AQUACULTURE MANAGEMENT BY INTEGRATING SEAWEED WITH SHRIMP

Thesis submitted in partial fulfillment
of the requirements
for the degree of

Ph.D. (Mariculture)

by

SEEMA.C, M.F.Sc.
(Ph.D - 179)

CENTRAL INSTITUTE OF FISHERIES EDUCATION
(Deemed University)
Indian Council of Agricultural Research
Versova, Mumbai – 400 061

SEPTEMBER 2008

Phone (Off) : 394867/....Ext. 391407
Telegram : CADALMIN EKM
Telex : 0885-6435 MFRI IN
Fax : 0484-394909
E-mail : mdcmfri@md2.vsnl.ne

भाकृअनुप ICAR

केंद्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान
पोस्ट बॉक्स सं 1603, एरणाकुलम, कोचीन- 682018

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
POST BOX No. 1603, ERNAKULAM, COCHIN- 682018
(भारतीय कृषि अनुसंधान परिषद)
(Indian Council of Agricultural Research)

Dated 8 September, 2008

CERTIFICATE

Certified that the thesis entitled **"AQUACULTURE MANAGEMENT BY INTEGRATING SEAWEED WITH SHRIMP"** is a record of independent bonafide research work carried out by **Mrs. Seema. C** (Ph.D – 179) during the period of study from September 2002 to September 2008 under our supervision and guidance for the degree of **Doctor of Philosophy (Mariculture)** and that the thesis has not been previously formed the basis for the award of any degree, diploma, associateship, fellowship or any other similar title.

Major Advisor/Chairman

Jayasankar

Reeta Jayasankar
Principal Scientist
Mariculture Division

Advisory Committee

P.K. Krishnakumar
(Co-Chairman)
Principal Scientist
Fishery Environment
Management Division

D. Prema
(Member)
Senior Scientist
Fishery Environment
Management Division

K.S. Shobana
(Member)
Senior Scientist
Physiology Nutrition And
Pathology Division

12/2/09
Dr. K.J. Joseph

Somy Kuriakose
(Member)
Senior Scientist
Fishery Resource
Assessment Division

DECLARATION

I hereby declare that the thesis entitled **" AQUACULTURE MANAGEMENT BY INTEGRATING SEAWEED WITH SHRIMP"** is an authentic record of the work done by me and that no part thereof has been presented for the award of any degree, diploma, associateship, fellowship or any other similar title.

26 September 2008
Cochin

(Seema. C)
Ph.D Student
Central Marine Fisheries
Research Institute

ACKNOWLEDGEMENTS

ACKNOWLEDGEMENTS

I express my deep sense of gratitude to my major advisor **Dr. (Mrs.) Reeta Jayasankar**, Principal Scientist, CMFRI, Cochin for her effective guidance, timely help, unstinted support and immense encouragement extended to me during the whole period of work and also in the preparation of manuscript. My sincere thanks to **Dr P.K. Krishnakumar**, Principal Scientist, **Dr. D. Prema**, Senior Scientist, **Dr. K.S. Sobhana**, Senior Scientist and **Dr. Somy Kuriakose**, members of the advisory committee for their kind support, valuable suggestion and help extended to me during the tenure of this work.

I am extremely grateful to **Prof. (Dr.) Mohan Joseph Modayil**, Director, CMFRI, Cochin for providing me all the facilities to carry out the research work. I take this opportunity to thank **Dr. R. Paul Raj**, Principal Scientist, **Dr. P.C. Thomas**, Principal Scientist, **Dr. M. Rajagopalan**, Principal Scientist, **Dr. A. Laxminarayana**, Principal Scientist and **Dr. Sunil Kumar Mohammed**, Principal Scientist, for allowing me to access all the facilities in their division.

My sincere thanks are due to **Dr. N. Kaliaperumal**, Principal Scientist, **Dr. K. Gopakumar**, Principal Scientist, **Dr. Bindu Sulochanan**, Scientist, **Mr. J.R. Ramalingam,** Technical Officer, **Mr. Chidambaram**, Librarian and other staff members of Mandapam Regional centre of CMFRI for their kind cooperation and helps during the research work.

I extend my sincere thanks to **Dr. P. Jayasankar**, **Dr. V. Kripa**, **Dr. C. Ramachandran** and **Dr. Feemena Hassan** for all the encouragement and support.

I whole heartedly thank **Mr. A. Nandakumar**, **Mr. L.R. Khambadkar**, **Smt. A. Kanagam**, **Smt. K.K. Valsala**, **Smt. K.S. Leelabhai**, **Smt. Jenny Sharma** and **Smt. Pennamma Joseph** for helping me in the laboratory analysis of samples.

My thanks are due to **Mr. Chandrasekharan** and staff of PGPM, **Mr. Edwin Joseph**, Librarian and Library staff for all the help provided to me during the course of study.

I express my deep sense of gratitude to **Dr. Martin Thompson**, OIC, Krishi Vigyan Kendra, Narakkal and **Mr. Vjayan**, Arun Aqua for rendering farm for the research work.

I would like to express my deep felt thanks to **Dr. M.M. Jose** and **Prof. (Dr.) Susheela Jose** of Fisheries Station, Kerala Agricultural University, Puduveypu for their valuable suggestions and support.

I am very much grateful to my friends **Divya**, **Sandhya**, **Reghu**, **Latha**, **Neetha**, **Sangeetha** and **Anand** for all their encouragement and helps. My special thanks are due to my juniors **Asha**, **Vidya**, **Hena**, **Sajitha** and **Vinoj** for their timely help.

I am indebted to my **Husband** for his cooperation, valuable suggestions, timely help, moral support, encouragements and good wishes which helped me to complete the research work successfully.

Words cannot express my deep felt gratitude to **Amma**, **sisters-in-law** and **family members** for the moral support and encouragements extended to me.

It is my privilege to thank my **grand parents**, **parents** and **family members** for their cooperation and encouragement throughout the period of my research work.

I hereby acknowledge **Indian Council of Agricultural Research**, New Delhi for awarding me Senior Research Fellowship during the tenure of study period at CMFRI.

Let me thank **God Almighty** for giving me such an opportunity in life

सारांश

जलजीव पालन विश्व में तेज़ बढने वाला खाद्योत्पादन का मुख्य क्षेत्र है। परन्तु तटीय प्रदूषण की वजह से यह क्षेत्र अत्यधिक छानबीन और समालोचना के विषय बन गए हैं। जैव पदार्थों, नाइट्रोजन यौगिकों, फोसफरस और अन्य पोषक घटकों से भरा हुआ गहन पालन व्यवस्था के बहिस्राव जलजीव पालन के लिए अनुपयुक्त होता है और इस से प्राकृतिक जल पर अनावश्यक सुपोषण भी होता है। स्थूल शैवाल पानी के विषाक्त अपशिष्टों को उचित और पालनयोग्य स्तर तक नियंत्रित रखने और पानी की गुणवत्ता बढाने में महत्वपूर्ण भूमिका निभाते हैं। जलजीव पालन व्यवस्था में समुद्री शैवालों को एकीकृत करके प्रभावकारी प्रबंधन किया जा सकता है। समुद्री शैवाल को जलजीव पालन प्रणाली में चिंगट के साथ सही मात्रा में एकत्रित करके अथवा चिंगट के बहिस्राव को दूसरे तालाब में शैवाल द्वारा जल शोधन करके पुनः व्यवहार किया जा सकता है। वर्तमान अध्ययन में, भारत के दक्षिण पश्चिम तट के ज्वार से भरी हुई पश्चजल व्यवस्था में और दक्षिण पूर्व तट के पम्प द्वारा भरी हुई समुद्र जल की पालन व्यवस्था में चिंगट के साथ एकीकृत पालन करने के लिए अनुकूल समुद्री शैवाल जाति को पहचानने का प्रयास किया गया है। नियंत्रित तालाबों की तुलना में उपचार तालाबों में समुद्री शैवालों द्वारा अमोणिया, नाइट्रेट, नाइट्रेट जैसे नाइट्रोजीनस यौगिकों और कुल नाइट्रोजन का निष्कासन क्रमशः 65-82%, 34-53%, 28-77% और 53-60% देखा गया। पश्चजल के तालाबों में चिंगटों के साथ एकीकृत पालन करने के लिए *ग्रासिलेरिया वेरुकोसा* अत्यंत अनुयोज्य है और मानसून अवधि के दौरान भारत के दक्षिण पश्चिम तट में मानसूनोत्तर अवधि अत्यधिक अनुकूलतम देखी गयी क्योंकि इस समय समुद्री शैवाल और चिंगट की वृद्धि दर ज्यादा पायी गयी है। भारत के दक्षिण पश्चिम तट में विषाक्त अपशिष्टों का संचयन कम होने पर भी जलजीव पालन व्यवस्था की वृद्धि दर तुलनात्मक ढंग से कम पाया गया है। अनुकूलतम संभरण सघनता में *जी. वेरुकोसा* के साथ *एन्टरोमोर्फा इन्टेस्टानालिस* का एकीकृत पालन करने पर बीजाणु खनिजीभवन द्वारा या समुद्री शैवालों के सीधा उपयोग द्वारा अधिक नाइट्रोजीनस अपशिष्टों की घटौती होने के कारण चिंगटों पर कम दबाव पडता है। नदीमुखों में बढने वाली जाति होने के नाते *जी. वेरुकोसा* लवणता के परास को बेहत्तर ढंग से सहन कर सकती है और अगरोफाइट होने की वजह से खनिजीभवन के लिए उपयोगी धरातल द्वारा बीजाणुओं को बढने के लिए आश्रय भी देती है। वर्तमान संदर्भ में, परीक्षण के पहले वर्ष में *जी. वेरुकोसा* की अत्यधिक वृद्धि से लगभग 880 कि.ग्रा. का फसल संग्रहण किया गया। इसके अतिरिक्त तालाब में वर्षों से चली आ रही जलजीव कृषि के कारण भारी मात्रा में उपलब्ध न्यूट्रिएन्ट को शोषित करने में सक्षम पाया गया। समुद्री शैवाल तालाब में पादपप्लवकों की अनावश्यक बढती को रोकने में सहायक होता है। यह भी देखा गया है कि तालाब में शैवाल बढने से चिंगटों में होने वाले रोगों में कमी पायी गयी है।

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ABSTRACT

Aquaculture is the fastest growing food production sector in the world and has come under increasing scrutiny and criticism because of coastal pollution. Effluents from intensive farming contain much organic matter, nitrogen compounds, phosphorus and other nutrients, makes the water unfit for aquaculture and lead to eutrophication. Macroalgae plays a vital role in controlling toxic wastes to reasonable and cultivable limits and also improves water quality. Aquaculture management can be done effectively by integrating seaweeds into aquaculture systems. This method can be done either by stocking seaweeds along with shrimp in optimum stocking density or by recycling the water through a pond supplemented with seaweeds. In the present study an attempt has been made to find out the species of seaweed suitable for integrated farming with shrimp in brackish water tide-fed system on southwest coast and sea water in pump-fed system on southeast coast of India. The removal of nitrogenous compounds such as ammonia, nitrate, nitrite and total nitrogen was found to be 65 to 82%, 34 to 53%, 28 to 77% and 53 to 60% respectively by seaweeds in the treatment ponds when compared to the control ponds. The species of *Gracilaria verrucosa*, proved to be an ideal seaweed for integrated farming with shrimp in the brackishwater ponds and post monsoon period is the most favourable period for integrated farming as the growth performance of seaweed and shrimp were found to be more than the monsoon period in the tide-fed system of southeast coast of India. Eventhough the accumulation of toxic waste was less compared to southwest coast, the growth rate was comparatively lower in sea water system of southeast coast of India. *G. verrucosa* integrated with *Enteromorpha intestinalis* in optimum stocking density can reduce stress on shrimp by utilizing excess nitrogenous wastes either through bacterial mineralization or direct use by seaweeds. In the present context, luxuriant growth of *G. verrucosa* in the first year of experiment leading to harvest of 880kg was due to the heavy amount of nutrient loaded in the pond for age long aquaculture activity, which enabled the proliferation of algal growth and maximum removal of nitrogenous load from the system. It was also observed that growth of alga in the pond was able to minimize the disease problems in shrimp.

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