

## Effect of different substrates on length-weight relationship of *Clarias batrachus* Larvae

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### Abstract

Utilization of three substrates *viz.*, rice straw, bamboo poles and small stones for the culture of *Clarias batrachus* larvae was studied for a period of 75 days. In the present study the larvae were cultured separately in three substrates. The water quality parameters such as dissolved oxygen, pH, water temperature, alkalinity and dissolved carbon dioxide were monitored regularly. The addition of substrates showed minor variations in water quality parameters. The initial total length and weight of twenty larvae were recorded for the individual tanks. At the end of 75 days, all surviving larvae were collected and counted. The final total length and weight of larvae were recorded. Among the three substrates the growth response of the larvae was more in rice straw substrates followed by small stones and bamboo poles. These results suggest that the nature of substrates had significantly influenced the growth of *Clarias batrachus* larvae.

**Keywords:** *Clarias batrachus*, larvae, length, substrate, weight

### INTRODUCTION

Despite the growth of the aquaculture sector, fish production still needs to double to satisfy the minimum protein requirement for human consumption. However, inland fisheries production is declining due to construction activities, over-fishing, irrigation and reclamation of land for human settlement. There is, therefore, a strong need to develop aquaculture techniques that enhance fish production in closed water bodies. Substrates in natural aquatic systems are known to support fish production (Welcomme, 1972; Ferguson and Rublee, 1976; Kirchman, 1987). Substrates provide sites for epiphytic microbial production consequently eaten by fish food organisms and fish. Asian catfish, *Clarias batrachus* is regarded as an important species for commercial aquaculture. Its aquaculture potentials have been mentioned at several occasions (Thakur and Das, 1986; Arrerat, 1987). These encourage people for its intensive aquaculture in Indian subcontinent. In spite of its potentials for aquaculture, the short supply of desirable stocking materials has been felt for its aquaculture production. However stocking material of a species remains a fundamental need for its successful aquaculture. It is well known that a series of rearing activities is required to get suitable stocking material in this species. The rearing of *C. batrachus* larvae to fry is usually carried

out inside the hatchery whereas rearing of fry to fingerling is in nursery tanks for getting stocking material (Sahoo *et al.*, 2004). The rearing pattern varies from species to species. Hence in the present study the effect of three different substrates on length-weight relationship of *C. batrachus* larvae under laboratory conditions was studied.

### MATERIALS AND METHODS

The broods of *C. batrachus* with an average 120 g body weight were collected from brood stock of Department of Zoology, Annamalai University, Annamalainagar. The females were injected with Ovaprim at 1 ml/kg body weight and stripped at 17 h post injection for egg collection. Testes were obtained from male by dissection. They were squeezed and mixed with normal saline to get the sperm suspension. The stripped eggs and sperm suspension were mixed well for fertilization. The eggs were incubated in plastic trays provided with flow through water (0.2 l/min). The hatchlings were collected after 28 h of egg incubation. The larvae were released in a series of cement tanks at 2000/m<sup>2</sup> in the indoor hatchery. After yolk sac absorption, the larvae were fed continuously with mixed zooplankton. The larvae thus reared were collected at the age of five, ten and fifteen days, and were utilised for experimental purpose. The experiment was conducted in a 25 m<sup>3</sup> (5 × 5 × 1 m) cement tanks with 15-cm soil base. In all the tanks initially added 0.25 kg of quick lime and 2.5 kg of poultry manure. Water was filled to the tanks from a perennial well and a depth of 90 ± 2 cm was maintained throughout the experimental period. Sampling for water quality parameters such as water temperature, dissolved oxygen, and pH were measured using a Horiba (Japan) water quality analyser

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(Model U 10). Total alkalinity, and dissolved carbon dioxide were estimated as per out APHA (2005) and photoperiod was held at 12:12 (light/ dark). The larvae of control aquaria were fed with *Artemia* sp. Twenty larvae were placed in each aquarium. Each aquarium contained 1.9cm diameter PVC pipes in excess as refuge. Three substrates viz., rice straw, small stones and bamboo poles were tested. All substrates were tested in triplicate for a total of nine aquaria. Rice straw collected locally were sun dried, bundled using nylon rope (Length 75 cm; diameter 5cm) and introduced into the tank randomly at the rate of 5 kg, by suspending the bundles at regular distances from bamboo poles keeping across the tanks. Bamboo culms from the local market were cut into 1.5-m lengths and planted at a density of 98 poles tank<sup>-1</sup>. The larvae were counted at the desired age and released in the prepared cement tank nursery. Before releasing the length and weight of twenty larvae were measured by measuring scale board and electronic balance respectively. At the end of 75 days, all surviving larvae were collected and counted for each tank. The final total length and weight of twenty larvae were recorded for the individual tanks. Data were analysed by variance component analysis (Snedecor and Cochran, 1967) and difference between the means was examined using Duncan's multiple range test.

**RESULTS AND DISCUSSION**

The water quality parameters showed minor variations between control and substrate added water. The water temperature varied from 27 - 29°C. pH value of well water was 7.01. After the addition of the substrates the value decreased as an average of 6.99. The total alkalinity varied from 17.15 to 32.84 mg l<sup>-1</sup>. In the present study the dissolved oxygen content showed a decreasing trend (6 to 5.1 mg/l). The length weight relationship of *C. batrachus* larvae in control and different substrates are presented in Table 1. There was a significant variation in weight between the three age groups in control and substrate added tanks. The mean length and weight of larvae in the rice straw and stone substrates was significantly greater (P<0.05) than those in the control, while the bamboo poles caused an intermediate effect. By providing organic matter and suitable substrates, heterotrophic food production can be increased several fold which in turn would support fish production. Langis *et al.* (1988) demonstrated an increase in the biomass of *Daphnia* by promoting bacterial biofilm formation on glass panels in aquaria. Shrestha and Knud Hansen (1994) using plastic baffles and bamboo poles as substrates demonstrated the possibility of increasing the attached microbial biomass significantly. On the contrary, Hem and Avit (1994) using bamboo poles, have shown a modest increase in fish growth and attributed this to fish feeding on attached microbial biomass (periphyton). In light of the above findings, it appears that biodegradable substrates

are better, in terms of promoting bacterial biofilm formation and enhancing the biomass of attached microorganisms. In this study, we have evaluated, the potential of three locally available substrates to support enhanced bacterial biofilm formation and subsequently fish growth. Traditionally, farmers only fertilize their ponds or apply a combination of fertilizers and feed. The present study was to compare the newly derived periphyton technology with the traditional management techniques. Despite some variability in substrate types and density, there is no doubt that fish production was consistently higher in the periphyton systems than in the substrate-free controls. It seems likely that the increased length and weight partly results from the additional food that the periphyton provides (Miller and Falace, 2000). The results of the present study indicate that the type of substrate used for the culture of

**Table 1.** The length weight relationship of *C. batrachus* larvae cultured in different substrates for 75 days

Experimental Group	Length (mm)		Weight (mg)	
	Initial	Final	Initial	Final
Control	9.82 ± 0.32	26.20 ± 0.50	6.53 ± 0.71	184 ± 15.25
Rice Straw	9.5 ± 0.30	21.15 ± 0.25	6.0 ± 0.22	154 ± 12.10
Bamboo Poles	9.2 ± 0.21	18.12 ± 0.15	6.2 ± 0.10	131 ± 11.50
Small Stones	9.5 ± 0.22	16.14 ± 0.17	6.5 ± 0.16	122 ± 10.20

\*The data are based on the means (± SE) of replicate tanks in each group.

larvae is an important factor since it significantly affected their growth. However, animals kept in rice straw and stones attained higher body length. The growth of fish was highest in substrate- based treatments compared to that in control, and among the three substrates, rice straw favoured increased length and weight of the fish *Clarias batrachus*.

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