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Effect of Hardness and Ammonia on Survival during Captive Nursery Rearing of Fish Seed in Net Cages in Srikakulam District, Andhra Pradesh

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ABSTRACT

Quality fish seed availability in right time is the major constraint for the development of aquaculture in Srikakulam district of Andhra Pradesh. Captive nursery rearing of fish seed Indian Major Carps Catla (*Catlacatla),* Rohu *(Labeorohita)* and Mrigala *(Cirrhinusmrigala)*up to fry stage in net cages was studied to know the effect of water quality parameters especially hardness and ammonia concentration on survival at 20 locations by Krishi Vigyan Kendra, Srikakulam. Three to five day old spawn stage fish seed was released at the rate of 1, 50,000 numbers in each cage. It was observed that highest survival 38 per cent and lowest 25.33 per cent, where the hardness and ammonia concentrations were in suboptimal range. The average survival rate and net profits observed were 32.18±3.83 per cent and Rs.9331/-, respectively. Based on the above results it is recommended that, nursery rearing of fish seed is a remunerative, reduces losses during transportation and assures the quality fish seed in required quantity.

Key Words: Carps, KVK-Srikakulam, Nursery rearing, Net cages,Survival

INTRODUCTION

Aquaculture is an important source of animal protein with minerals and essential amino acids at lower cost. Apart from the nutritional richness, known fact is it helps in increased employment opportunities and income of rural area.In 2018, World aquaculture and fisheries production reached 178.5Mt out of which 46per cent of production was contributed by aquaculture (FAO, 2020). Of this, fish production 156.4 Mt used for fish consumption, making per capita consumption 20.5 kg. In India, remarkable increase in average growth rate of fisheries sector was observed from 5.27 per cent(2009-13) to 10.87per cent (2014-18) with a share of 7.28 per cent in agriculture economy during 2018-19 (DAHDF, 2018). Indian major carps (IMC) taking key role in aquaculture production from inland water bodies of Andhra Pradesh known as Aqua hub of India.

Srikakulam district is blessed with rich inland water resources,397 community tanks, 2883 panchayat tanks; one reservoir with effective water spread area of 29772 ha. Estimated fish fingerlings are about 52.6 million (Anonymous, 2018). In these tanks composite fish culture is being taken up, adoption of good management practices gives better results (Singh, 2019). The development of induced breeding technology through hypophysation has reduced dependence on natural seed by large scale fish seed production. Recent advancements in brood stock management, hatchery designs, use of hormones in induced breeding techniques has made the way forward in quality seed production throughout India.

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In spite, rapid growth in seed production technologies access to these technologies to the farmers in remote, backward villages still a constraint due to lack of awareness (Mohapatra *et al*, 2011). Availability of quality carp fish seed in required quantity in right time is prerequisite for fast growth of aquaculture (Ayyappan, 2006;Radheyshyam, 2010). However, seed supply in time is the major constraint, and transportation of fish seed from the long distances ending up with very low survival and inappropriate stocking ratios, high incidence of disease outbreaks in grow culture tanks (Abraham*et al*, 2020, Vignesh *et al*, 2017). Hence, nursery rearing of fish seed (spawn to fry and fry to fingerlings) aiming at higher growth rates and survival near to grow out culture tanks for stocking fingerlings in right size and time. Krishi Vigyan Kendra, Srikakulam conducted multi location demonstrations to disseminate the nursery rearing technology of carp fish seed and to find out the feasibility of seed rearing in captivity near to grow out culture tanks.

MATERIALS AND METHODS

The present study was carried out during the months of July and August 2017 in 16 villages covering 11 mandalsin the Srikakulam district of Andhra Pradesh situated betweenco-ordinates of 18°-20' and 19°-10' of Northern latitude and 83°-50' and 84°-50' of Eastern longitude. A total 20 number of farmers and Inland fishermen Cooperative society members were identified and adopted for conduct of captive nursery rearing experiment. Fish tanks of 0.1 to 0.5 ha with 60 to 80 per centof water spread area, 1.5 to 2.0 m water depth were selected.

Dissemination of technology

The technical intervention involved in carp seed rearing from spawn to fry was demonstrated to the beneficiaries identified. The farmers were educated nursery management practices *viz.,* preparation of pond, removal of aquatic weed, eradication of unwanted fish and insects, selection of fish species, identification of quality fish seed, acclimatization, plankton development and analysis, dose calculations of lime, manures and other chemicals, application procedures, responsible use of manures, supplementary feed and other chemicals, growth and health observation, harvesting, segregation, packing and transportation. Critical inputs like IMC fish seed, Hapa net, supplementary feed De Oiled Rice Bran (DORB) and Ground Nut Oil Cake (GNOC) were supported to the farmers.

Carp seed rearing from spawn to fry

Carp fish seed rearing spawn to fry stage was done in 7x3x2 m, size hapas (fixed cages) prepared with 400 micron nylon mesh nets, and bamboo poles. Fixed cages were established at periphery of fish tanks identified in a cool, less turbulent area of pond free from weeds. Care has been taken that, water depth in the cage is about 1.0 to 1.5 m. Fish tanks were limed, fertilized, and applied soap oil emulsion to eradicate insects before establishing cages. Cages were then stocked with 3 to 5 day old spawn stage seed of IMC @ 1,50,000 per cage after acclimatization and the stocking ratio of *Catlacatla, Labeorohita, Cirrhinusmrigala* was 30: 40: 30.

For constant production of phyto, zoo plankton, slurry prepared with GNC, cattle dung, mineral mix and Single Super phosphate (SSP) was applied 3-5 days before stocking. A mixture of DORB and GNOC are used @ 1:1 ratio to prepare the supplementary feed. Fish spawn was initially fed with supplementary feed equal to the biomass per day for a week, later reduced to 50% of total biomass per day. Feeding frequency is 4 times a day initially later reduced to 2 times (morning and evening).

Sampling was done regularly using fine mesh net to check the health status and growth. Final harvesting of fry was carried out by taking the growth parameters. Random samples were taken to record mean length in mm and growth. Survival of seed at final harvest was calculated using formula,

Survival rate %= (No of fry stage fish seed harvested/no of spawn stocked)x100.

Analysis of water quality parameters

Water quality parameters were estimated at regular intervals during the demonstration period. Physico-chemical parameters such as temperature (^{0}C), pH, electric conductivity (EC) (µS/cm), transparency (cm), dissolved oxygen (DO) (ppm), alkalinity (ppm), hardness (ppm) and ammonia (ppm) were analyzed atSoil and water quality testing laboratory, Krishi Vigyan Kendra, Srikakulam, Andhra Pradesh, India.Microprocessor based pH meter (ESICO, Model 1010, celsius thermometer, secchi disk, conductivity meter (Elecronics India, Model 611) were used to measure water pH,temperature,transparency and EC, respectively. Standard laboratory procedures were used to analyze the chemical parameters APHA (2005)

RESULTS AND DISCUSSION

Physico-chemical and productivity analysis of pond waters

Water quality parameters such as temperature, pH, Dissolved oxygen, transparency, conductivity, alkalinity, hardness and ammonia were recorded in all locations found within the optimal range for rearing of fish seed (Table 1). Water pH, in all locations is in alkaline in nature, most of the time from 6.74 to 8.36.

Table 1: water quality parameters in selected areas.

Water quality parameter	Minimum	Maximum
Temperature in ^{0}C	25	33
pH	6.74	8.36
Dissolved oxygen in ppm	3.6	6.4
Transparency in cm	15.2	36.1
Conductivity in µS/cm	112.2	423.1
Alkalinity in ppm	68	174
Hardness in ppm	64	166
Ammonia in ppm	0.2	1.7

Wide range of hardness is having an effect on survival of fish seed (Molokwu and Okpokwasili, 2002) in the demonstration with narrow range of hardness, observed highest survival 38% and 37.33%. Survival of fish seed was less in; where highest hardness was recorded (Fig 1) may be due to stresses during larval development (Onuoha andNwadukwe, 1990).Water temperature, pH, alkalinity are in the range of optimum for seed rearing(Sarangi *et al*, 2008;Korwin-KossakowskiM, 1992).

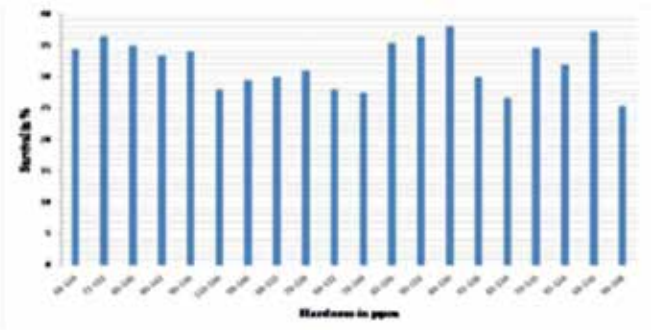

Figure 1: Fish seed survival vs [illegible] in ppm

In the present study ammonia levels were ranged between 0.2-1.7 and the survival of spawn to fry stage is depending on the concentration of ammonia, fish seed exposed to higher range of ammonia levels shows lower the survival (Fig 2). IMC fish seed exposed to sublethal concentrations of total ammonia were in stress observed condition during transportation (Das et al, 2005).

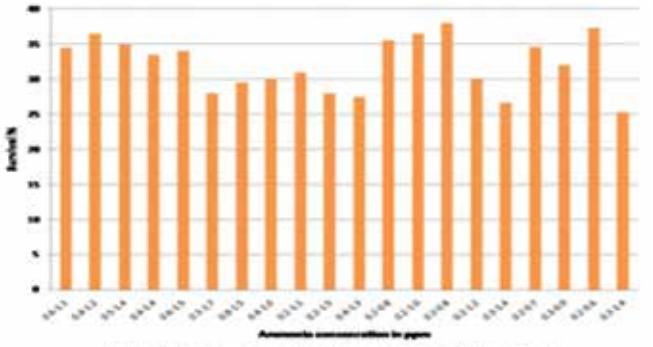

Figure 2: Fish seed survival vs Ammonia concentration in ppm

Survival of fish seed

In the present study fish seed survival from spawn (5-10 mm) stage to fry (20-30 mm)stage was observed in 20 locations for 14-18 days of culture period, was ranged from 25.33 to 38%in Table 2. An average survival of all demonstrations reported was 32.18±3.83% of 20-30 mm size. Carp seed rearing were demonstrated in nursery of Badabishola

Table 2: Survival percentage of carp fry stage fish seed in different locations.

Sr. No	Location	No of spawn released (5 to 10 mm size)	No of fish seed harvested (20 to 30 mm)	survival rate %
1	Solithiri (V),Bhamini(M)	150000	51750	34.50
2	Kothuru(V &M)	150000	54750	36.50
3	Srusuvada (V), Kotturu(M)	150000	52500	35.00
4	SMPuram 1(V), Etcherla(M)	150000	50250	33.50
5	TD Parapuram 1 (V), Palakonda(M)	150000	51000	34.00
6	Kesarodipeta (V), Etcherla(M)	150000	42000	28.00
7	Murandhapadu (V), Etcherla(M)	150000	44250	29.50
8	Komanapalli (V), Hiramandalam(M)	150000	45000	30.00
9	Rajam(V &M)	150000	46500	31.00
10	Palavalsa(V) Burja(M)	150000	42000	28.00
11	Labham(V), Burja(M)	150000	41250	27.50
12	Palakonda(V &M)	150000	53250	35.50
13	N K Rajapuram(V) Palakonda (M)	150000	54750	36.50
14	Sompeta(V &M)	150000	57000	38.00
15	Palasa(V &M)	150000	45000	30.00
16	Oppangi(V), Srikakulam (M)	150000	40000	26.67
17	TD Parapuram 2, (V) Palakonda (M)	150000	52000	34.67
18	SM Puram 2 (V) Etcherla (M)	150000	48000	32.00
19	Madanapuram (V), Burja (M)	150000	56000	37.33
20	Kuddiram (V), Amadalavalsa(M)	150000	38000	25.33
	Total	3000000	965250	32.18 ± 3.83

(V)-Village, (M)- Mandal, (V&M)-Village and Mandal

district in Odisha reported 35, 16 and 21 % of survival in rohu, common carp and grass carp respectively (Mohapatra*et al,* 2014). The survival of fish seed reared in fixed cages was influenced by many factors such as water quality parameters, availability of natural food, supplementary feed etc. In the present study IMC seed rearing (Mix of catla, rohu, mrigala), a survival of 38% was observed in 15 days of culture. An average survival rate of 42.2 and 65.15 % was observed from fry to fingerling stage (Mohapatra *et al,* 2018; Sahoo*et al,* 2017)

Economics

Through the nursery seed rearing of fish seed in fixed cages near grow out culture tanks, the average net benefit of Rs 9331.25 realized per location. However, cost on transportation Rs 2000-5000 based on the distance between culture tank and fish seed hatchery. Loss due to mortality fish seed is 3-16% (Das*et al*, 2015) during transportation stress is Rs 1500-7500 as well loss. The economics of seed rearing was given in Table 3.

Table 3: Economic analysis.

Sr. No	Particular	In Rupees
A	Cost on fish seed(Spawn stage) @Rs. 1000/- Lakh. 30lakh no in 20 locations	30000.00
	Hapa (7*3*2 M.) Cost @ Rs 3000/- can be used for two years (Per year) *i.e.,* 1500 per location	30000.00
	Feed cost (Rice bran + GNC) @3300/-location	66000.00
	Pond preparation cost (Removal of weeds, unwanted fish, insects + Lime+ organic manure)@ 1500/- location	30000.00
	Harvesting charges @ 2000/- per location	40000.00
	Labour, Watch and ward and Miscellaneous@ 5000/- location	100000.00
	Total cost	296000.00
	No of fish seed fry stage (30 to 50 mm) harvested 965250nos @ 32.18% Survival	
B	Value of harvested fish seed (Gross returns)*	482625.00
	Net Profit (B-A) for 20 locations	186625.00
	BC Ratio	1.63
	Net profit per location	9331.25
*Price of fry was Ru 0.50 per individual		

CONCLUSION

The present study was carried out for captive nursery rearing of fish seed near to grow out culture tanks for production of fish seed fry stage at farmer's level for stocking in their fish tanks. The awareness levels of farmers about fish seed rearing was assessed and based on that technical back up was given to adopt good management practices in nursery rearing. In the present demonstrations, achieved 32.18±3.83% survival and there is no additional cost on seed transportation, and developed as a model to farmers of Srikakulam to produce their required quality fish seed for themselves in time.

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