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# Survival, Growth and Breeding Performance of Common Carp (*Cyprinus carpio*) in Semi-Intensive Farming System

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**ABSTRACT**

*Common carp (Cyprinus carpio) is a hardy and resilient freshwater fish capable of surviving in a wide range of environmental conditions. It tolerates variations in temperature, dissolved oxygen, and water quality better than most cultured species. This adaptability allows it to thrive in ponds, lakes, reservoirs, and even moderately polluted waters. The present study was conducted in fish pond of Govt. Degree College, Baramulla to investigate the optimization of rearing and reproductive conditions of Cyprinus carpio (common carp) under a semi-intensive farming system. The research aimed to assess the growth performance, and breeding efficiency through balanced pond management, feed optimization, and controlled water quality. Experimental trials were conducted in a pond with a semi-concrete pond with earthen bottom and concrete sidewalls over a twelve-month culture cycle. Water temperature, dissolved oxygen, and nutrient load were monitored regularly. Broodfish were conditioned using formulated diets with 30% crude protein, and natural breeding was carried out by designing a suitable breeding facility and maintaining optimum environmental conditions to promote natural spawning of* Cyprinus carpio *in captivity. Results revealed that optimum growth and reproductive performance occurred in well maintained semi-intensive system.*

***Keywords:*** *Cyprinus carpio, Semi-intensive system, Water quality, Broodstock management.*

## INTRODUCTION

*Cyprinus carpio* (common carp) is one of the most economically important freshwater fish species worldwide due to its rapid growth, omnivorous feeding habit, high fecundity, and remarkable adaptability to a wide range of environmental conditions. Its ability to thrive in controlled and enclosed farming systems has made it a preferred species for aquaculture development in many countries (FAO, 2024; & Jhingran, 1991). In South Asia, semi-intensive culture systems constitute the backbone of carp aquaculture, where natural pond productivity is enhanced through fertilization and supplementary feeding to achieve higher yields (Jena et al., 2007; & Nandeesha, 1993).

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In India, common carp forms an important component of composite fish culture systems and contributes significantly to inland fish production owing to its fast growth and efficient utilization of available food resources (Das & Ray, 1989; & Jhingran, 1991). Furthermore, the species has demonstrated excellent potential for monoculture under diverse aquaculture conditions. In the Kashmir Valley, *C. carpio* has emerged as a suitable cultivable species because of its ability to survive, grow, and reproduce successfully under the temperate climatic conditions of the region (Yousuf et al., 2012; & Bhat et al., 2018).

Although common carp culture is widely practiced in India, information regarding its growth, survival, and breeding performance under semi-intensive farming conditions in the temperate climatic conditions of Kashmir remains limited. Therefore, the present study was undertaken to evaluate the survival, growth, and breeding performance of *Cyprinus carpio* under a semi-intensive farming system and to assess its suitability for sustainable aquaculture development in the region.

## MATERIALS AND METHODS

### Study site

The present study was carried out in the fish pond of Government Degree College, Baramulla, J&K. The pond is semi-pucca in nature, featuring an earthen bottom and concrete sidewalls. This design maintained natural pond conditions at the base while ensuring structural stability and ease of management through reinforced concrete boundaries. The pond measures 70 feet in length, 35 feet in width, and 6 feet in depth. It is continuously supplied with groundwater from a borewell located within the college campus, ensuring a stable and clean water source throughout the study period. The research was conducted from April 2023 to March 2024 to assess survival and growth rate.

### Stocking of fish seed

Healthy fingerlings (average weight 27.66 g) were procured from National Fish Seed Farm Manasbal, Ganderbal, J&K and were stocked at a density of 5000 fish/ha in the well prepared pond of Government Degree College, Baramulla.

The stocking density was determined in accordance with the recommendations for semi-intensive carp culture provided by Jhingran (1991), Pillay and Kutty (2005), and FAO (2014), corresponding to approximately 5,000 fish $ha^{-1}$. Based on the pond area (approximately 227.6 $m^2$), the calculated stocking capacity was about 114 fingerlings. However, a total of 120 fingerlings were stocked to optimize pond utilization and evaluate their survival, growth, and breeding performance under semi-intensive farming conditions.

### Feeding and Water Quality Monitoring

The stocked fingerlings were *fed once daily with a semi-formulated diet containing 30% crude protein at 5% body weight. The diet was prepared using wheat bran, mustard cake, and fish meal in a 2:1:1 ratio. This feeding protocol was similar to that described by Gangadhara et al. (1997), who used a comparable protein level and feeding rate for rohu. Similar feeding strategies have been successfully applied in other studies on carp species (De Silva & Anderson, 1995; Hasan & Ahmed, 2002;* & *Nandeesha et al., 2000).*

*Water quality parameters, including temperature, dissolved oxygen, pH, alkalinity, and transparency were monitored monthly using standard analytical procedures (APHA, 2017; Boyd & Tucker, 1998;* & *Eaton et al., 2005) to ensure suitable environmental conditions for fish growth and survival. Routine pond management practices like maintenance of water level, removal of debris and aquatic weeds and regular observation of fish health and behavior were followed as described by previous researchers (Bhatnagar & Devi, 2013;* & Pillay & Kutty, 2005).

### Survival and Growth Performance

**Survival Rate -** *Survival rate was determined by comparing the number of fish harvested with the number initially stocked, as commonly practiced in aquaculture studies (Pillay &*

*Kutty, 2005; Khan et al., 2018, & Sharma et al., 2021).*

$$\textbf{Survival Rate}: (\%) = \frac{\textbf{Number of fish harvested}}{\textbf{Number stocked}} \times \textbf{100}$$

**Growth Performance –** Growth performance was calculated using standard aquaculture equations - **Average Daily Gain (ADG), and Specific Growth Rate (SGR)**

1. **Average Daily Gain (ADG)** was calculated as the total weight gain divided by the number of culture days (Lugert et al., 2016).

$$ADG\ (g/day) = \frac{W2 - W1}{t}$$

Where
W2 = final body weight (g),
W1 = initial body weight (g), and
t = culture duration in days.

2. **Specific Growth rate -** Fish were sampled periodically during the culture period to monitor growth. At harvest, average final body weight was recorded and growth performance was evaluated in terms of specific growth rate (SGR) (Gangadhara et al., 1997; Hopkins, 1995; Bera et al., 2024; Ali et al., 2025; & Debnath et al., 2025).

$$Specific\ growth\ rate\ (SGR) = \frac{timeln(W2) - ln(W1)}{t} \times 100$$

Where:
$\mathbf{W_2}$ = final weight (or mass) at the end of the time period
$\mathbf{W_1}$ = initial weight (or mass) at the start of the time period
**ln** = natural logarithm (base *e*, ≈ 2.718)
**t** = the duration between measuring $W_1$ and $W_2$ (in days, weeks, etc.)

**Breeding Set up and Performance**

The breeding of common carp was carried out in the same pond within a separate Happa enclosure specially created for this purpose. Mature brooders (800g – 1 Kg) were introduced into the enclosure, and aquatic plants, mainly Hydrilla, were placed to serve as a natural substrate for egg attachment. The breeding activity commenced within one week, and fertilized eggs were observed adhering to the roots and stems of Hydrilla plants. The eggs were left undisturbed for incubation within the enclosure, and within 48–72 hours, active larvae were seen freely floating and swimming inside the confined area.

Breeding performance was evaluated through spawning success, fecundity, fertilization rate, hatching rate, and larval survival (Pillay & Kutty, 2005; & Rath, 2018). Mature brooders spawned successfully in hapa enclosures, producing fertilized eggs that subsequently hatched under controlled conditions.

Fertilization, hatching, and larval survival rates were calculated as follows:

$$Fertilization\ Rate\ (\%) = \frac{Number\ of\ Fertilized\ Eggs}{Total\ Number\ of\ Eggs} \times 100$$

$$Hatching\ Rate\ (\%) = \frac{Number\ of\ Hatched\ Larvae}{Number\ of\ Fertilized\ Eggs} \times 100$$

$$Larval\ Survival\ Rate\ (\%) = \frac{Number\ of\ Surviving\ Larvae}{Total\ Number\ of\ Hatched\ Larvae} \times 100$$

## RESULTS AND DISCUSSIONS

**Survival Performance**

Survival performance was assessed by comparing the number of fish harvested with the number initially stocked. Out of 120 fingerlings stocked, 109 fish were recovered at harvest, resulting in a survival rate of 90.83 %. The high survival rate (90%) indicates favorable environmental conditions and effective pond management throughout the culture period.

**Growth Performance**

1. **Average Daily Gain (ADG)** in the present study is 1.98g per day. The average weight of fish (fingerlings) at the time of stocking is 27.66 g. Fish attained an average final body weight of 753.40 g after one year of culture. The Average Daily Gain (ADG) of common carp recorded was 1.98 g day$^{-1}$**,** indicating satisfactory growth under the semi-intensive culture conditions adopted. The observed ADG falls within the range commonly reported for common carp cultured in earthen ponds and semi-intensive farming systems. Several studies have reported ADG values ranging from 1.5 to 3.0 g day$^{-1}$ depending on stocking density, feed quality, pond productivity, environmental conditions, and culture duration. The ADG observed in the present study is comparable

to values reported from semi-intensive carp culture systems and reflects efficient utilization of both natural food resources and supplementary feed.

**Table1. Comparison of ADG of *Cyprinus carpio* of past studies with present study**

| Study | Culture System | Culture Duration (days) | ADG (g day$^{-1}$) |
|---|---|---|---|
| Nandeesha et al. (1993) | Semi-intensive pond culture | 300–365 | 1.70–2.20 |
| Jena et al. (2007) | Composite carp culture | 330–365 | ~2.00 |
| Sahoo et al. (2004) | Pond culture with supplementary feeding | 300–360 | 1.80–2.40 |
| Rahman et al. (2019) | Semi-intensive fertilized ponds | 180–240 | 2.10–2.60 |
| Present study | Semi-intensive pond culture | 365 | 1.98 * |

* Value represents the single estimate because only one species was cultured and no experimental replicates were maintained.

2. **Specific Growth rate** –The **Specific Growth Rate (SGR) of common carp recorded in the present study was 0.91 % day$^{-1}$,** which falls within the range commonly reported for common carp reared under semi-intensive pond culture conditions. Growth rates in common carp vary considerably depending on stocking density, feed quality, water quality, culture duration, and management practices. Several studies have reported SGR values ranging from **0.5 to 1.5 % day$^{-1}$** for common carp cultured in ponds. The SGR observed in the present study is comparable to those reported for long-term grow-out culture systems, where fish attain larger body sizes over extended culture periods. Generally, SGR tends to decline as fish increase in size because growth becomes proportionally slower relative to body weight.

**Table2. Comparison of SGR of *Cyprinus carpio* of past studies with present study**

| Study | Culture System | Culture Duration (days) | SGR (% day$^{-1}$) |
|---|---|---|---|
| Nandeesha et al. (1993) | Semi-intensive pond culture | 300–365 | 0.70–1.10 |
| Jena et al. (2007) | Composite carp culture | 330–365 | 0.80–1.20 |
| Sahoo et al. (2004) | Pond culture with supplementary feeding | 300–360 | 0.75–1.05 |
| Rahman et al. (2019) | Semi-intensive fertilized ponds | 180–240 | 0.90–1.30 |
| Present study | Semi-intensive pond culture | 365 | 0.91 * |

* Value represents the single estimate because only one species was cultured and no experimental replicates were maintained.

**Breeding Performance**

The breeding performance of common carp was evaluated under semi-intensive farming conditions by assessing egg production, fertilization success, hatching rate, and larval survival. These parameters are widely recognized as important indicators of reproductive efficiency and seed production potential in cultured fishes (Horváth et al., 2002; & FAO, 2023).

**Table 3. Breeding performance of *Cyprinus carpio***

| Parameter | Value in No.s | Percentage (%) |
|---|---|---|
| Total eggs produced | 200,000 eggs | — |
| Fertilized eggs | 162,000 eggs | 81 |
| Hatched larvae | 113,400 larvae | 70 |
| Surviving larvae | 70,308 larvae | 62 |

The breeding performance of common carp in the present study showed a fertilization rate of 81%**,** hatching rate of 70%**,** and larval survival rate of 62%**.** These values fall within the range commonly reported for breeding of common carp under pond conditions, although they are comparatively lower than the optimum values reported under highly controlled breeding environments using induced breeding in hatcheries.

**Table 4. Comparison of Breeding performance of *Cyprinus carpio* of past studies with present study**

| Study | Fertilization Rate (%) | Hatching Rate (%) | Larval Survival Rate (%) |
|---|---|---|---|
| Jhingran (1991) | 80–95 | 70–90 | 60–80 |
| Chakrabarti et al. (2012) | 85–92 | 75–88 | 65–78 |
| Rath (2018) | 80–90 | 70–85 | 60–75 |
| Present Study | 81* | 70* | 62* |

The common carp exhibited substantial growth during the one-year culture period, attaining an average harvest weight of 753.40 g from an initial stocking weight of 27.66 g. The observed average daily gain (1.99 g $day^{-1}$) and specific growth rate (0.91% $day^{-1}$) indicate favorable growth under the semi-intensive farming system. The final harvest weight recorded in the present study falls within the range of 0.6–1.0 kg reported for common carp reared in semi-intensive and polyculture pond systems under subtropical conditions, demonstrating that the culture practices adopted were effective in supporting fish growth and production.

## CONCLUSION

The present study demonstrated that common carp can be cultured successfully in a semi-intensive pond farming system. Fish achieved a high survival rate of 90%, attained an average harvest weight of approximately 750 g, and exhibited efficient feed utilization Successful breeding in hapa enclosures resulted in high fertilization and hatching rates, confirming the reproductive suitability of broodstock reared under pond conditions. These findings indicate that semi-intensive pond culture offers a productive and economically viable approach for common carp farming. Future investigations should incorporate replicated trials, seasonal growth assessments, and economic analyses to further optimize production efficiency.

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**Conflict of Interest:**
No conflict of interest declared.

**Author Contributions:**

All authors reviewed and approved the manuscript.

## REFERENCES


Bhat, F. A., Yousuf, A. R., Balkhi, M. H., & Mahdi, M. D. (2018). *Status and prospects of carp culture in Kashmir Valley*.

Brummett, R. E., & Noble, R. P. (1995). Different systems of carp production and their impacts on the environment. *Aquaculture, 129*(1–4), 347–372. https://doi.org/10.1016/0044-8486(94)00292-V

Debnath, C., Mahanta, P., & Das, S. K. (2025). Exploring the potential of *Averrhoa carambola* extract for enhancing growth and immunity in *Labeo rohita* in hill aquaculture of North-east India. *Indian Journal of Fisheries, 72*(1), 101–108. https://doi.org/10.21077/ijf.2025.72.1.138767-13

Department of Fisheries, Government of Kerala. (2021). *Package of aquaculture practices*. Department of Fisheries, Government of Kerala. https://fisheries.kerala.gov.in/sites/default/files/inline-files/Aquaculture%20Practices_compressed.pdf

Gouda, P., Sinha, M. K., & Parida, S. P. (2020). A study on biology, brood-stock management and induced breeding of Amur common carp, *Cyprinus carpio haematopterus* (Linnaeus, 1758). *Journal of the Indian Society of Coastal Agricultural Research, 38*(1), 76–83. https://epubs.icar.org.in/index.php/JISCAR/article/view/103181

Hazarika, M. M. A., Kumar, S., Nayak, S. K., Brahmchari, R. K., Kumar, A., Kumar, P., Mogalekar, H. S., & Srivastava, P. P. (2023). Comparative study on growth performance and survival of Indian major carps and male monosex tilapia in recirculating aquaculture system: Culture potential of carp in RAS. *Indian Journal of Fisheries, 70*(1), 36–43. https://doi.org/10.21077/ijf.2023.70.1.132803-06

Jena, J. K., Ayyappan, S., Aravindakshan, P. K., & Muduli, H. K. (2001). Comparative evaluation of growth, survival and production of carp species at different stocking densities under polyculture. *Indian Journal of Fisheries, 48*(1), 17–25.

Jena, J. K., Das, P. C., Das, R., Mondal, S., & Mukhopadhyay, P. K. (2007). Performance of carp culture systems in freshwater ponds. *Aquaculture Research, 38*, 120–128.

Jena, J. K., Das, P. C., Mondal, S., & Mukhopadhyay, P. K. (2002). Comparative evaluation of production performance in varied cropping patterns of carp polyculture systems. *Aquaculture, 207*(1–2), 49–64. https://doi.org/10.1016/S0044-8486(01)00800-6

Jhingran, V. G. (1991). *Fish and fisheries of India* (3rd rev. & enl. ed.). Hindustan Publishing Corporation (India).

Lugert, V., Thaller, G., Tetens, J., Schulz, C., & Krieter, J. (2016). A review on fish growth calculation: Multiple functions in fish production and their specific application. *Reviews in Aquaculture, 8*(1), 30–42. https://doi.org/10.1111/raq.12071

Nath, D. C., & Kalita, K. (2016). Effect of high stocking density of Indian major carps on growth, survival and production in polyculture system. *Journal of the Inland Fisheries Society of India, 48*(2), 25–30. https://doi.org/10.47780/jifsi.48.2.2016.116743

Network of Aquaculture Centres in Asia-Pacific (NACA). (2001). *Transhimalayan fisheries*. Network of Aquaculture Centres in Asia-Pacific. https://library.enaca.org/NACA-Publications/Transhimalayanfisheries.pdf

New, M. B. (2002). *Farming freshwater prawns: A manual for the culture of*

*Macrobrachium rosenbergii* (FAO Fisheries Technical Paper No. 428). *Food and Agriculture Organization of the United Nations*.

Peteri, A. (2005). *Cyprinus carpio* (Common carp). In *Cultured Aquatic Species Information Programme*. Food and Agriculture Organization of the United Nations (FAO). https://www.fao.org/fishery/en/culturedspecies/cyprinus_carpio

Pillay, T. V. R., & Kutty, M. N. (2005). *Aquaculture: Principles and practices* (2nd ed.). Blackwell Publishing Ltd., Oxford, UK.

Rahman, M. M. (2015). Role of common carp (Cyprinus carpio) in aquaculture production systems. *Aquaculture Research, 46*(2), 399–410. https://doi.org/10.1080/21553769.2015.1045629

Rath, R. K. (2000). *Freshwater aquaculture* (2nd ed.). Scientific Publishers.

Reddy, P. V. G. K., Gjerde, B., Tripathi, S. D., Jana, R. K., Mahapatra, K. D., Gupta, S. D., Sahoo, M., Saha, J. N., Lenka, S., Govindassamy, P., & Rye, M. (2002). Growth and survival of six stocks of rohu (Labeo rohita) in mono and polyculture production systems. *Aquaculture, 203*(3–4), 239–250. https://doi.org/10.1016/S0044-8486(01)00540-3

Sharma, J., & Chakrabarti, R. (2003). Role of stocking density on growth and survival of Catla (Catla catla) and Rohu (Labeo rohita) larvae in a recirculating system. *Journal of Applied Aquaculture, 14*(1–2), 171–178. https://doi.org/10.1300/J028v14n01_14

Veerina, S. S., Nandeesha, M. C., De Silva, S. S., & Ahmed, M. (1999). An analysis of production factors in carp farming in Andhra Pradesh, India. *Aquaculture Research, 30*(11–12), 805–814. https://doi.org/10.1046/j.1365-2109.1999.00397.x

Venkatachalam, S., Kandasamy, K., Krishnamoorthy, I., & Narayanasamy, R. (2018). Survival and growth of fish (Lates calcarifer) under integrated mangrove-aquaculture and open-aquaculture systems. *Aquaculture Reports, 9*, 18–24. https://doi.org/10.1016/j.aqrep.2017.11.004

Yousuf, A. R., Bhat, F. A., & Balkhi, M. H. (2012). *Fisheries and aquaculture resources of Kashmir Valley*.