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Study on the growth and survival of *Channa striatus* (Bloch) postlarve using live feed

W. Mehraj Ud Din, K. Altaff * and M. A. Haniffa*
Unit of Reproductive Biology & Live Feed Culture. Dept. of Zoology
The New College, Chennai 600 014, Tamilnadu, India.
*Centre for Aquaculture Research & Extension, St. Xaviers College
Palayamkottai 627 002, Tamilnadu, India.
*Corresponding author e-mail: kaltaff@rediffmail.com, mehrajuddinwar@yahoo.co.in

Abstract
Feeding experiments were conducted on the postlarvae of *Channa striatus* with two different live feeds – a copepod (*Thermocyclops decipiens*) and cladocerans (*Moina micrura* and *Ceriodaphnia cornuta*) individually and in mixture. Food was provided at the rate of (500±50 Ind./L) and the experiments were carried out in 100 litre capacity tanks for 30 days. Results indicated better weight gain (951.85±28.77%) and survival (92.00%) of postlarvae fed with mixed live food than individual live feed organisms.

Key words: Postlarvae, Copepod, Cladocerans, *Channa striatus*.

Introduction

In larviculture artificial diets may perform poorly due to poor digestibility (Lauff and Hofer 1984), deficiency of growth factors (Higgs *et al.*, 1985), and insufficient stimulation of feeding behavior or pollution due to over feeding (Dave 1989). The cladoceran genera such as *Miona* and *Daphnia* have been used in freshwater fish larval rearing successfully, their biochemical profile with respect to organic and inorganic components are reported to be higher than the levels prescribed for freshwater fish larvae. Common carp and Atlantic salmon grew faster when fed on zooplankton (Kamler *et al.*, 1992) as compared to formulated diets. LeBrasseur (1969) observed higher growth rate and better food conversion in chum salmon (*Oncorhynchus nerka*) fed on live zooplankton. Watanabe *et al.*, (1983) reported an excellent protein efficiency ratio (PER) value of rainbow trout fed with *Daphnia* and *Moina*. Zooplankton are rich in essential amino and fatty acids (EPA and DHA) and should be sufficient as the first source of nutrients required by fish for growth (Kanazawa *et al.*, 1979). The exquisite value of copepods as live feed has been acquainted by the works of Kraul (1989) on the mass culture of these zooplankton. The

nauplii, copepodid stages and adults have wide spectrum of sizes ranging from 50μm to several millimeters rendering them highly suitable as live feed for many commercially important larvae of fishes, prawns, shrimps and mollusks. In order to get consistent results it is proposed to conduct experiments on the postlarvae of *Channa striatus* with different live zooplankton cultured in the lab comprising of a cladocerans (*Moina micrura* and *Ceriodaphnia cornuta*), and a copepod (*Thermocyclops decipiens*), to record feed acceptability, their survival and growth.

Material and methods

Experiments were conducted to study feed acceptability, growth rate and survival of postlarvae of *Channa striatus*. The postlarvae were collected from Centre for Aquaculture Research & Extension (CARE), St. Xaviers College, Tamilnadu. These postlarvae were transported to the laboratory and maintained in large tanks. For feeding experiments 4 batches of postlarvae having 25 numbers in each fibre tank with 50 litres of water were provided with different types of food. Cladocerans (*M. micrura* and *C. cornuta*) and Copepods (*T. decipiens*) cultured in the laboratory were fed to the larvae as individual and mixed feed.

Food was not offered to the larvae on the first day. The larvae were allowed to acclimatize in the laboratory condition for two days. During acclimatization feacal pellets and other debris were removed every day in the morning and 50% of the water was renewed. After third day, the entire water of the tank was renewed and food was given thrice a day at 8 hours interval at the rate of (500± 50 Ind./L) (Qin, *et al.*, 1997).

The postlarvae with similar length and weight (measured to the accuracy of 1 mm and 0.01 gm for length and weight respectively) were introduced in the circular fibre tanks @ of 25 larvae per tank. Experimentation was conducted in three replicates with these feeds for 30 days. Length and weight of the postlarvae were measured before and at the end of the experiment and the values were used for statistical analysis.

Results

Among the 4 types of live feed offered, highest growth was recorded in the fishes fed with mixture of copepod and cladoceran diet (SGR 3.97 ± 0.06, AWG, 951.85 ± 28.77) with significantly higher survival (92.00%) as shown in Table 1.

Among individual feeds *T. decipiens*, showed better results (SGR 3.97 ± 0.06, AWG, 442.66 ± 15.39) followed by *C. cornuta* (SGR, 3.49 ± 0.03 AWG, 404.66 ± 16.70) and *M. micrura* (SGR, 3.36 ± 0.09 AWG, 3.36 ± 0.09). Significantly better weight gain (2.57 gm) and increase in length (1.73 mm) was recorded in postlarvae fed on mixed zooplankton and lesser weight gain (1.00 gm) and increase in length (0.75 mm) in fishes fed on individual diet of *M. micrura.*

Table 1. Growth and survival in postlarvae of *Channa striatus* fed on different individual live feed and their mixed feed (Mean ± SE)

Feeds	Ceriodaphnia	Moina	T. decipiens	Mixed feed
Initial length (mm)	1.76 ± 0.01^{a}	1.75 ± 0.01^{a}	1.77 ± 0.01^{a}	1.77 ± 0.01^{a}
Final length (mm)	2.5 ± 0.01^{a}	2.40 ± 0.02^{a}	2.6 ± 0.02^{b}	3.5 ± 0.04^{c}
Increase in length (mm)	0.75^{e}	0.65^{f}	0.83^{g}	1.73^{h}
Initial weight (g)	0.26 ± 0.01^{a}	0.24 ± 0.01^{a}	0.27 ± 0.01^{a}	0.27 ± 0.01^{a}
Final weight (g)	1.31 ± 0.06^{a}	1.24 ± 0.05^{a}	1.46 ± 0.02^{b}	2.84 ± 0.01^{c}
Weight gain (g)	1.05^{e}	1.00^{e}	1.19^{f}	2.57^{g}
SGR (SGR %)	3.49 ± 0.03^{a}	3.36 ± 0.09^{a}	3.97 ± 0.06^{b}	8.56 ± 0.073^{c}
Weight gain (AWG %)	404.66 ± 16.70^{a}	3.36 ± 0.09^{a}	442.66 ± 15.39^{a}	951.85 ± 28.77^{b}
Survival (%)	80.00^{a}	80.00^{a}	84.00^{b}	92.00^{c}

Values in each row with different superscripts are significantly different at < 0.05 level of significance.

Discussion

The results suggested that postlarvae fed with mixed diet showed better growth and survival and were considered to be the best source of nutrients. The mixture of cladocerans (*M. micrura* and *C. cornuta*) and copepod (*T. decipiens*) might supply all required essential nutrients, thereby provides balanced diet. The movement of copepods and their nauplii triggers the feeding responses in fish larvae. The 'jerking' swimming action of most copepod nauplii and adults is believed to be an important stimulus for initiating feeding by fish larvae (Buskey 2005). The HUFA's are also likely to be present in the correct ratio to enhance survival and growth of fish larvae (McKinnon *et al.*, 2003). Due to the

smaller size and higher locomotive behaviour *C. cornuta* becomes most preferable species by the fish larvae (Suresh kumar 2000) which in turn results in frequent encounter thereby increasing the ingestion rate.

Snakehead can be successfully weaned by feeding them with live plankton from hatchling to larval stage and with combined diet (Live *Chironomous* larvae and formulated diet) during the fry stage (Haniffa and Arockia Raj 2000). Parameswaran (1975) reported that smaller postlarvae (5 – 15 mm) subsist on plankton of which zooplankton constituted the bulk (97.4%) consisting mainly of cladocerans (63.6 %), rotifers (27.9 %) and protozoan (5.4 %) the rest being other zooplankton. Large post larvae (16 - 30 mm) consumed in addition to above (Cladoceran 41.3 %, rotifer 6.2 %, copepods 27.9 % and phytoplankton 0.7 %), aquatic insects and other hemipterous and young shrimp. Hoff and Snell (1989) reported that snakehead larvae could be successfully reared using plankton, which can actively swim for 5 hours in freshwater, thereby extending their availability for larval consumption. Fregadolli (2003) has also reported predation of larvae of Brazilian fishes, *Piaractus mesopotamicus* and *Colossoma macropomus* on a cyclopoid copepod *Thermocyclops* sp. as first feed.

These findings suggest that snakehead can be successfully weaned by feeding the larvae with live plankton from hatchling to fry stage. Easy ingestion of live food organisms as well as their high content of essential factors, such as vitamins, enzymes are likely to be the plausible causes for better survival and growth of larvae and post larvae as observed by Kahan (1984). The ranking of protein quality on experimental diets based on EAAI (Essential Amino Acid Index) by Tacon (1990) is tuned with the present results, in which copepod fed diet stands first foreshadowing its utility.

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