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Effect of Stocking density and Food on Growth of Spawn of Common carp

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ABSTRACT

The spawn rearing shed consists of three cement tank each of size 5m x 1.22m x 1.22m. The stocking density was 25,000 (i.e. 4098/m^3) each in cistern no.1 and 2 and 30,000(i.e.4918/m^3) in cistern no. 3. The stocking size of fish seed was 10.5 mm. The foods offered were natural plankton, rice bran and mustard oil cake, readymade food for aquarium fishes (Toya food) and prepared food (Soya bean+ wheat flour + ground nut oilcake rice bran +egg + mineral powder). The higher stocking density in the present study was found to be the reason of arresting growth due to the high competition of food and space. In present investigation spawn reared at 40.9-49.1 million. The average size of spawn of around 25mm was obtained on 15th day. In 3rd cistern the stocking density was high (4918/m^3) as compared to1st and 2nd cistern (4098/m^3) which influence the growth of fish seed. Thus stocking density and supplementary feeding both influences the growth of fish seed.

Key word: *- Stocking density, Spawn rearing, Fish Seed, Fish Feed.*

Introduction:

The scarcity of quality fish seed is identified as major constraint in popularization of fish farming to utilize the rich potential inland water resource of the country. Till the early sixties, rivers were the only major source of fish seed supply contributing 92% of total seed supply.The collected seed from riverine sources comprises a mixed lot of fish seed and may include uneconomical and predatory fish seed. Despite the fact that the technology of induced breeding and the advancement of various hatchery systems have paved the way for large scale seed production

(Alikunhi *et al.*, 1952; Bhowmik, 1978) over the last four decades thereby reducing the dependence on natural seed stock. Limitations of nursery /rearing ponds, problems in pond preparation and management techniques were recognized as some of the major contributory factors for reduced seed rearing activities, poor survival and growth of fish seed. At National level, the mortality rate reported in rearing spawn up to fry stage is very high (85%) in carp nursery and about 64% from fry to fingerlings in rearing ponds (Alikunhi *et al.*, 1984). Rearing of spawn in nurseries is an important and crucial step in fish culture. The intensification of culture technologies being followed at present has resulted in high stocking rate thereby increasing the demand of stocking materials. Keeping the above facts in mind, the present investigation was undertaken to evaluate the growth and survival of common carp at different stocking densities rearing in cement cisterns under adverse environmental conditions.

Material and Methods*:*-

The present study was conducted at department of Zoology Ch. Ballu Ram Godara Govt. Girls (P.G.) College, Sri Ganganagar (Rajasthan). The area of study Sri Ganganagar district is situated in the north-western part of the state of Rajasthan in the Thar Desert.

Site description:-

The spawn rearing shed at department of zoology, Govt. Girls College, Sri Ganganagar (Rajasthan) consists of three cement tank each of size 5m x 1.22m x 1.22m. The capacity of each tank is thus 7.44 cubic meters. All the tanks are covered by a green net at a height ten feet. This keeps in order avoiding heat radiation. The cisterns are in a row on either side an operating passage. The cisterns are built about one feet height than the surrounding ground area in order to lower the conduction of heat to the water. The water inlet is through a set of three jet at one feet above the bottom outlet. The shed is attached to the Zoology Deptt. and laboratory where biological and other analytical work is carried out. One small tank made-up of stone slabs was constructed for the development of plankton food. However, it was found to be insufficient hence artificial food was given.

Growth pattern of fish seed:-

In the present study, the stocking density was 25,000 (i.e. 4098/m^3) each in cistern no.1 and 2 and 30,000(i.e.4918/m^3) in cistern no. 3. The stocking size of fish seed was 10.5 mm. The growth increment for first five days was observed 0.6 mm per day (5.71%) in cistern no.1 and 0.7 mm per day (6.66%) in cistern no.2 and 3 for first five days. The growth increment for next five days was slightly increased and reduced in last five days. The growth increment for next five days (i.e.5^{th}-10^{th}days) was 0.9 mm per day (6.66%) in cistern no.1, in 2^{nd} cistern 1.0 mm per day (7.14%) and 0.8 mm per day (5.71%) in 3rd cistern. The growth increment for last five days was 0.4 mm per day (2.22%) in cistern no.1 and 3 and 0.6 mm per day (3.15%) in cistern no.2. The growth increment was highest (1.0 mm i.e. 7.14%) in cistern no.2. (shown in table3) The earlier observation that the stocking density influences the growth was supported by this study. There appears slight but insignificant rhythmicity in the growth patterns; being slightly low in the first five days, then higher between 5^{th}-10^{th}days, again slightly depressed in last five days (i.e. 10-15^{th}days).

Food and Feeding of the Fish Seed:-

Following foods were given on experimental basis in order to understand the diets giving the highest conversion ratio or showing their suitability from aspects such as easy availability, cost, easiness of administration, shelf life etc. The foods offered were natural plankton, rice bran and mustard oil cake, readymade food for aquarium fishes (Toya food) and prepared food (Soya bean+ wheat flour + ground nut oilcake rice bran +egg + mineral powder). The natural plankton was grown in stone –slab pond by manuring through cow dung, groundnut oilcake etc. The rate of fertilization is given in table no 1.

Table-1: Fertilization of Ponds during Fish seed rearing						
Pond No.	Pond Size(m)	Fertilized soil (cm)	Cowdung (kg)	Urea (kg)	SSP (kg)	Lime (kg)
1	5x1.22x1.22	10	5.0	0.5	0.07	0.5
2	5x1.22x1.22	10	5.0	0.5	0.07	0.5
3	5x1.22x1.22	10	5.0	0.5	0.07	0.5

The cement cisterns were not exposed to direct sunlight and hence the biodegradation was not rapid, resulting in poor plankton growth. Further, the continuous water circulation lowered the plankton density. Table no.2 give both the water quality and plankton production in the experimental areas.

Table-2: Water Quality and Zooplankton of rearing tank during fish seed rearing

Consignment Date	Max.Air Temp. (0 C)	Water Temp. (0 C)	Relative Humidity(8.30hrs)	pH	DO (mg/l)	CO2 (mg/l)	Total alkalinity (mg/l)	Phos-phate (mg/l)	Nitrate (mg/l)	Zoo-plankton (per lit.)
16.3.2016 to 01.4.2016	23.0 - 37.8	22.2 - 27.8	60 - 94	7.0 - 7.5	4.7 - 7.1	1.8 - 3.8	30 - 58	0.17 - 0.37	0.4 - 1.1	110 - 204

The readymade food (Toya food) was given as it is known to be the best food for the aquarium fishes because of its high digestibility and the resultant low metabolic wastes.

Result Discussion:-

Physico-chemical parameters of water play an important role in the biology and physiology of fish (Ayinla et al, 1994). These parameters are considered critical because they affect the health and productivity of the culture system, (Landau, 1992). The table –2 shows the water quality of the rearing waters. It would be seen from table that all the water quality parameters of the experimental ponds were within the acceptable ranges for aquaculture and there was no abrupt change in any parameter of the pond water. In this study, the pond had similar size and shape and equal depth was maintained throughout the whole period of experiment.

High stocking densities are associated with stress, competition for food and living space, voluntary appetite suppression and more energy expenditure in antagonistic interactions (Yi et al. 2004 and Bachellos and Lulhier, 1999). According to Stickney (1996), the effect of stocking density on production showed that some species can tolerate extreme crowding but competition for food can limit their growth. Havey (1980) also found that there was significant inverse linear relationship between stocking rate and growth. The higher stocking density in the present study was found to be the reason of arresting growth due to the high competition of food and space. In present investigation spawn reared at 40.9-49.1 million. In the present investigation the average size of spawn of around 25mm was obtained on 15th day. The growth pattern and result shown in table 3and 4. The size of above 20 mm is supposed to be the lifting size for IMC seed (Shirgur, 1987, 1988). In fact this targeted growth was achieved much more rapidity. Our system of spawn rearing was found to be less effective after the size of 25-28 mm as after attaining this size heavy mortality began showing in the cisterns and growth also slowed down. This was due to overcrowding. It is felt that after attaining the growth of around 25 mm the density of the seed must be thinned out besides manipulating supplementary feeding. The quality and quantity of feed are important factors affecting growth and reproduction in fishes (Wooton, 1982, Lochmann and Phillips, 1994, James and Sampath, 2002). The optimum growth of aquatic animals largely depends on food quality. The important stage in the development of fish larvae is the changeover from endogenous to endo-exogenous to exclusively exogenous feeding (Santamaria *et al*., 2004). Availability of appropriate live feed during these stages is vital and it decides the survival rate of the larvae. In the present investigation, the feeding experiments could not be framed in the scientific way. However, feeding had shown certain distinct advantages and disadvantages of different feeds. The seed accept the food and it was observed that hanging feeding trays overcrowded with seed avidly eating the Toya feed. The rice bran and mustard oil cake in the ratio 1:1 was used in the cistern no.2 throughout the rearing period and growth was satisfactory. In present study the highest growth was recorded in 2nd cistern (22mm) as compared to that of 1st and 3rd cistern (20mm each), it was due to the effect of stocking density. In 3rd cistern the stocking density was high

(4918/m^3) as compared to1st and 2nd cistern (4098/m^3) which influence the growth of fish seed. The same pattern was obtained in per day growth increment. The highest per day growth increment was recorded in 2nd cistern as compared to that of 1st and 3rd cistern, it was due to the effect of stocking density. Thus stocking density and supplementary feeding both influences the growth of fish seed.

Table-3: Growth pattern of seed(common carp)

Cistern No.	No. of seed stocked	Seed density No./m3	Initial length (mm)	Length increment(mm) per day at a fixed interval			Percent length increment per day at a fixed interval		
				0-5 days	5-10 days	10-15 days	0-5 days	5-10 days	10-15 days
1	25000	4098	10.5	0.6	0.9	0.4	5.71	6.66	2.22
2	25000	4098	10.5	0.7	1.0	0.6	6.66	7.14	3.15
3	30000	4918	10.5	0.7	0.8	0.4	6.66	5.71	2.22

Table-4: Results of fish seed rearing

Cistern No.	Cistern Size(m)	Total No. of seed stocked	Seed density no./m3	Stock-ing size (mm)	Growth increment after days(in mm)			No. of fry harvested	Survival percent after 15 days
					5 days	10 days	15 days		
1	5x1.22x1.22	25000	4098	10.5	13.5	18.0	20.0	11000	44.0
2	5x1.22x1.22	25000	4098	10.5	14.0	19.0	22.0	10700	42.8
3	5x1.22x1.22	30000	4918	10.5	14.0	18.0	20.0	10100	33.6

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