PERFORMANCE OF INDIAN MAJOR CARPS CULTURED WITH DIFFERENT STOCKING DENSITIES AND MANAGEMENT PRACTICES

Thesis submitted to the

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For award of the degree

of

Doctor of Philosophy

by

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Under the guidance of

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INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

JULY 2012

DECLARATION

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IIT Kharagpur
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List of Abbreviations

ANOVA	Analysis of variance
ARR	Annual rate of return
BCR	Benefit cost ratio
CF	Cash flow
DO	Dissolved oxygen
FCR	Feed conversion ratio
G.O.C	Groundnut oil cake
IMC	Indian major carp
IO	Initial outlay
IRR	Internal rate of return
M.O.C.	Mustard oil cake
MP	Management practice
NPV	Net present value
PI	Profitability index
SD	Standard deviation
SGR	Specific growth rate
St.D	Stocking density
TAN	Total ammonia nitrogen
TOC	Total organic carbon
TSS	Total suspended solids

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ABSTRACT

Performance of Indian major carps (IMC), viz., catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala*) was evaluated with stocking densities (St.D) of 20 000, 35 000 and 50 000 fingerlings ha^{-1} under different management practices (MP). Different MPs included the culture of IMC (a) without water exchange and supplementary aeration (MP-I), (b) with water exchange and without supplementary aeration (MP-II) and (c) with water exchange and supplementary aeration (MP-III). Fishes were fed pelleted feed containing 35% crude protein in all the three different MPs. pH of pond water was maintained within its ideal range through intermittent application of lime. In MP-II and MP-III, concentration of total ammonia nitrogen (TAN) was maintained within its critical limit through water exchange. Problem of environmental pollution during water exchange was avoided by discharging the effluent into the nearby agricultural crop field. Significant decrease in TAN and feed conversion ratio along with substantial increase in production for St.D-3.5 and St.D-5.0 of MP-II compared to that of MP-I confirmed the effectiveness of water exchange on water quality and fish growth. Values of profit, net present value (NPV), profitability index (PI) and internal rate of return (IRR) were also found significantly higher in MP-II over MP-I for St.D-3.5 and St.D-5.0. In MP-III, provision of supplementary aeration was made to ensure minimum dissolved oxygen (DO) level of 4.0 mg L^{-1} in all the treatments. Increased total productions of 80% in St.D-2.0, 115% in St.D-3.5 and 117% in St.D-5.0 of MP-III over MP-II confirmed the significant positive impact of aeration. Significant increase in profit, NPV, PI and IRR and decrease in payback period in MP-III compared to MP-I and MP-II showed the effectiveness of aeration from economic point of view. Maximum profit of about Rs 726 000 ha^{-1} yr^{-1} was recorded in St.D-5.0 of MP-III. A pond of 0.30 ha area has been identified as a desirable pond size for earning livelihood of a marginal fish farmer with a monthly income of above Rs 12 000. Feed cost and sale price are found as the most important sensitive variables in intensive IMC culture system.

***Keywords**: Indian major carp, stocking density, water quality, water exchange, supplementary aeration, fish production, economic analysis, sensitivity analysis*

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