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Indian major carp seed rearing practices in ponds of tribal farmers of Ganjam district, Odisha, India

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Abstract

Availability of fish seed in terms of quality as well as quantity has been a major constraint for the farmers involved in fish farming since long in Ganjam District, Odisha. Three Community Development Blocks of the district namely, Khallikote, Kukudakhandi and Digapahandi were surveyed for selection of rural ponds for carp seed rearing programme. Advanced IMC fry (*Catla catla* 17-24 mm & 0.03-0.104 g, *Labeo rohita* 14-18 mm & 0.02-0.037 g, and *Cirrhinus mrigala* 16-22 mm & 0.02-0.051 g) of 66,000 nos. were procured from Orissa Pisciculture Development Corporation (OPDC) Hatchery, Digapahandi, Ganjam and were stocked in three ponds with total area of 4.4 ha (with 70% WSA) of the beneficiaries on 31 August 2017. The stocking density was 15,000 nos/ha pond area and the ratio of stocking was catla: rohu: mrigal: 1:2:1. The fry were reared for 40-43 days. In Digapahandi Block the farmers used rice bran and sesame oil cake in the ratio 1:1 as supplementary feed and in other two blocks rice bran and ground nut oil cake in the ratio 1:1 was used. Growth of all the three species was better in Digapahandi Block (*C. catla* 57-64 mm & 2.02-2.68 g, *L. rohita* 45-52 mm & 1.67-2.52 g, and *C. mrigala* 36-47 mm & 0.53-0.75 g) than other two blocks. The average survivability achieved in this scientific IMC seed rearing practice from advanced fry to fingerling stage in Ganjam District was 65.15%, being highest in Digapahandi Block (70.83%). Before adoption the productivity of ponds in terms of plankton volume was 0.4-0.5 mg/50 liter pond water and this was increased to 0.8-1.8 mg/50 liter with adoption of better management practices (BMP) during seed rearing programme.

Keywords: IMC, Advanced fry, Fingerling, Pond productivity, Survivability, Ganjam District

1. Introduction

Fish is a rich source of simple protein. Aquaculture is considered as the most profitable cash crop in many regions of the world and there has been sharp increase in demand of fish and its products due to increasing population pressure ^[1, 2]. Over last few decades the country has noticed a sizable expansion of freshwater aquaculture, but, these developments are concentrated in few states and few regions within the states. The remote, inaccessible and backward regions are often lagged behind in aquaculture development due to lack of access to aquaculture technologies ^[3]. According to Radheyshyam, 2010 ^[4], the rural carp seed production may be defined as "carp seed production using technologies adapted to locally available and limited resources of households". Rural carp seed production is different from more commercially operated or entrepreneurial carp seed production systems.

In Ganjam District, Odisha, agriculture is the backbone of the economy and around 80% people of the district depend on it ^[5]. Fishes are cultivated in ponds, but unfortunately culturists are not much aware of good aquaculture practices. Department of Science and Technology (DST), Govt. of India has sponsored a project to ICAR-Central Institute of Freshwater Aquaculture, in which four Community Development (CD) Blocks namely, Khallikote, Kukudakhandi, Digapahandi & Sanakhemundi of Ganjam District are selected for the implementation of project mandate. In the present study the fry rearing was carried out in Khallikote, Kukudakhandi and Digapahandi Blocks by adopting better management practices (BMP) for getting higher fingerling yield.

2. Materials and method

2.1 Site selection

Ganjam District is located in 19.4° - 20.17° North Lat. and 84.7° - 85.12° East Long.

The south eastern portion of the district is fertile [6]. Total 121 (SC-1 and ST-120) beneficiaries from Khallikote, Kukudakhundi and Digapahandi Blocks were adopted for the seed rearing experiment. Fish ponds with size 1.6, 2.0 & 0.8

hectares (with 70% WSA during study period) were selected from Kukudakhundi, Digapahandi and Khallikote Blocks respectively. Details of the ponds are given in the Table 1.

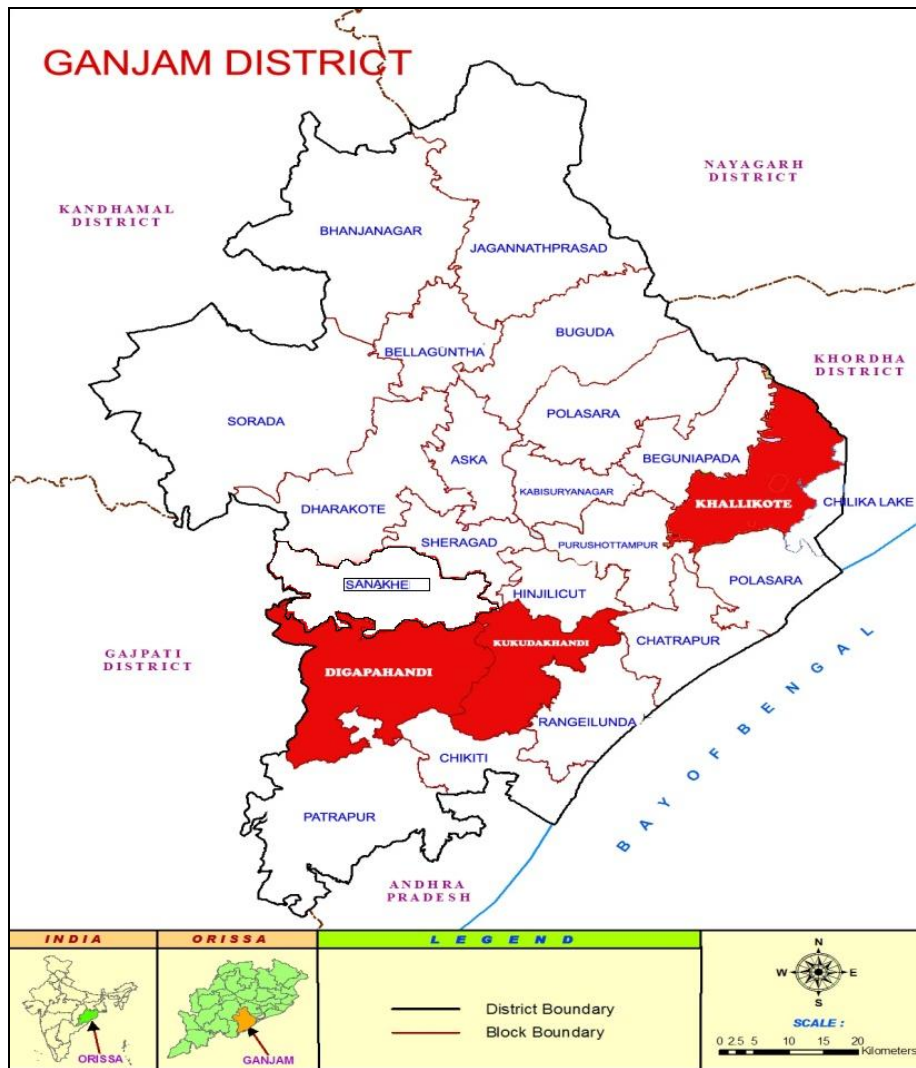


Table 1: Pond details from CD Blocks of Ganjam District, Odisha for IMC seed rearing

Block Name	Village Name	Area of the Pond (ha.)	Depth of the pond (m.)	Pond Type
Kukudakhundi	Nuapada	2.0	1.5	Perennial
Digapahandi	Ambapur	1.6	1.5	Seasonal
Khallikote	Debajhari	0.8	1.3	Seasonal

2.2. Pond preparation

The seed rearing ponds in different villages were cleaned of weeds and wastes hipped near to them. Sludge was removed from pond bottom and lime was applied @150 kg/ha to maintain the alkaline nature and to rectify the pond water before stocking of carp seed. A solution of the powdered lime and water was applied over the water surface from one end of

the pond to the other. Cow dung @ 8-10 t/ha/year was applied in ponds at one month intervals splitting the yearly dose to months [7]. The inputs like, lime, urea and single super phosphate (SSP) were supplied from the project for application to the ponds based on their area and water quality. It was applied in two equal split doses to the pond during seed rearing period. Its quantity is given in Table 2.

Table 2: Application of lime, urea, SSP and seed/ha in different block

Block	Village Name	Pond size (ha)	Lime (kg)	Urea (kg)	SSP (kg)
Digapahandi	Ambapur	1.6	78	47	78
Kukudakhundi	Nuapada	2.0	60	40	60
Khallikote	Debajhari	0.8	50	25	50

2.3. Rearing of IMC seed

Seed rearing of Indian Major Carps (*C. catla*, *L. rohita* and *C. mrigala*) was done in 4.4 ha pond area (1.6 ha - Digapahandi,

2.0 ha - Kukudakhundi and 0.8 ha - Khallikote). Total 66,000 nos. advanced fry of IMC (catla: rohu: mrigal:: 1:2:1) were stocked in the ponds @ 15,000 nos/ha on 31 August, 2017.

Length and weight of the fishes were recorded during stocking. The seed were supplied from the Orissa Pisciculture Development Corporation (OPDC) Hatchery located at Digapahandi, Ganjam. Normal seed rearing practices were followed and the growth of the fishes was monitored through sampling in every 15 days. The seed rearing experiment was continued till October, 2017.

Generally mixture of rice bran and ground nut oil cake (GNOC) is being used as supplementary feeding to fishes as per requirement^[8]. In the present case powered feed prepared from rice bran and sesame oil cake (1:1 ratio) was provided to the fishes as supplementary feed in Digapahandi Block only. In Khalikote and Kukudakhandi Blocks rice bran and GNOC was given in 1:1 ratio. Initial 15 days the feed was given @ 8-10% of the fish biomass, next 15 days 6-8% and last 15 days 4-6%.

2.4. Analysis of pond water

Physico-chemical parameters such as water temperature ($^{\circ}\text{C}$), pH, total alkalinity (mg/l), total hardness (mg/l), conductivity ($\mu\text{S/cm}$), ammonium-N (mg/l), nitrite-N (mg/l), nitrate-N (mg/l), phosphate-P (mg/l), Chlorophyll-a ($\mu\text{g/l}$) and plankton volume (ml/50 l pond water) were analyzed monthly basis during the culture period by standard laboratory procedures

(APHA)^[9].

3. Results and Discussion

3.1. Physico-chemical and productivity analysis of pond waters

The sampling data (Table 3) revealed that the water parameters of all experimented ponds were found almost similar in Ganjam District *i.e.*, pH 6.49-8.48, conductivity 67.7-429 $\mu\text{S/cm}$, total alkalinity 92-184 mg/l and total hardness 64-152 mg/l. The adopted ponds were found less productive in terms of plankton volume (0.3-1.9 mg/50 liter pond water) and number of major phytoplankton species recorded were 11 nos. and zooplankton 6 nos. Chlorophyll-a was measured from these ponds and found between 1.14 to 30.94 $\mu\text{g/l}$. Chlorophyll-a was measured more (1.19-30.94 $\mu\text{g/l}$) in the pond of Kukudakhandi Block. The plankton species found in pond waters of Ganjam District were Phytoplankton: Blue green algae (*Anabaena*, *Rivularia*); Green algae (*Ankistrodesmus*, *Protococcus*, *Microspora*, *Botryococcus*); Diatoms (*Melosira*, *Diatoma*, *Navicula*, *Synedra*, *Frustulia*) and Zooplankton (*Diaptomous*, *Daphnia*, *Copepods*, *Cladocerans*, *Cyclops*, *Monia*). All the ponds were found suitable for fish rearing with better management practices (BMP) advices^[10].

Table 3: The water quality parameters of ponds of Ganjam District

Parameters	Digapahandi	Kukudakhandi	Khallikote
Water temperature ($^{\circ}\text{C}$)	29.2-32.6	25.4-31.2	26.5-31.7
pH	6.49-8.48	7.21-7.92	6.9-7.8
Conductivity ($\mu\text{S/cm}$)	77.8-429	129-378	210-289
Total alkalinity (mg/l)	72-148	100-184	84-112
Total hardness (mg/l)	75-125	75-152	86-123
Ammonium-N (mg/l)	0.249-1.962	0.258-1.134	0.891-1.110
Nitrite-N (mg/l)	0.068-1.549	0.977-1.579	0.789-0.995
Nitrate- N (mg/l)	0.659-0.985	0.019-0.425	0.364-0.890
Phosphate-P (mg/l)	0.089-0.152	0.145-0.887	0.128-0.525
Chl. a ($\mu\text{g/l}$)	1.24-7.14	1.14-30.94	2.25-17.56
Plankton volume (ml/50 l)	0.5-1.2	0.7-1.8	0.4-0.8

3.2. Growth of fish from advanced fry to fingerling stage

The rearing of the advanced fry to fingerling stage continued from 31 August, 2017 to second week of October, 2017 (fingerling harvest started from 11 October, 2017). The growth performance observed within this rearing period is given in Table 4. Growth of all the three species was better in Digapahandi Block (*C. catla* 57-64 mm & 2.02-2.68 g, *L.*

rohita 45-52 mm & 1.67-2.52 g, and *C. mrigala* 36-47 mm & 0.53-0.75 g) than other two blocks Khallikote and Kukudakhandi in that order. The average survivability achieved in this scientific IMC seed rearing practice from advanced fry to fingerling stage in Ganjam District was 65.15%, being highest in Digapahandi Block (70.83%). It is given in Table 5.

Table 4: Growth performance of IMC seed from advanced fry to fingerling stage in Ganjam District

Name of the Blocks	Species reared	Initial stocking		Final harvest	
		Length (mm)	Weight (g)	Length (mm)	Weight (g)
Digapahandi	<i>C. catla</i>	17-24	0.030-0.104	57-64	2.02-2.68
	<i>L. rohita</i>	14-18	0.02-0.037	45-52	1.67-2.54
	<i>C. mrigala</i>	16-22	0.020-0.051	36-47	0.53-0.78
Kukudakhandi	<i>C. catla</i>	17-24	0.030-0.104	49-52	1.97-2.19
	<i>L. rohita</i>	14-18	0.02-0.037	38-49	0.90-1.20
	<i>C. mrigala</i>	16-22	0.020-0.051	33-47	0.41-0.74
Khallikote	<i>C. catla</i>	15-20	0.04-0.10	56-61	2.10-2.60
	<i>L. rohita</i>	15-19	0.02-0.037	45-48	1.00-1.20
	<i>C. mrigala</i>	14-18	0.020-0.051	36-39	0.56-0.75

Table 5: The survival rate of seed (advanced fry to fingerling) in field condition in Ganjam District

Name of the Blocks	Pond area (ha)	No. advanced fry stocked	No. of fingerling harvested	Survival rate (%)
Digapahandi	1.6	24,000	17,000	70.83
Kukudakhandi	2.0	30,000	19,000	63.33
Khallikote	0.8	12,000	7,000	58.33
Total	4.4	66,000	43,000	65.15

The nutritional value of sesame oil cake (SOC) has been evaluated in rainbow trout fry (initial body weight of 1.42 g) in a growth trial performed for 45 feeding days at 15 ± 1 °C [11]. Growth rate of fry significantly improved in fish fed SOC diets compared to the fishmeal control diet (D0) whatever the SOC inclusion level. This positive effect on growth was mainly related to a marked improvement of voluntary feed intake. In the present study sesame oil cake and rice bran was given as supplementary feed in 1:1 ratio to the fishes in pond of Digapahandi Block. Growth rate of fishes was comparatively high in that block than the fishes of other blocks fed with GNOC and rice bran in 1:1 ratio.

Mohapatra *et al.* [12] had demonstrated carp seed production and rearing in a remote village Badabishola in Mayurbhanj District, Odisha. Fry of rohu, common carp and grass carp measuring 18-30 mm were raised for 3 months for fingerling production. GNOC and rice-bran at 1:1 (w/w) was used as supplementary feed @ 8-10; 6-8 and 4-6 per cent of initial biomass of fry/day during the first, second and third months of rearing, respectively. After 3 months of rearing of fry 3.15 lakh rohu, 0.38 lakh grass carp and 0.3 lakh common carp fingerlings were harvested out of 5.6, 0.96 and 0.63 lakh fry respectively. The survival rate of rohu was 56.25%. In another study one complete cycle of fish seed rearing practice was demonstrated with hatchery-produced rohu spawn at Nuagaon Village, Nayagarh District during July-August 2010. [13]. Total 4.5 lakh spawn was stocked in 4 earthen ponds of size 0.02 ha each (@ 5.6 million spawn/ha) for harvest of fry in 15-20 days. Around 1.8 lakh fry was harvested and stocked in rearing ponds for fingerling production. Total 0.72 lakh fingerlings were produced after 90 days of rearing. The survivability was calculated to be 40% during the rearing period. In the present study the survival rate from fry to fingerlings is better in village condition ponds in Ganjam District.

4. Conclusion

The present study was undertaken in three C.D. blocks namely Kukudakhandi, Digapahandi and Khallikote of Ganjam district, Odisha under the DST, Government of India sponsored project operating at ICAR-CIFA. Before adoption, the productivity of ponds in terms of plankton volume was assessed. It was low (0.4-0.5 mg/50 liter pond water) and was rectified to 0.8-1.8 mg/50 liter with adoption of better management practices (BMP). The IMC seed rearing was successfully conducted in scientific lines in the adopted villages and the average survivability of 65.15% was achieved from advanced fry to fingerling stage. The study also provided some information on the prevailing conditions of the ponds of the district from aquaculture point of view. Those fish ponds can be utilized for fish production with adoption of BMP.

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