Fishery Technology
2006, Vol. 43 (2) pp : 176 - 179

Use Of Fish Silage as an Alternate Protein Source for the Spawn Rearing of *Cirrhinus mrigala* (Ham.)

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An experiment was carried out to study the efficacy of fish silage as an alternate protein source for rearing the spawn of *Cirrhinus mrigala*. 3 days old mrigal spawn of a single batch of initial average weight 3.5 ± 0.1 mg and length 6 ± 0.14 mm were stocked at a stocking density of 2nos/L in fibre glass tanks. For the first three days feeding was done with mixed zooplankton. From the fourth day onwards, four different types of feed were given with 6 replicates each for 30 days. The feeds were as follows: Conventional feed (Powdered ground nut oil cake and rice bran in the ratio 1:1) (T_1), formulated commercial feed (T_2), Dried and powdered fish silage made from low quality trash fish (T_3) and Fish silage powder and conventional feed in the ratio 1:1 (T_4). After 30 days, it was found that the percentage weight gain (12138), Specific growth rate (15.69) and Net Biomass Index (407.7) of the fish spawn fed with fish silage and conventional feed in the ratio 1:1 were significantly higher compared to those fed either conventional or commercial feed. The survival was not significantly different in any of the treatments. The results show that fish silage can be used as an alternative cheap protein source for the spawn rearing of *C. mrigala*, thereby reducing the cost of spawn rearing to a great extent.

Key words : Fish Silage, *Cirrhinus mrigala*, spawn feed, specific growth, survival

Nursery rearing of carp spawn is usually practiced with powdered groundnut oil cake and rice bran (ratio, 1:1) as supplementary feed. This diet although cheap, is not nutritionally balanced and very often does not give a satisfactory result (Das & Ray, 1991). The use of commercial feed for rearing spawn is cost intensive. Therefore alternate cheap feeds with improved growth performance of carps are to be identified. The present study evaluated the utilization of fish silage as a cheap source of protein for *Cirrhinus mrigala* spawn. Fish silage can be produced very easily compared to fishmeal and has got good storage characteristics. (Jackson *et. al.*, 1984). It is already used as dietary ingredient for poultry and pigs (Raa & Gildberg, 1982) and its suitability in fish diet has also been worked out. (Asgard & Austreng, 1981)

Materials and methods

Undersized tilapia (*Oreochromis mossambicus)* from the Instructional farm of College of Fisheries, Panangad was used for the preparation of silage. Formic acid was used for silage preparation as per the method described by Ali *et. al.* (1994). The fish was ground and mixed with 90% formic acid in the ratio 100:3.5

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(w/w). The mixture with a pH of 3.2 was kept in a plastic container for 3 days at a temperature of 28-32°C. After 3 days the liquid silage was neutralized with sodium hydroxide. Four diets T_1-T_4 were prepared for the experiment. Conventional feed consisted of powdered groundnut oil cake and rice bran in the ratio 1:1(T_1). The commercial pelleted feed with 35% protein was ground ,sieved and used in the experimental diet T_2. The diet (T_3) comprised fish silage alone and it was prepared by drying the neutralized silage in a tray after which it was scraped off, ground and sieved to the required particle size. Diet T_4 was prepared by mixing the conventional feed with liquid silage in the ratio 1:1followed by drying , pelleting ed and sieving. The proximate composition of the different diets are given in Table 1.

Mrigal spawn was obtained from the carp hatchery of the Instructional farm of the

Table 1: Proximate composition of the diet

% Composition	T_1	T_2	T_3	T_4
Crude protein	21.2	34.6	51.35	36.1
Lipid	10.45	8.2	8.5	9.3
Crude fiber	17.65	14.9a	6.55	11.8
Ash	9.4	18.1	11.22	10.31
Moisture	10.1	8.2	10.38	10.1

College of Fisheries. Soon after hatching, they were fed mixed zooplankton as a starter feed for 3 days. Spawn of average size 3.5 mg were transferred to circular fiberglass tanks of 83 l capacity with 50 litres of fresh aerated water at a stocking density 2 nos./ l. The experiment was done in completely randomized design with six replication each. Feeding was done *ad libitum* three times daily. Every day morning the bottom of the tank was cleaned and 50% water was changed. The water quality parameters were monitored regularly once in every three days and are given in Table 2.

The experiment was conducted for a period of 30 days. Survival rate and growth in terms of percentage weight gain , specific growth rate and net biomass index were calculated. The data obtained was analysed

Table 2: Water quality parameters of the rearing tanks

Water quality parameters	Range
Temperature	28.9-30.4°C
Dissolved Oxygen	5.5-6.5 ppm
pH	7-8
Ammonia-N	0.01-0.03 ppm

using ANOVA (Snedecor and Cochran, 1968).

where,

Wi = Initial average weight of the experimental animals at day Ti

Wf = Final average weight of experimental animals at day Tf

$$\text{Percentage weight gain} = \frac{(Wf - Wi) \times 100}{Wi}$$

$$\text{Specific growth rate} = \frac{\text{In } Wf - \text{In } Wi \times 100}{Tf - Ti}$$

Specific growth rate is expressed as percentage (assuming exponential growth).

$$\text{Net biomass index} = \frac{(Wf \times Nf) - (Wi \times Ni)}{100}$$

$$\text{Survial rate} = \frac{(Ni - Nf) \times 100}{Ni}$$

In = Natural logarithm

Ni = Initial number of animals

Nf = Final number of animals

Results and Discussion

The percentage weight gained by the experimental animals is presented in figure 1. Analysis of variance revealed significant difference between the different treatments. The spawn fed on the conventional diet of groundnut oil cake and rice bran (T_1) gave the lowest growth (1710 %) followed by commercial feed (3329 %) (T_2). The growth of the animals fed on silage based diets (T_3 and T_4) were significantly high compared to diets T_1 and T_2.

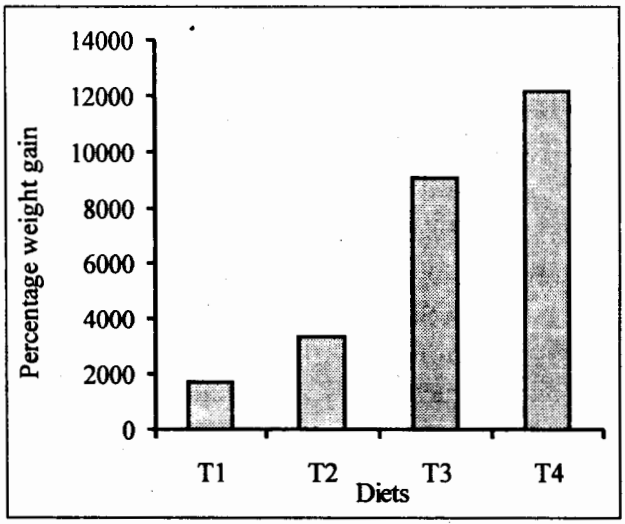

Fig.1 Percentage weight gain of the *C. mrigala* fed different diets

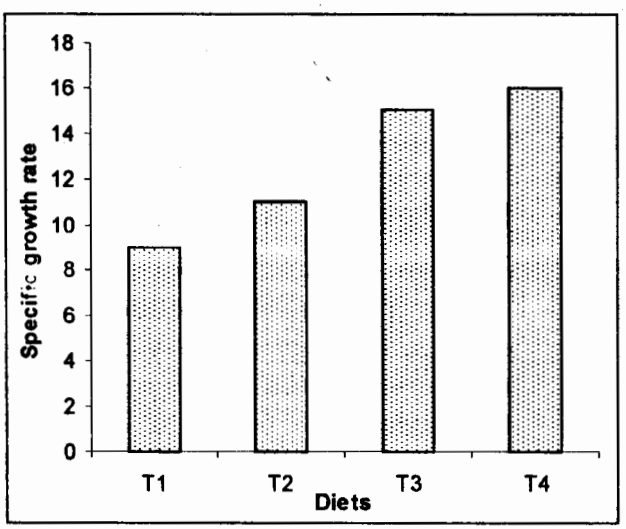

Fig.2 Specific growth rate of the *C. mrigala* fed with different diets

Between the two silage-based diets, diet T_4, which is a combination of silage and traditional feed gave better growth rate (12138 %) than diet T_3 with silage alone (9043 %). The specific growth rate obtained with silage-based diets was significantly higher (15 %) compared to the other diets (9-11 %); however there was no significant difference between diets T_3 and T_4. The values obtained in different treatments are shown in figure 2. The normalized biomass index followed the same pattern as the percentage growth rate and the mean values obtained in the different treatments are given in figure 3. The survival rate was not significantly different in any of the treatments.

The result is in agreement with the findings of Srinivasan *et. al.* (1985), who obtained double the weight gain for *C. mrigala* fry in silage based diet compared to control diet consisting of mustard oil cake and rice bran. Similar result was also obtained in eel (Gonclaves *et. al.*, 1989). However, Wood *et. al.* (1985) reported poor growth response in common carp with silage-based diets and attributed this to its low palatability and loss of nitrogen by leaching.

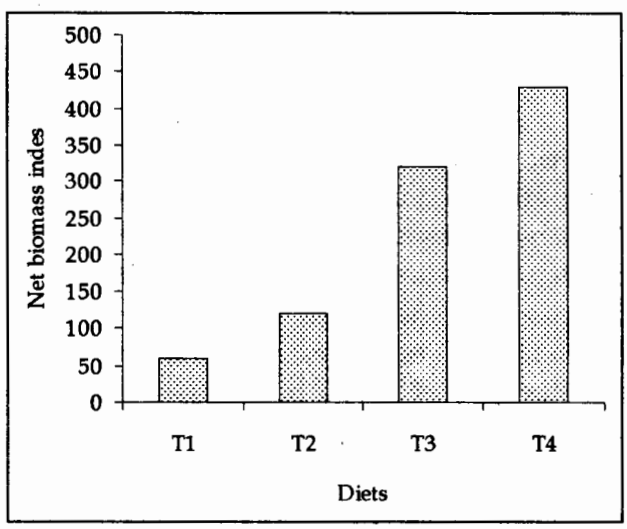

Fig.3 Net biomass index of the *C. mrigala* fed with different diets

A significant observation in the present study was the deterioration of water quality in tanks in which silage alone was used as feed. This may be due the absence of a binder in the diet used. In T_4, the rice bran might have acted as a binder which prevented deterioration of water quality in these tanks. The use of wheat bran as filler in the preparation of dry silage feed has been demonstrated by Ali *et. al.*, (1994). Hence, the use of silage alone as feed for the carp spawn is not recommended in the field level since, it may affect the water quality adversely leading to low survival rates especially when the stocking densities are high. The growth response of the carp spawn to commercial feed (T_2)was higher than

conventional feed (T_1), which may be due to the fortification of this diet with vitamins, minerals, etc.

The growth performance of *C. mrigala* spawn using diet T_3 was slightly less compared to diet T_1. This may be because of higher percentage of protein (51.35 %) in this diet. A reduced growth rate with high protein diet (55 %) of *C. mrigala* is reported by Das & Ray (1991). The optimum protein requirement of mrigal fry has been reported to be 40 % (Paulraj, 1990) and hence, the superior performance of the spawn with diet T_4 containg 39 % protein may be justified.

Vidotti *et al.* (2002) have reported the superior performance of fermented silage compared to acid silage in the rearing of *Piaractus mesopotamicus*. According to them, fermented silage has more digestibility compared to acid silage. Future studies with different types of silage are warranted to find out the type of silage most efficient in the nursery rearing of carp spawn.

The authors thank the Director, National Agricultural Technology project and Dean College of Fisheries, Kerala Agricultural University for providing fund and facilities to carry out this work.

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