

IMPROVING SURVIVAL RATE IN PACIFIC WHITE SHRIMP
(*Litopenaeus vannamei*) REARED IN LOW SALINITY WATER
BY SUPPLEMENTATION OF Mg^{2+} AND K^{+}

MOHAMAD ASLAH BIN MOHAMAD

FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU
MALAYSIA

2013

LP
13
EMSM
2
2013

**IMPROVING SURVIVAL RATE IN PACIFIC WHITE SHRIMP (*Litopenaeus
vannamei*) REARED IN LOW SALINITY WATER BY SUPPLEMENTATION OF
Mg²⁺ AND K⁺**

By

Mohamad Aslah bin Mohamad

**Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Marine Biology)**

**Department of Marine Science
Faculty of Maritime Studies and Marine Science
UNIVERSITI MALAYSIA TERENGGANU
2013**

This project report should be cited as:

Mohamad, M.A. 2013. Improving Survival Rate in Pacific White Shrimp (*Litopenaeus vannamei*) Reared in Low Salinity Water by Supplementation of Mg^{2+} and K^+ . Undergraduate Thesis, Bachelor of Science (Marine Biology), Faculty of Maritime Study and Marine Science, Universiti Malaysia Terengganu, Terengganu, 47p.

No part of this project report may be reproduced by any mechanical, photographic or electronic process, or in the process of photographic, recording, nor may it be stored in a retrieval system, transmitted or otherwise copied for public or private use without the permission from the author and the supervisor(s) of the project.

1100091328

13
FAMM
2013



DEPARTMENT OF MARINE SCIENCE
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled:
*Improving survival rate in Pacific white shrimp (*Litopenaeus vannamei*)
reared in low salinity water by supplementation of Mg^{2+} and K^+*
by *Mohamad Aslam bin Mohamad*....., Matric No. *UK22452*..... have
been examined and all errors identified have been corrected. This report is submitted to
the Department of Marine Science as partial fulfillment towards obtaining the Degree
Bachelor of Science (Marine Biology)....., Faculty of Maritime Studies and
Marine Science, Universiti Malaysia Terengganu.

Verified by:

Principal Supervisor

Name:

Official stamp:

DR. SAFIAH BT JASMANI
Pensyarah
Institut Akuakultur Tropika
Universiti Malaysia Terengganu
21030 Kuala Terengganu

Date: *19/6/2013*.....

Second Supervisor **PROF. MADYA DR. SITI AISHAH ABDULLAH**

Name:

Official stamp:

@ CHRISTINE A. ORSCO
PENYELARAS PROGRAM BIOLOGI MARIN
JABATAN SAINS MARIN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

Date: *19/6/2013*.....

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious.

Thanks to Allah SWT, I had finished my thesis. He tested me very hard along the way to complete this thesis. I lost my father, my shrimps died due to physical factors before starting the experiment (I had repeated samples preparation with four batches of shrimps from four different locations of commercial hatcheries), two IC and one osmometer failed to be used due to technical problems (I'm not the one who make it damage, seriously) and many more.

At this moment, I would like to thanks to any person who help me to complete my proposal especially to my supervisor, **Dr. Safiah binti Jasmani** who really coached and guided me from starting till the end, my parents **Nooridah binti Che Mat** who give moral support and always pray for me, my late father **Mohamad bin Said** who gives me a motorbike to ease my experiment at the hatchery, my best friends who always support me, **Hidir bin Ariffin** and **Mohd Farhan bin Tahir**, **Puan Zuhrah** the INOS officer, **Mr. Yaakob** the hatchery officer, **Mr. Wan Mohd Redhuan** and **Ms. Jannatul Fareha** (research assistants) and many others. Millions of thanks for you guys.

TABLE OF CONTENTS

	Page
DECLARATION AND VERIFICATION FORM	ii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF APPENDICES	viii
ABSTRACT (in English)	1
ABSTRACT (in Bahasa Malaysia)	2
1.0 INTRODUCTION	3
1.1 Culturing development of <i>L. vannamei</i> in low salinity water	
1.2 Problem statement	
1.3 Justification	
2.0 LITERATURE REVIEW	
2.1 <i>Litopenaeus vannamei</i>	
2.2 Previous study on optimum concentration K ⁺ and Mg ²⁺	
2.3 Inland shrimp culture: Methods to increase growth and survival rate of <i>L. vannamei</i>	
2.3.1 Dietary modification method	
2.3.2 Temperature modification method	
2.3.3 Stocking density modification	
2.3.4 Ion supplementation method	12
2.4 Ion supplementation in rearing water is the better than dietary modification	
2.5 Survival and growth rate of <i>Litopenaeus vannamei</i> in low salinity water	
2.6 Concentration for low salinity rearing water for present study	
2.7 Malaysia involvement in <i>L. vannamei</i> culture	

2.8	Commercial hatcheries and shrimp farms in Malaysia	
2.9	Inland culture as a solution for destruction of mangrove forest for shrimp farms	
2.10	Magnesium and Potassium ions: Vital ions for <i>L. vannamei</i> culture	
2.10.1	Potassium	
2.10.2	Magnesium	
3.0	METHODOLOGY	
3.1	Low salinity water	20
3.2	Preparation of treatment tanks	
3.3	Acclimation of <i>L. vannamei</i>	
3.4	Feeding of <i>L. vannamei</i>	
3.5	Effect of Mg ²⁺ supplementation on survival rate of <i>L. vannamei</i>	
3.6	Haemolymph osmolality and ionic composition	
3.6.1	Eluent preparation	
3.6.2	Sample preparation	
3.6.3	Standard preparation	
4.0	RESULTS	26
5.0	DISCUSSION	
5.1	K ⁺ treatment	29
5.2	Mg ²⁺ treatment	
5.3	K ⁺ and Mg ²⁺ treatment	
6.0	CONCLUSION	35
7.0	SUGGESTION	37
	REFERENCES	38
	APPENDICES	41
	CURRICULUM VITAE	43

LIST OF TABLES

Table		Page
2.0	Acclimation Period	21
3.0	Physical parameters along the treatments	25
4.0	Survival and ionic concentrations (mg g^{-1}) among the treatments	27

LIST OF FIGURES

Figure		Page
1.0	The lifecycle of Paneid shrimp in natural ecosystem	4
1.1	Inland culture of <i>L.vannamei</i>	5
4.0	Survival rate (%) of <i>L. vannamei</i> in rearing water added with different level of K ⁺ and Mg ²⁺ during two weeks period	25
4.1	Survival rate (%) of <i>L. vannamei</i> in rearing water added with different level of K ⁺ and Mg ²⁺ during two weeks period (error bar graph)	26
4.2	Figure 1.2 Ionic concentrations in shrimp's hemolymph (mg g ⁻¹) in rearing water supplemented with different level of K ⁺ and Mg ²⁺ during two weeks period	27

LIST OF APPENDICES

Appendix		Page
1.0	Survival data	42
1.1	Ionic concentration Data	44
1.2	Picture of L vannamei used in the study and picture of 883 basic IC Metrohm ion chromatography analyzer	46

ABSTRACT

This study was conducted at Universiti Malaysia Terengganu, Malaysia. Samples of Pacific White Shrimp, *Litopenaeus vannamei* were obtained from commercial hatcheries of Agrobest Shrimp Farm in Nenasi, Pahang. Samples were cultured for fourteen days in order to investigate the survival rate of *L. vannamei* in different treatment of low salinity water (0.5 ppt) supplemented with 5 ppm K^+ , 40 ppm K^+ , 20 ppm Mg^{2+} , 160 ppm Mg^{2+} and mixed cations of 5 ppm K^+ with 15 ppm Mg^{2+} and 40 ppm K^+ and 120 ppm Mg^{2+} . 160 ppm Mg^{2+} showed the highest survival rate which is 80% and the lowest survival rate (23.3%) is the control tanks where the low salinity water of 0.5 ppt was not supplemented with any cations. Mixture of 5 ppm K^+ with 15 ppm Mg^{2+} showed high survival rate and efficient for shrimp survival and growth.

Meningkatkan Kadar Survival Udang Putih, *L. vannamei* Yang Dibela Dalam Air Berkemasinan Rendah Dengan Penambahan Mg^{2+} Dan K^+

ABSTRAK

Kajian ini mengenai survival udang putih, *Litopenaeus vannamei* di dalam air berkemasinan yang sangat rendah iaitu pada kemasinan 0.5 ppt. kajian ini dilakukan di Universiti Malaysia Terengganu, Malaysia. Sampel udang putih diambil dari Pusat Kultur Udang Agrobrest di Nenasi, Pahang. Sampel dibela selama 14 hari untuk menguji tahap survival udang di dalam air berkemasinan rendah tersebut. Sample udang tersebut dibahagikan kepada tujuh tangki kajian dan setiap tangki diisi dengan kadar konsentrasi K^+ dan Mg^{2+} yang berlainan. Konsentrasi kation tersebut merangkumi 5 ppm K^+ , 40 ppm K^+ , 20 ppm Mg^{2+} , 160 ppm Mg^{2+} dan kation campuran 5 ppm K^+ bersama dengan 15 ppm Mg^{2+} dan 40 ppm K^+ bersama dengan 120 ppm Mg^{2+} . Tangki yang berisi sample dalam air berkemasinan rendah yang ditambah dengan 160 ppm Mg^{2+} menunjukkan kadar survival yang sangat tinggi (80%) manakala tangki kawalan yang tidak diisi dengan kation K^+ dan Mg^{2+} menunjukkan kadar survival yang terendah iaitu 23.3%. Campuran kation 5 ppm K^+ dengan 15 ppm Mg^{2+} menunjukkan kadar pertumbuhan yang tinggi dan efisien bagi meningkatkan kadar pertumbuhan dan survival udang putih.