EFFECT OF LIVE FOOD, ARTIFICIAL AND MIXED DIET ON THE SURVIVAL, GROWTH AND DIGESTIVE ENZYME ACTIVITIES OF *CLARIAS GARIEPINUS* (BURCHELL) LARVAE

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Abstract

This study was conducted to determine the effect of live food (*Artemia* nauplii), artificial and mixed diets on the survival, growth and digestive enzyme activities of African catfish, *Clarias gariepinus,* larvae. Newly hatched catfish larvae were stocked at 15 larvae l^{-1} in nine 15L glass aquaria for growth study and six 200L circular fiberglass tanks for enzyme study. All diets were randomly assigned and given *ad libitum* between 2-4 times a day for 16 days.

The highest mean survival rate was observed among larvae that fed on mixed diet (78.8%), followed by those fed on *Artemia* (73.4%) and artificial diet (63.0%). The mixed diet also gave the best growth for catfish larvae. However, the larval growth for those fed on *Artemia* and artificial diet were nearly identical and significantly lower ($P<0.05$) than those fed on mixed diet.

The study also showed that the highest total amylase, trypsin and chymotrypsin activities were found in larvae which fed on mixed diet. This was followed by those fed on artificial diet and live food, respectively. However, the patterns of specific content of digestive enzymes were nearly identical for both *Artemia* and artificial diet fed larvae. This indicated that *C. gariepinus* larvae could equally and efficiently digest both live and formulated feed.

Keywords: *Clarias gariepinus* larvae, growth, digestive enzymes

Introduction

Clarias gariepinus was introduced to Malaysia in the early 1980s (Thalathiah and Ibrahim, 1992). Since then, it has become one of the most popular commercially cultured freshwater

catfishes. Although a specific larval diet for *C. gariepinus* has been developed (Uys and Hecht, 1985), it is not locally available. Most of the hatchery operators use *Artemia* nauplii during the larval rearing as there are conflicting findings by Uys and Hecht (1985) and Van Damme *et al.* (1990) on the use of artificial diets. This study was conducted to evaluate a locally available commercial larval diet and to determine the effects of live food, artificial and mixed diets on the survival, growth and digestive enzyme activities of *C. gariepinus* larvae. Knowledge on the digestive capability of fish larvae would be useful in developing a specific larval diet (Uys and Hecht, 1987) and feeding strategies (Verreth and Segner, 1995) for that specie.

Materials and methods

This study was conducted in nine 15L glass aquaria for growth measurement and six 200L circular fiberglass tanks for enzyme samples. Newly hatched catfish larvae were stocked in all tanks at 15 larvae l^{-1}. The tanks were randomly assigned to three different diets i.e. live food (*Artemia* nauplii, Bio-Marine Brand), a commercial artificial larval diet (Gold Coin Brand) and a mixed live-artificial diet. Artificial feed was given 4 times a day (0800,1200,1600,2000H) while live food was given 2 times a day (0800 and 1600H). For the mixed diet, artificial diet was given 10 min earlier than the live food. Larvae were fed *ad libitum* from the second day of rearing (Uys and Hecht, 1985).

Larvae were sampled at every other day for total length and weight measurements, and enzyme activities. All enzyme samples were kept at -80°C until assayed. Trypsin, chymotrypsin and amylase activities were respectively determined using TAME, BTEE (Rick, 1974a,b) and corn starch (Rick and Stegbauer, 1974) as substrates in international unit (U) $larvae^{-1}$ or mg^{-1} body weight following the modified microtechniques described by Kamarudin *et al.* (1994).

Results and Discussion

Survival and Growth

The survival rate and growth of larvae fed on the different diets are shown in Fig. 1 and Table 1. The mixed diet produced the highest survival rate and significantly higher growth ($P<0.05$) for *C. gariepinus* than the other diets. This study showed that the artificial diet performed as well as the live food but with a lower survival rate. The growth results of the present study were comparable to those of the earlier works (Uys and Hecht, 1985; Verreth and Van Tongeren, 1989).

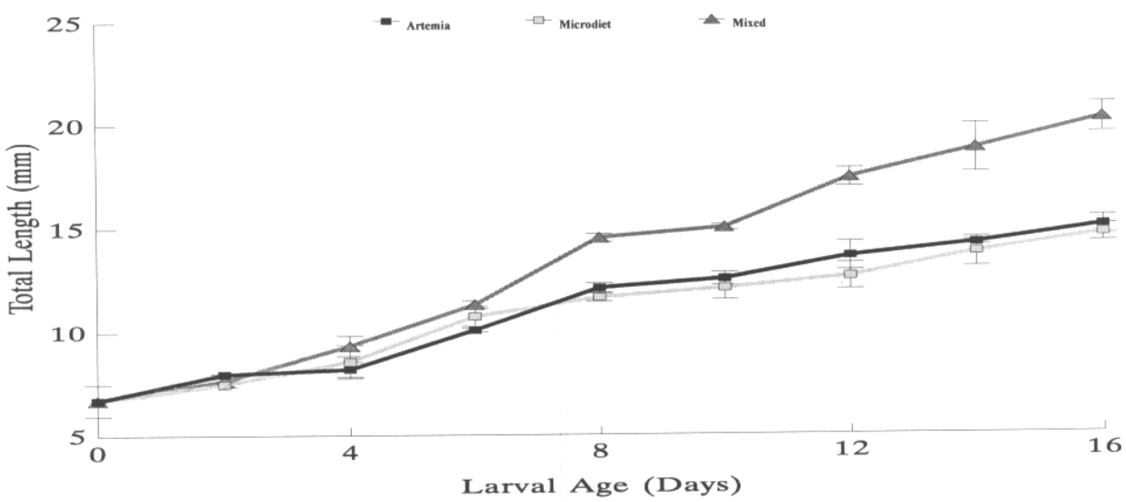

Fig. 1 Growth of *C. gariepinus* larvae fed on different diets

Table 1. Mean survival rate, body weight and specific growth rate (SGR) of *C. gariepinus* larvae fed on different diets*.

Diet	Survival (%)	Wet Body Weight (mg)			SGR (% d^{-1})
		Initial	Final	Gain	
Artemia	73.4±2.0 a	2.67±0.01 a	25.90±3.11 b	23.23±3.11 b	14.2±0.7 b
Microdiet	63.0±4.0 b	2.67±0.01 a	21.03±1.27 b	18.36±1.27 b	12.9±0.4 b
Mixed	78.8±3.3 a	2.67±0.01 a	66.73±6.77 a	64.06±6.77 a	20.1±0.6 a

* Means within the same column and followed by a similar letter are significantly different (P>0.05).

Digestive Enzyme Activities

Generally, total trypsin activity increased after Day 6 and was the highest in larvae fed on the mixed diet (Fig. 2). In contrast, specific trypsin content was initially high in all treatments and decreased as the larvae developed. However, sharp peaks of trypsin activity were observed at Day 8 especially for larvae fed on artificial and mixed diets.

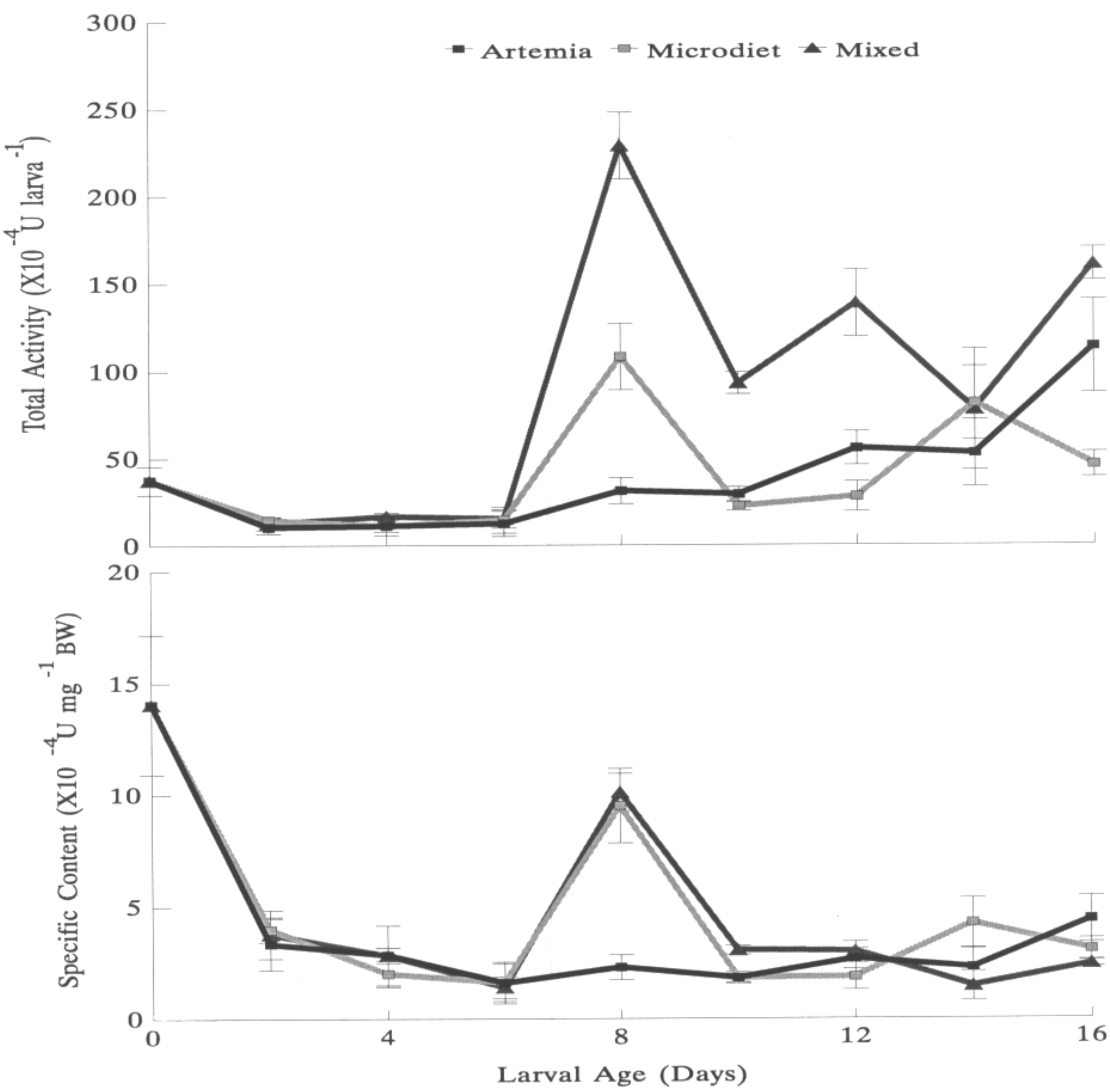

Fig. 2 Trypsin activity in developing *C. gariepinus* larvae fed on different diets

Total chymotrypsin activity also increased with larval development. The highest activity was observed among those fed on the mixed diet, followed by those fed on artificial diet and live food, respectively. Similar to trypsin activity, specific chymotrypsin content in all larvae was initially high and decreased with as larvae developed (Fig. 3). After Day 6, the activity started to increase to a peak at Day 10. In general, the chymotrypsin activity in larvae fed on mixed and artificial diets were higher than the activity in those fed on live food.

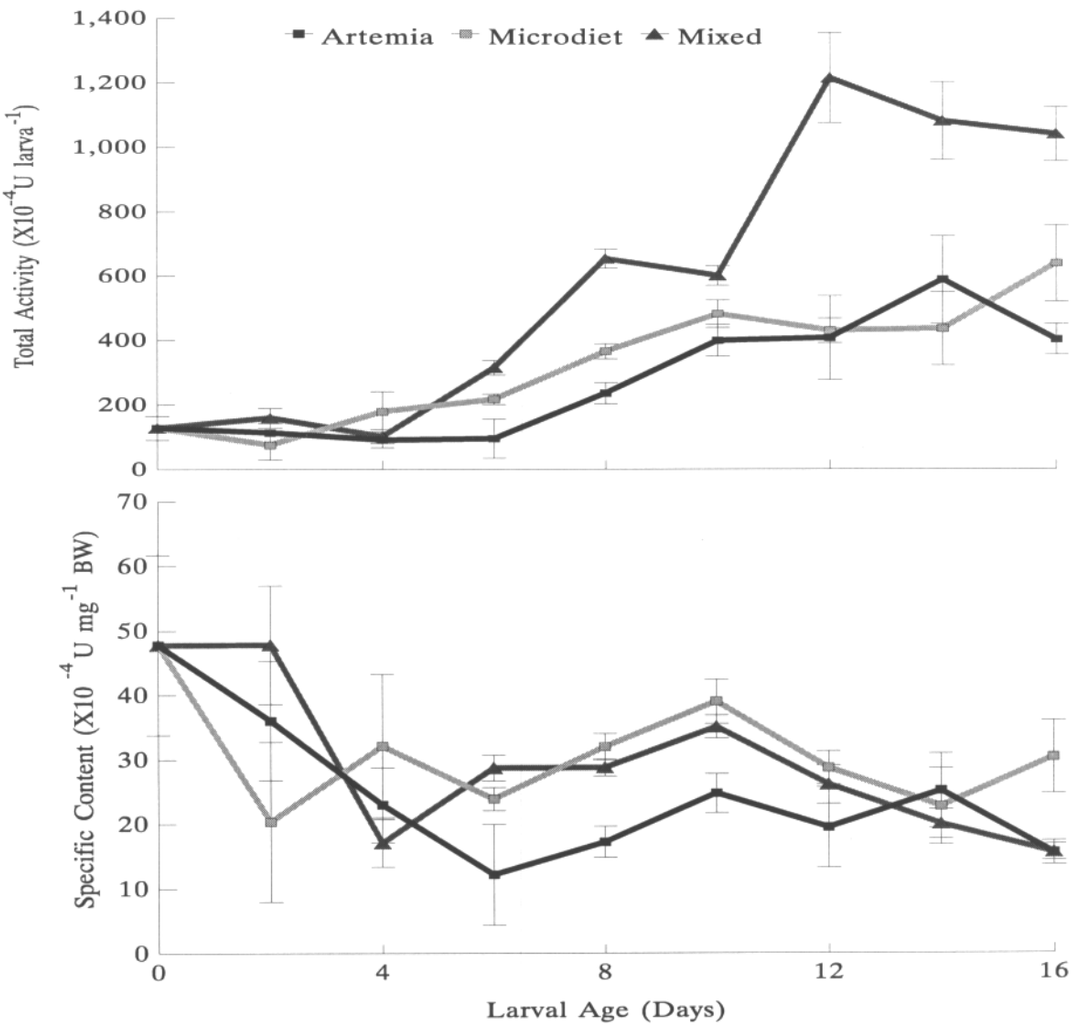

Fig. 3 Chymotrypsin activity in developing *C. gariepinus* larvae fed on different diets

The activities (specific content) of proteolytic enzymes in *C. gariepinus* larvae dropped after first feeding. Similar drop was observed in *Macrobrachium rosenbergii* larvae (Kamarudin *et al.,* 1994). However, these activities peaked when the larvae were 8-10 days old. These peaks coincided with the earliest weaning time recommended for *C. gariepinus* larvae (Verreth and Van Tongeren, 1989; Van Damme *et al.*, 1990). Chymotrypsin activity in *C. gariepinus* larvae remained higher than trypsin activity throughout the study. Similar observation was made in striped bass larvae (Baragi and Lovell, 1986).

In general, total amylase activity increased as larvae developed especially among those fed on the mixed diet. Specific amylase content was low at hatch and suddenly peaked at Day 2 (Fig. 4) which coincided with the first feeding. Later, amylase activity generally decreased with development although the activity was higher in those fed on artificial diet in the first 6 days.

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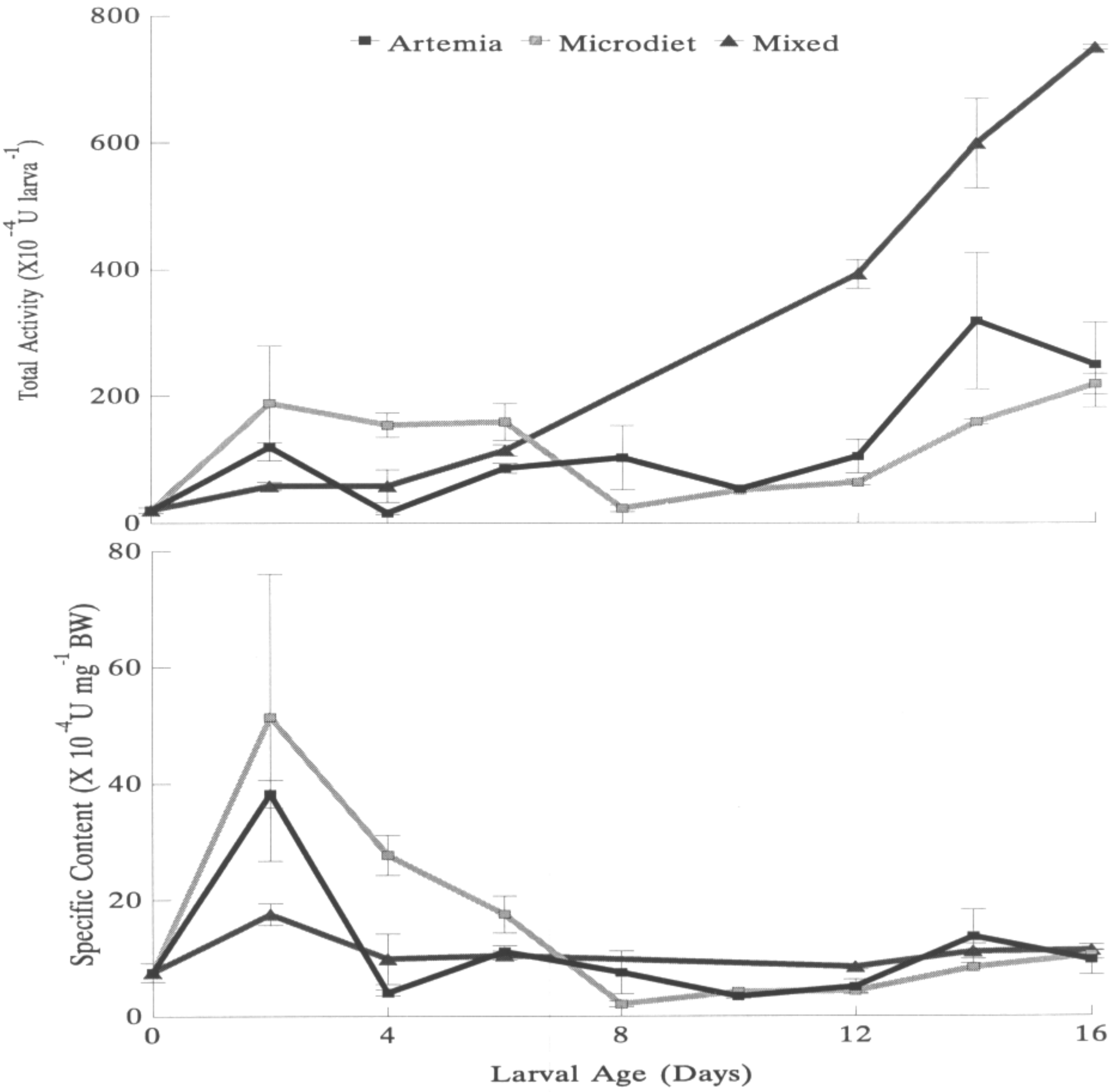

Fig. 4 Amylase activity in developing *C. gariepinus* larvae fed on different diets

Zambonino Infante and Cahu (1994) reported that feeding artificial diet resulted in higher amylase and proteolytic enzymes (except trypsin) in *Dicentrarchus labrax* larvae. Similar patterns were also seen in the present study. Based on growth and digestive enzyme activities, this study suggested that *C. gariepinus* larvae were very capable to adapt themselves to their diet.

Acknowledgment

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