5 Cm.