



To Study the Growth Performance of *Mystus vittatus* (Bloch, 1794) by Feeding 40% Rich Crude Protein Diet

Debbarma Ritesh, Kothari Bhupendra and Das Rakhi*

Department of Aquaculture, School of Agriculture,
Sanjeev Agrawal Global Educational University, Bhopal (Madhya Pradesh), India.

(Corresponding author: Das Rakhi*)

(Received: 02 April 2024; Revised: 28 April 2024; Accepted: 17 May 2024; Published: 15 June 2024)

(Published by Research Trend)

ABSTRACT: The aim of this study was to check the growth performance of the *Mystus vittatus* in captive condition for 45 days upon feeding with prepared feed against the commercially available feed consisting of 40 % protein content. In this experiment, two treatments were prepared i.e., Treatment 1 contains the experimental ingredients and a second treatment is a commercial feed. In each treatment, 10 numbers of fish were stocked and fed with 5% of its body weight. The increased in growth rate were observed in both the treatments. Comparatively, the better performance of treatment 1 was observed with a good FCR of 2.03 and net biomass increased by 13.71g with daily biomass gained up to 0.30g/day. In treatment 2 the net biomass was much lower with a net biomass gain of 5.67g with a daily weight gain of 0.12g/day.

Keywords: Captive condition, *Mystus vittatus*, growth performance, growth rate, FCR, net biomass, and daily weight gain.

INTRODUCTION

Mystus vittatus, also known as the striped dwarf catfish belongs to the family bagridae. It is found in freshwater and brackish water systems with marginal vegetation in lakes and swamps with a mud substrate of Asian countries Pakistan, India, Sri Lanka, Nepal, Bangladesh, and Myanmar (Talwar and Jhingran 1991). The body of *Mystus vittatus* is elongated and slightly compressed with the maxillary barbels extending from the pelvic fins to the end of the anal fins. The fin formula of this species is D6-7(1), A12-13, V31-37 Hossain *et al.* (2006). Generally, this species often has body similarities with the other *Mystus* Sp. (such as *Mystus tengara*, *Mystus gulio* and *mystus bleekeri*). *M.vittatus* prefers to live either in stagnant water bodies like swamps, wetlands, paddy field irrigational canals, ponds, and lakes within the shallow waters with a muddy substrate, as well as in rivers and streams, these species could be found. The feeding habits were observed by Rao (2017); Victor *et al.* (2014); Mondal *et al.* (2017) that *Mystus* species mainly feeds on insects, small fishes, crustaceans, zooplankton, and even plant materials. Their peak breeding season occurs usually in the monsoon season (May to August and breeding could be extended till the month of September) reported by Gupta and Banerjee (2015). *M. vittatus* attains its sexual maturity when it reaches 8.5 to 9.5 cm, however, a female could be observed to reach its maturity at 7.5cm in total length as reported by Hossain *et al.* (2006).

MATERIALS AND METHODS

A. Study area

This experiment was performed in the Department of Aquaculture, School of Agriculture, Sanjeev Agrawal Global Educational University (SAGE) Sahara bypass road, Bhopal, Madhya Pradesh 462022, India. Lat 23.184385°N Long 77.522782°E.

B. Experimental procedure

The fry of *Mystus vittatus* were collected from the canal of Barrai, Sahara Bypass road, Bhopal, Madhya Pradesh, India. The collected *M. vittatus* seeds were disinfected using KMnO₄. During the following days, the artificial feeds for 500g were prepared using the Pearson feed formulation using ingredients such as dry fish meal, wheat flour, salt, raw turmeric powder, chili powder, orange peel, and vitamin B Complex tablet. And on the other hand, commercial feed was fed to the quarantine fish seeds. Rectangular glass tanks were used for studying the proposed experiment. The tanks were cleaned properly using tap water and KMnO₄. Then the tank was fitted with water filter cum aerators and one pinch of salt was mixed with the water before stocking. Rectangular glass tanks with two different treatments (T1 and T2) were stocked with the *Mystus vittatus* fries. In each treatment 10 numbers of seed were stocked with the average weight of 0.76 ± 0.06g in treatment-1 and 0.55 ± 0.05g in treatment-2.

C. Feed preparation

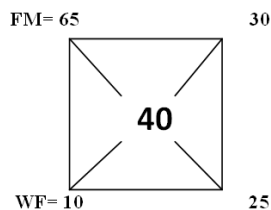
The artificial feed for 500g was prepared using the Pearson square method. Ingredients such as dry fish meal, wheat flour, raw turmeric powder, chili powder,

orange peel powder, common salt, and Vitamin-B complex tablet.

Table 1: Ingredients used in feed preparation.

| Sr. No. | Ingredients | Quantity in gram (g) |
|---------|---------------------------|----------------------|
| 1. | Dry fish powder/fish meal | 227.5 |
| 2. | Wheat flour | 272.7 |
| 3. | Raw –turmeric powder | 1.0 |
| 4. | Orange peel powder | 1.0 |
| 5. | Chili powder | 1.0 |
| 6. | Common salt | 1.0 |
| 7. | Vitamin B complex | 2.0 |

The feed containing 40% protein were prepared using the Pearson feed formula with the ingredient of Fish meal (65% of protein content), and wheat flour (10% protein content).



Total feed in gram for 500g for 40% protein content

Wheat flour (WF) = $500 \times 54.54/100 = 272.70\text{g}$

Fish meal (FM) = $500 \times 45.5/100 = 227.50\text{g}$

After feed preparation, it was kept for sun-drying at least for 10 hours. The stocked fish fries were fed twice a day once in the morning and another in the evening with 5% of its body weight. The fecal matter or excreta was siphoned every 5 days and the new water was being replaced.

Fish Growth to be observed

(a) F.C.R= Feed given/fish weight gain

(b) Net Biomass gain (g) = (final biomass – initial biomass)

(c) Daily Biomass gain (g/day) = [final biomass – initial biomass]/culture period

(d) Specific Growth Rate per day (%) = $\frac{\ln(\text{final weight}) - \ln(\text{initial weight})}{\text{no. of experimental days}} \times 100$

E. Water quality parameters

Water quality such as dissolved oxygen, total alkalinity, total ammonia, nitrate & nitrite was checked every weekend using the titration method in the Aquaculture Laboratory (School of Agriculture, SAGE University, Bhopal). Water pH was measured using the electronic pH meter. And, the water temperature was measured using an electronic thermometer.

RESULT AND DISCUSSION

Two types of feed were fed to determine the better growth performance of *Mystus vittatus* fries for 45 days. Treatment-1 and treatment-2 containing experimental feed (prepared feed) and the commercial feed were examined in the laboratory for their proximate composition shown in Table 2. The growth responses and feed conversion upon feeding with the isonitrogenous feed containing 40% crude protein to the fishes were shown in Table 4 and Figure no. 1, 2, and 3

respectively. The hydrochemical parameters such as water temperature, dissolved oxygen, water pH, total alkalinity, ammonia, nitrate, and nitrite were observed every 15 days of experimental periods. The measured water quality parameters are shown in Table 3.

The net biomass gain in this study for 45 days in treatment-1 and treatment-2 were 13.71g and 5.67g. The specific growth rates measured in every sampling were 2.20%, 2.60%, and 1.80% in Treatment-1 and 2.10%, 1.60%, and 1.42% in Treatment-2. The study results of the feed conversion ratio in both treatments were 2.03 and 2.54 on average.

During this experimental study, the water temperature was constantly decreasing, therefore electric heaters were used to maintain the water temperature around 28°C. water temperatures were monitored daily in both the time morning and evening, and the readings were between 24°C to 29°C according to Rem *et al.* (2020). In both treatment, the pH value did not differ much and the range was 7.4 to 7.8. The other water parameters were in good range as discussed in Table 3. and similar to the findings of Ali *et al.* (2018). Overall, the water quality was in the acceptable range in the entire experimental period as discussed by Ekubo and Abowei (2011); Bhatnagar and Devi (2013).

Mystus vittatus is an omnivorous fish, that mainly feeds upon small fishes, crustaceans, zooplanktons, and some plant materials Chakladar *et al.* (2014); Gupta and Banerjee (2014); Rao (2017). In this study, feeding *Mystus vittatus* with an experimentally prepared feed by comparing with the commercial feed (isonitrogenous diets) with the experiment period of 45 days has been observed.

According to Chattopadhyay *et al.* (2014), *Mystus vittatus* is a slow-growing fish, the body growth observed in this experiment gives the satisfied result in the Treatment-1 with 0.30g/day, with the average Specific growth rate (SGR) of 2.2% but higher than the finding of Mondal *et al.* (2017); Hasan *et al.* (2023), but in treatment-2 the finding of SGR (%) of 1.70 % were similar with the study of Mondal *et al.* (2017); Hasan *et al.* (2023). The study also shows that the feed conversion ratio (FCR) in Treatment -1 was relatively constant in 30 days at 1.86 and in the next 15 days it increased to 2.37, it may be due to the competition among themselves for food or space limiting effect in the culture medium or may be due to the fluctuation of temperature the metabolism activity could decrease in its body agreeing with Gupta and Banerjee (2014 and 2015); Mondal *et al.* (2017); Hosen *et al.* (2017) ; Hasan *et al.* (2023). Similarly, in treatment-2 the FCR was normal but gradually increased during the study period shown in the Figure. 3 graph, a similar finding with Hasan *et al.* (2023).

Mystus vittatus is a slow-growing fish among the catfishes, but feeding with the proper diet could make it to the moderately growing catfish. In this study, it has been found that the FCR, SGR (%), and weight gain(g) of both treatments are quite acceptable. However, the feed that was prepared with the crude protein of 40% has performed the best in terms of fish growth and desirable FCR value. According to Hosen *et al.* (2017), the striped catfish *M. vittatus* should be reared in a

monoculture in ponds or tanks for proper growth. And most importantly it would not be wrong to mention the feed was economical and easy to prepare manually with low input.

Table 2 : Nutritional composition in treatment-1 and treatment-2.

| | Prepared feed (Treatment-1) | Commercial feed (Treatment-2) |
|-------------------|-----------------------------|-------------------------------|
| Crude protein (%) | 40 | 40 |
| Crude lipid (%) | 8.2 | 5 |
| Crude fibre (%) | 9.5 | 7 |
| Moisture (%) | 18 | 10 |

Table 3: Water quality parameters recorded throughout the experiment.

| Sr. No. | Water parameters | Treatment-1 | Treatment-2 |
|---------|---|------------------|------------------|
| 1 | Water temperature | 24 -29°C | 24 -29°C |
| 2 | Dissolved oxygen | 5.8- 7.6 mg/l | 6.1-7.7 mg/l |
| 3 | Ammonia | 0.04-0.06 mg/l | 0.02-0.05 mg/l |
| 4 | Nitrate (NO ₃ ⁻) | 0.02-0.4 mg/l | 0.03-0.04 mg/l |
| 5 | Nitrite (NO ₂ ⁻) | 0.001-0.003 mg/l | 0.001-0.002 mg/l |
| 6. | Total Alaklinity | 55-63 mg/l | 61-65mg/l |
| 7. | pH | 7.4-7.7 | 7.4-7.8 |

Table 4 : Growth performance of *Mystus vittatus* upon feeding with experimental diet and commercial feed in 30 days

| Sr No. | | Treatment-1 | Treatment-2 |
|--------|----------------------|-------------|--------------|
| 1 | Initial weight (avg) | 7.87 g | 5.75 g |
| 2 | Final weight (avg) | 21.58 g | 12.60 g |
| 3 | Net biomass gain | 13.71 g | 5.67 g |
| 4 | Daily biomass gain | 0.30 g/day | 0.12 g/day |
| 5 | SGR (%) | 2.2,2.6,1.8 | 2.1,1.6,1.42 |
| 6 | FCR | 2.03 | 2.54 |

SGR- Specific Growth Rate and FCR- Feed Conversion Ratio

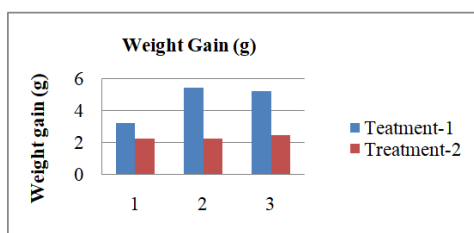


Fig. 1. Bar graph showing the Weight gain of *Mystus vittatus* in every 15 days.

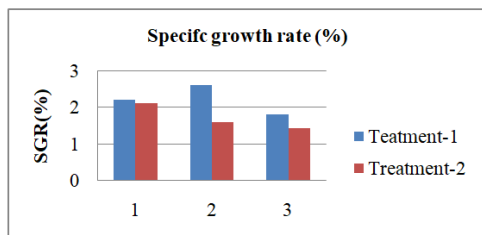


Fig. 2. Bar graph showing the Specific Growth Rate (SGR) percentage of *Mystus vittatus* in every 15 day.

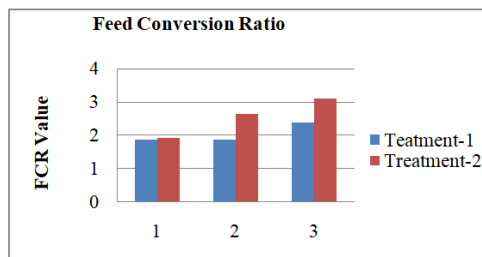


Fig. 3. Bar graph showing the Specific Growth Rate (SGR) percentage of *Mystus vittatus* in every 15 days.



Fig. 4. Experimental diet preparation.



Fig. 5. Sampling at the end of experiment.

CONCLUSIONS

Tengara fish can be raised in small spaces like cemented tanks or small ponds. It can also be polycultured with IMCs and other Cyprinid species. Feeding is one of the most important aspects of aquafarming; higher feed quality leads to higher production. In this study, feed prepared and fed to *Mystus vittatus* fries was found to be efficient, with improved growth parameters and a higher FCR than commercial feed. Throughout, the study period, the water quality parameter remained unaffected or showed no anomalies. Thus, feeding *M. vittatus* with readily available ingredients could prove profitable for any fish farmer.

FUTURE SCOPE

Dwarf Stripped catfish, also known as tengara fish, is well-known for its delicious flavor and commands a high market price (when alive). Many aquarists regard *Mystus* species as potential ornamental fish for the ornamental fish industry. Thus, culturing *Mystus* species or Tengara could be profitable for many fish farmers while also contributing to national income through the fish food or ornamental fish industries. Feeding *Mystus* species with locally available

ingredients may be more cost-effective and reduce feed purchases.

Acknowledgement. I would like to thank the School of Agriculture, Department of Aquaculture, Sanjeev Agrawal Global Educational University, Bhopal, for providing me with all of the laboratory equipment and assistance I needed for this research study.

Conflict of Interest. None.

REFERENCES

- Ali, M. Z., Paul, M., Jana, P., Rahman, M. K., & Mahmud, Y. (2018). Evaluation of selected dietary probiotics on growth performance, nutrient utilization and body carcass composition of *Mystus cavasius* (Hamilton, 1822) fry. *International Journal of Current Microbiology and Applied Sciences*, 7(8), 3328-3339.
- Bhatnagar, A., & Devi, P. (2013). Water quality guidelines for the management of pond fish culture. *International journal of environmental sciences*, 3(6), 1980-2009.
- Chattopadhyay, S., Nandi, S., & Saikia, S. K. (2014). Mouth morphometry and architecture of freshwater cat fish *Mystus vittatus* Bloch (1974) (Siluriformes, Bagridae) in relation to its feeding habit. *Journal of Scientific Research*, 6(1), 169-174.
- Ekubo, A. A., & Abowei, J. F. N. (2011). Review of some water quality management principles in culture fisheries. *Research Journal of Applied Sciences, Engineering and Technology*, 3(12), 1342-1357.
- Gupta, S., & Banerjee, S. (2014). Food and feeding habit of a freshwater catfish, *Mystus tengara* (Siluriformes: Bagridae). *Journal of ichthyology*, 54, 742-748.
- Gupta, S., & Banerjee, S. (2015). Length-weight relationship of *Mystus tengara* (Ham.-Buch., 1822), a freshwater catfish of Indian subcontinent. *International Journal of Aquatic Biology*, 3(2), 114-118.
- Hasan, K. R., Ahamed, S., Mahmud, Y., & Mou, M. H. (2023). Culture technique of Tengra (*Mystus vittatus*) with short cycle fish species in the drought prone northern region of Bangladesh. *Archives of Agriculture and Environmental Science*, 8(3), 370-376.
- Hosen, M. H. A., Pervin, R., & Shahriar, S. I. M. (2017). Changes in growth performances, survival rate and water quality parameter of pond on different stocking density of Gulsha Tengra (*Mystus cavasius*) in a monoculture system. *Int J Fish and Aquat Stud*, 5(6), 52-56.
- Hossain, M. Y., Ahmed, Z. F., Leunda, P. M., Jasmine, S., Oscoz, J., Miranda, R., & Ohtomi, J. (2006). Condition, length-weight and length-length relationships of the Asian striped catfish *Mystus vittatus* (Bloch, 1794)(Siluriformes: Bagridae) in the Mathabhanganga River, southwestern Bangladesh. *Journal of Applied Ichthyology*, 22(4), 304-307.
- Mondal, A., Chakravarty, D., & Zaman, S. (2017). Feeding Ecology with Prey Electivity and Growth Performance of Indigenous Asian Striped Dwarf Catfish, *Mystus Vittatus* (Bloch, 1794) in Low Saline Earthen Ponds of Indian Sundarbans. *Annals of Marine Science*, 1(1), 032-038.
- Mondal, A., Sundaray, J. K., Bhattacharyya, S. B., Chakravarty, D., Zaman, S., & Mitra, A. (2017). Growth performance, feeding ecology and prey preference of Bagrid catfish, *Mystus tengara* (Hamilton, 1822) in low saline polyculture ponds of Indian Sundarbans. *International Journal of Aquaculture and Fish Science*, 3(1), 001-008.
- Rao, K. R. (2017). Food and feeding habits of freshwater Catfishes (Siluriformes: Bagridae: *Mystus* sp.). *International Journal of Life-Sciences Scientific Research*, 3(1), 786-791.
- Rem, P., Chiayvareesajja, S., & Suanyuk, N. (2020). Effects of temperature on growth performance and water quality in culture system of butter catfish (*Ompok bimaculatus*). *Songklanakarin Journal of Science and Technology*, 42(6), 1253-1258.
- Talwar, P. K., & Jhingran, A. G. (1991). *Inland fishes of India and adjacent countries* (Vol. 2). CRC press.
- Victor, R. M., Sivakumar, R., & Mathialagan, R. (2014). Food and feeding habit and length-weight relationship of the Asian striped catfish *Mystus vittatus* (Bloch, 1794) (Siluriformes: Bagridae) in the Vadavar River, Lower Anicut, Tamil Nadu. *Indian Journal of Science*, 8(20), 55-64.

How to cite this article: Debbarma Ritesh, Kothari Bhupendra and Das Rakhi (2024). To Study the Growth Performance of *Mystus vittatus* (Bloch,1794) by Feeding 40% Rich Crude Protein Diet. *Biological Forum – An International Journal*, 16(6): 173-176.