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Effect Of Different Probiotic Enriched Diets On Growth Performance Of Cirrhinus Mrigala Fingerlings

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SUMMARY

The 60 days experiment was conducted with a view to observing the effects of different probiotic feeds and feeding rations on the growth of *cirrhinusmrigala*fingerlings. Fish fed with fish-A diet showed higher feed consumption (7.02g) at 8% feeding regime than other experimental feeds.The lower consumption (2.36g) was studied in feed-A at 4% feeding regime. Regarding the absorption, the maximum of 6.50g was observed in feed-A type at 8% and minimum of 2.10g was observed to feed-B type at 8% feeding rations. Food conversion ratio (FCR) was observed to be highest (3.02) is probiotic feed containing spirulina at 8% feeding. Maximum increase in average wet body weight (2.92g) of *cirrhinusmrigala*fingerlings was observed as g in feed-A type at 8% feeding regime. The highest enhancement in length (1.4cm) was found when fishes fed with feed-A at 8% feeding.

Key words: Probiotic feed.spirulina, *lactobacillus*, food conversion ratio, feeding regimes.

INTRODUCTION

Fish play an important role in human nutrition in India, particularly to people of coastal areas. Good and adequate nutrition plays a very important role in the expression of mental, physical and intellectual qualities in humans. To ensure access to the nutritionally adequate food for the improvement in the quality of diet of a poor

person in the society, fish is the only medium which can serve the very purpose. To meet the demand for food fish of an increasing and wealthier global population by the year 2030, it appears that the aquaculture production rate needs significant acceleration as capture fisheries production. Sustainable and successful freshwater fish culture on scientific basis principally depends upon the use of adequate, economically viable and environment friendly artificial feeds.

Fish production can be increased with accurate application of supplementary feeds in carp in semi intensive culture system. Supplementary feeding plays an important role in intensive and semi–intensive fish culture system. The use of supplementary feed in carp culture has become inevitable for the success of fish culture. Nutritionally balanced feeds are prerequisite to cost-effective fish production. The provision of species-specific feeds that address the nutritional requirements of the different life stages of fish is still a challenge for both commercial and farm-made feed production sectors.

The use of probiotic as feed supplements has attracted considerable attention by feed manufactures as mean of improving livestock performance. Most of the studies concerned with the effect of probiotics on cultured aquatic animals have emphasized a reduction in mortality increased survival, improved resistance against disease (villamil*et al.,* 2003); enhance the ability to adhere and colonize the gut (vine *et al.,* 2004), improved the ability to antagonize other organism (Burgents*et al*., 2004; Lie *et al*., 2004).

The term probiotics is defined as "live microbial feed supplements which when administered in adequate amount beneficially affect the host by improving its microbial balance (FAO, 2005). In aquaculture, probiotics as dietary supplementation leads to health benefits on host, and in turn to obtain high production. The role of commercial probiotics in growth, disease resistance and beneficial activities in fish has proven beyond any doubt. Keeping this in view, the present study has been carried out to study the effect of probiotic supplemented diet in enhancing the growth performance and feed utilization in the fingerlings of *cirrhinusmrigala*.

MATERIALS AND METHODS

COLLECTION AND REARING

The fingerlings of *Cirrhinusmrigala* were procured from fishfarm. They were carefully transported to the laboratory through oxygenated polythene bags. These animals were brought to the lab condition and were stocked in the plastic troughs. Much care was taken to avoid overcrowding during transportation and stocking. These fishes were allowed to acclimatize for a period of 10 days. Then they were subjected to experiments.

DIET FORMULATION

The fishes were fed with pelleted feed. The ingredients used for forming control pelleted dry feed were Soya bean flour, Rice bran, Wheat flour, fishmeal, Vitamins and minerals. Diets formulation was done basically by "pearson's square method" using determined values of protein content.

Three different types of dry pelleted feeds were prepared. Each feed was prepared by using certain specific ingredients. Tapiocawas used as the binder. All the diets were biochemically estimated for ascertained the carbohydrate, protein and lipids levels. Feedwithout probiotics (40%protein) was used as control feeds.

According to desired level of protein (40 %) ingredients were added factorlly (%weight) to form test diets (table 1). For probiotics enriched diet (test diets)the required amount of spirulina (2gms/100gm of ingredients) and probiotic *lactobacillus acidophilus*suspension (10.0×10^{-10}/cfu.ml) were sprayed into the cooked ingredient mix slowly part by part in a drum mixer, after which it was air dried under sterile conditions for 12hrs. The pellets were dried in an oven at 30˚C for 18hrs, packed and stored in a freezer 20˚C until used.

EXPERIMENTAL PROCEDURE AND FEEDING TRAILS

Mirgal fingerlings having same size and weight were carefully selected and feeding experiments were conducted with Control, Feed-A and Feed-B. Experimental fishes were placed in a trough with a size of 25 x 40cms, which is filled with 20Lts of water. Feeding trails was started at a rate of 4, 6 and8% of body weight in a feeding regime of one time a day. Experiment was conducted for 60 days. For a single type of feed, fingerling of same size were chosen and divided into three groups. Each group having 3 fish fingerlings (triplicate). The first, second into third group was fed with 4, 6 and8% of body weight regime.

The water in the trough was siphoned off every day to remove remains of the feed and fecal matter. The dissolved oxygen level of water was maintained at 5.10± 1 mg/lt. Carbondioxide level was 6ppm and temperature was 28˚ to 30˚C. Control group fish fingerlings were fed on probiotic free control basal feed. The second group was fed on feed supplemented with spirulina containing 40% protein (FEED-A).The Third groups were fed on feed supplemented with probiotic bacteria (*lactobacillus acidophilus)*40% protein (FEED-B).

After every week, cultured experiment fish fingerlings were captured from each treatment using drag net and weight. After recording the data for wet body weight (WBW), they were released back into their respective troughs. The total length of fish was also recorded at weekly intervals. The daily ration of feed given (4, 6, &8%) was readjusted at every week intervals on the basis of wet weight gain (WBM). At the end of the experiment, fish fingerlings from all treatments were weight, based on which the growth parameter weight gain (%), All weighting made in an electrical digital balance too an accuracy of 1mg. Feed Conversion Ratio (FCR), specific growth rate (SGR) and survival (%) were calculated.

ENERGY BUDGET

Rates of feeding, absorption, conversion and metabolism were calculated by dividing the respective quantities of the products of initial weight of the fish (mg) and duration day of the experiment. The rate was expressed as mg dry wt/gm live fish / day.

Food conversion Ratio (FCR)=Dry food intake / Wet body weight gain

Specific growth rate (SGR)=In $W_o - W_1$ / t x 100

Where
W_o=Final live weight
W_1=Initial live weight
t=Experimental duration
Average daily gain (ADG)=Growth (live weight) / Experimental duration
Percent gain weight=Average final weight-Average initial weight/ Average initial weight x 100
Percent gain length=Average final length – Average initial length/ Average initial length x 100

RESULTS

Table 1: Ingredients of test diets.

S.No	Ingredients	Feed-A	Feed-B	Control
1	Fish meal	+	+	+
2	Wheat flour	+	+	+
3	Rice bran	+	+	+
4	Soybean flour	+	+	+
5	Vitamins & minerals	+	+	+
6	Spirulina	+	_	_
7	Probiotic bacteria	_	+	_
8	Tapioca flour	+	+	+

(+) – Presence; (-) – Absence.

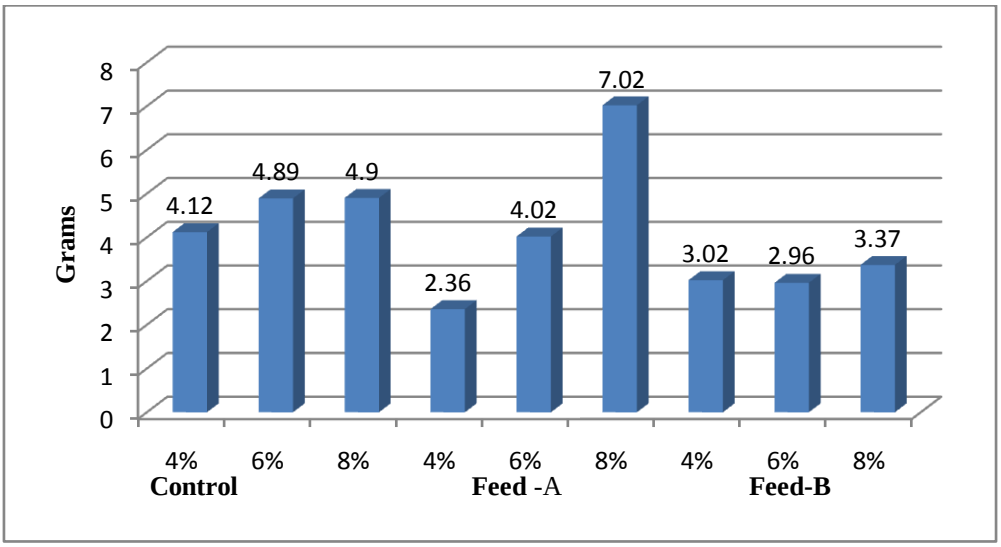

Figure 1: Feed consumption of *cirrhinusmrigala*fed with different feed types & feeding regimes

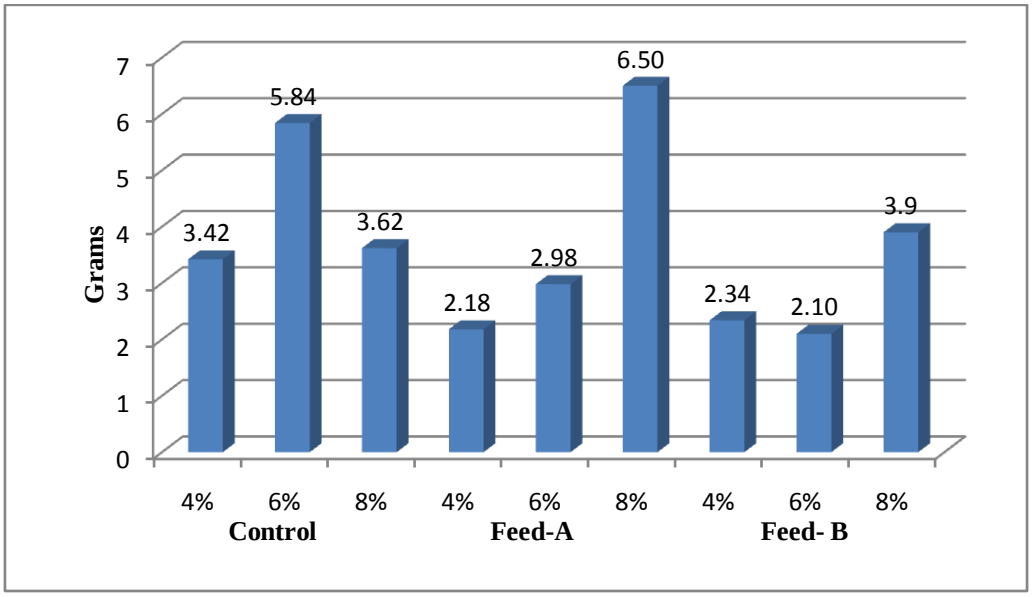

Figure 2: Feed absorption of *cirrhinusmrigala*fed with different feed types and feeding regimes.

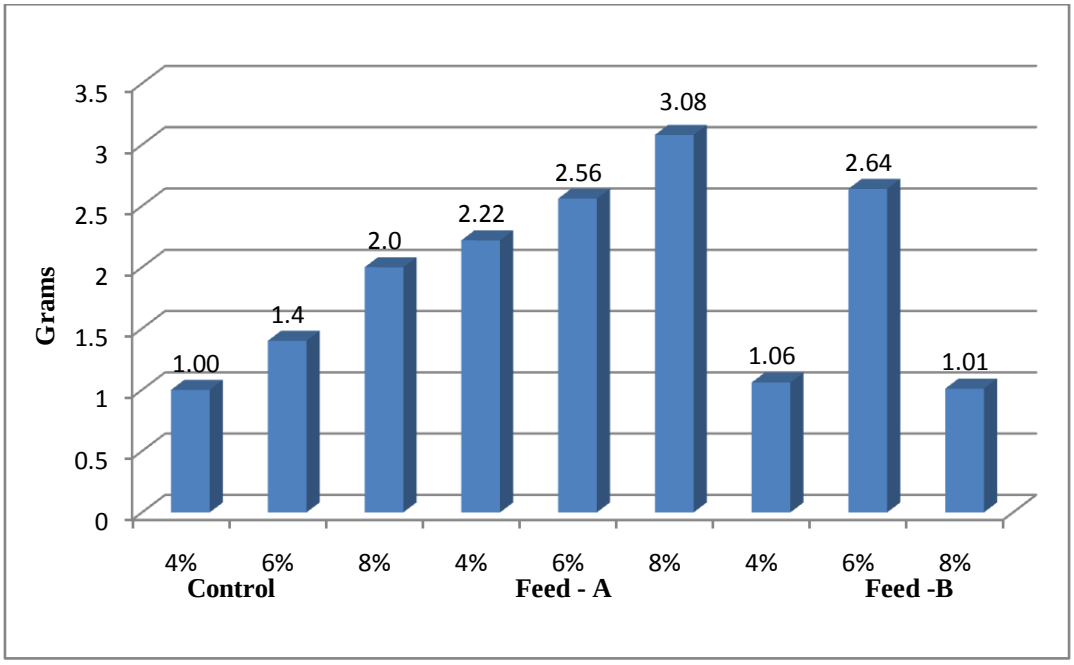

Figure 3: Feed Conversion of *cirrhinusmrigala*fed with different feed types & feeding regimes.

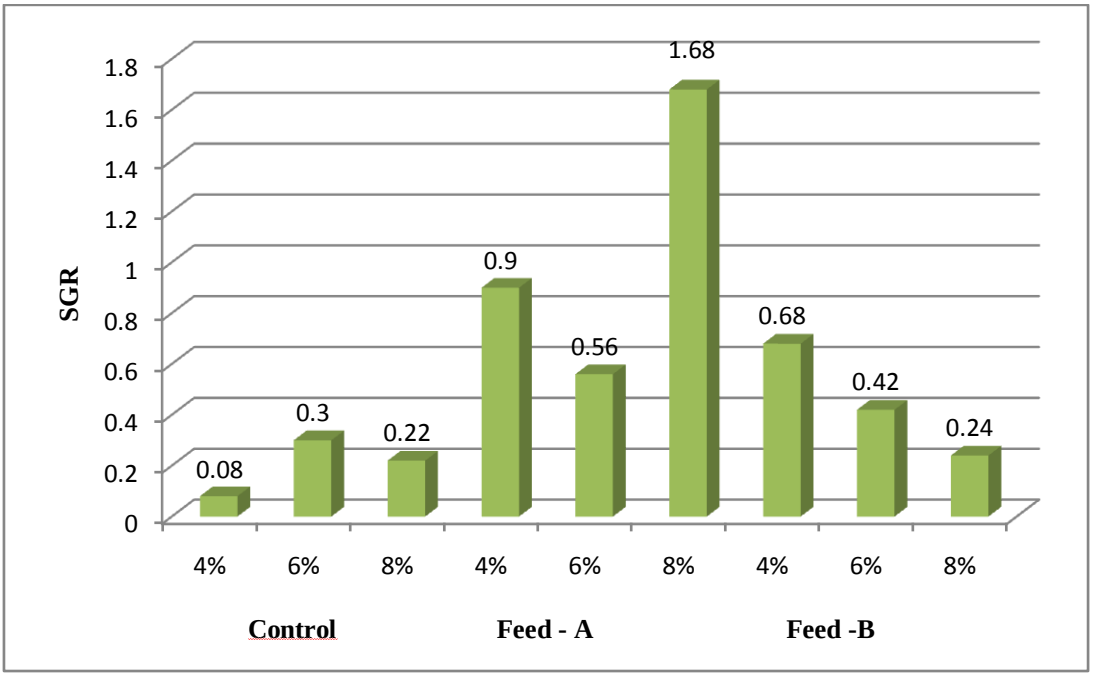

Figure 4: Specific growth rate of *cirrhinusmrigala*fed with different feed types and feeding regimes.

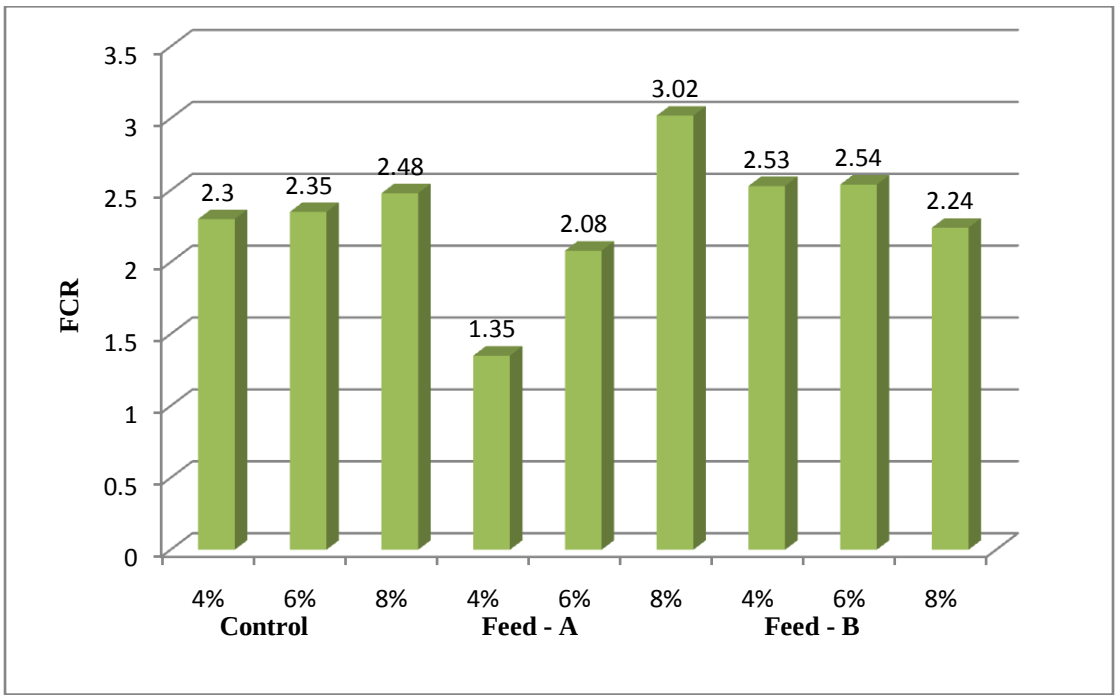

Figure 5: Food conversion ratio of *cirrhinusmrigala*fed with different feed types and feeding regimes

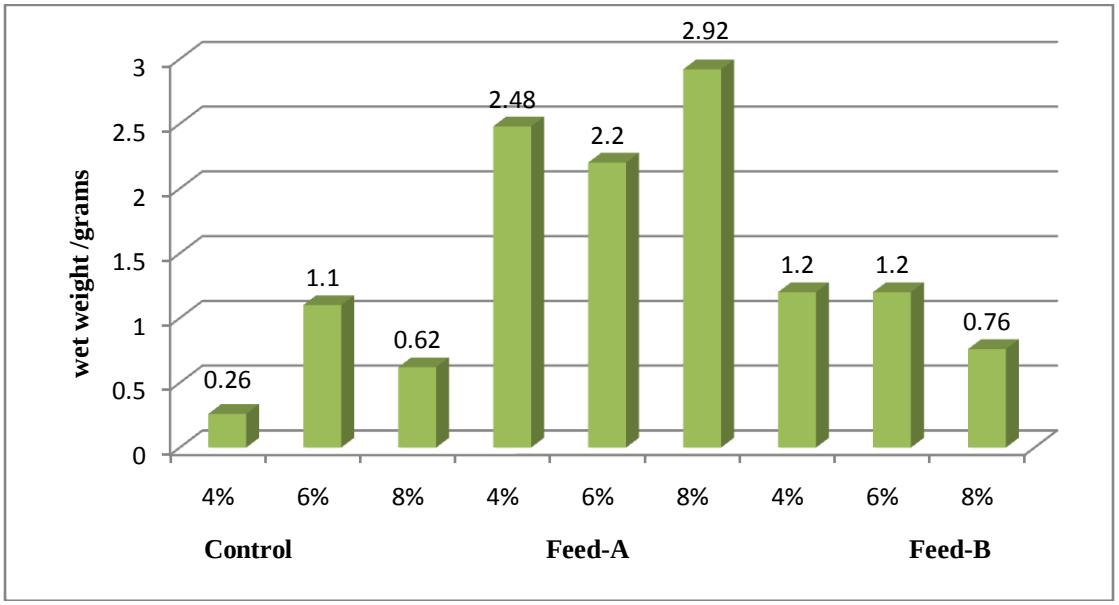

Figure 6: Wet body weight gain of *cirrhinusmrigala*fed with different feed types and feeding regimes

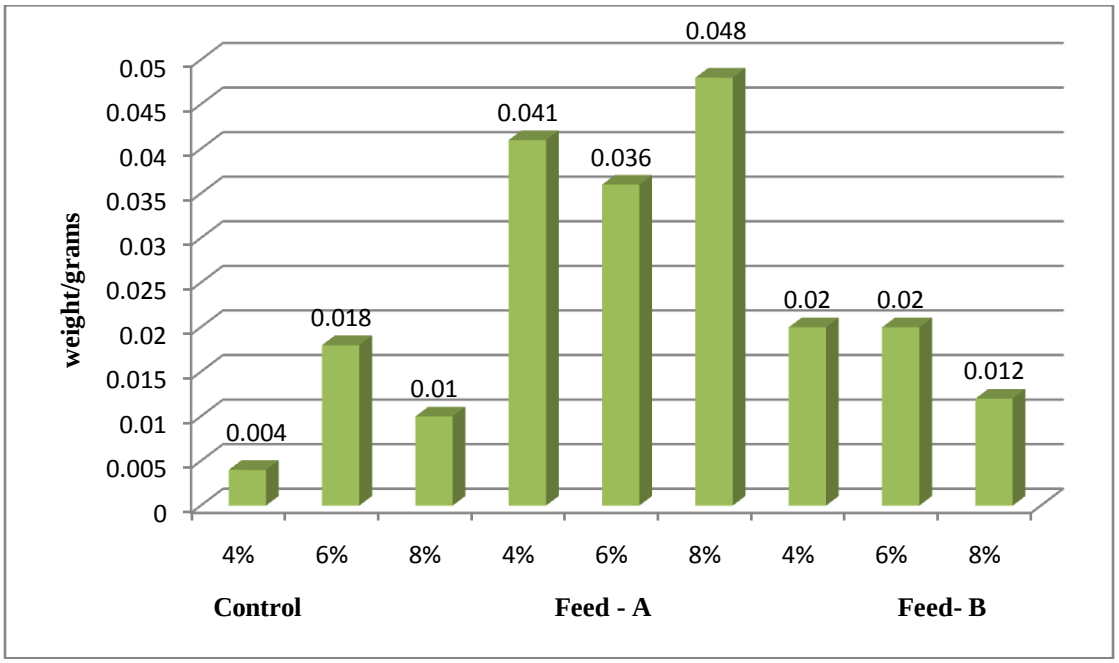

Figure 7: Average daily weight gain of *cirrhinusmrigala*fed with different feed types and feeding regimes.

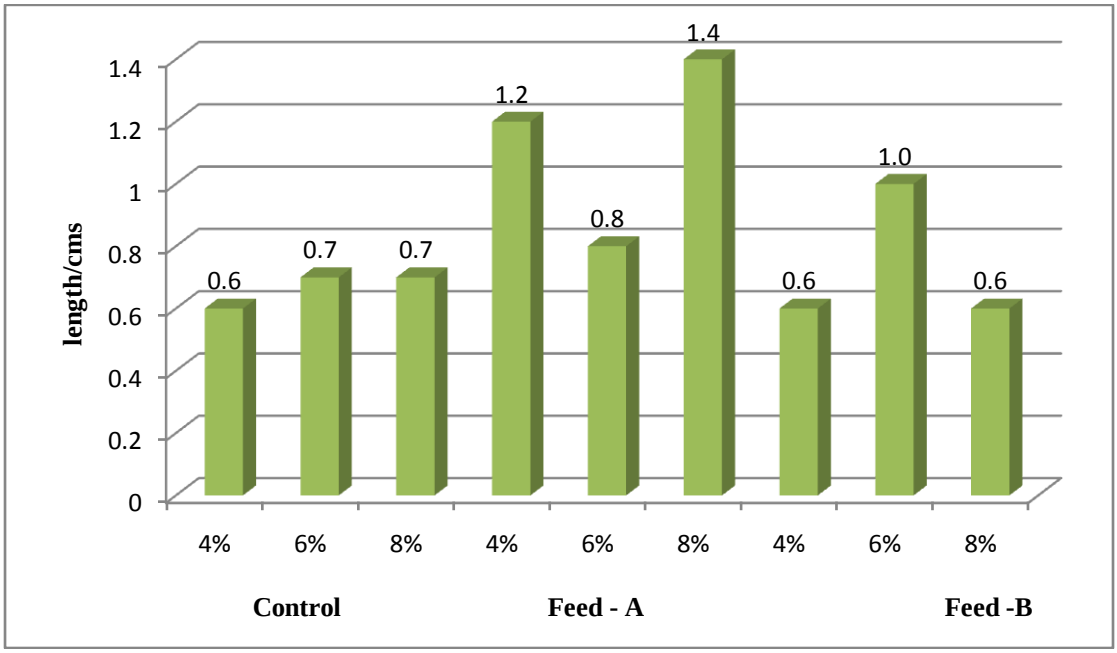

Figure 8: Average length increase of *cirrhinusmrigala*fed with different feed types and feeding regimes

RESULTS

The 60 days experiment was conducted with a view to observing the effects of different probiotic feeds and feeding ration on the growth of *cirrhinusmrigala*fingerlings. After feeding experiments, the growth parameters such as survival rate, food consumption, food absorption, food conversion, wet weight gain, specific growth rate, food conversion ratio, fish length gain were indivually determined.

The ingredients of test diets (Control, feed-A & feed-B) were presented in table-1.The crude protein content of the control, feed-A (probiotic feed with spirulina) and feed-B (probiotic feed with *lactobacillusacidophilus*) was 40%. The overall energy budget of *cirrhinusmrigala*fed on the formulated probiotic enriched feed at different feeding regimes (4, 6& 8% of body weight) was recorded in figure 1 to 8. In the present work, the amount of day substance gained or loosed by the fish after 30 days of feeding at different feeding regimes (4, 6& 8%) was calculated and expressed gram dry substance gained/lost/fish/day. The feed given were adjusted at 10 days intervals after the fish were weighed.

The results showed that feed types (control, feed-A, feed-B) had significant effect on the feeding parameters. Fish fed with fish – A diet elicited higher feed consumption (7.02g) at 8% feeding regime than other experimental feeds (figure-1). The lower consumption (2.36g) was noticed in feed-A at 4% feeding regime. Regarding the absorption, the maximum of 6.50g was observed in feed-A type at 8% and minimum of 2.10g was observed to feed-B type at 8% body weight feeding rations (figure-2). The food conversion was higher (3.02g) in feed-A at 8% feeding regimes (figure-3).

Food conversion ratio (FCR) was observed to be highest (3.02) in feed-A at 8% feeding and lowest (1.35) feed-A type at 4% feeding (figure-5). The specific growth rate of test diets was ranged from 0.08 to 1.60 (figure-4). The growth rate of fish fingerlings fed with 4, 6 and 8% feeding regimes of different feed type (control, feed-A, and feed-B) are depicted in figure-6 and 7 respectively. Maximum increase in average body wet weight of *cirrhinusmrigala*fingerlings was observed as 2.92g in feed-A type at 8% feeding regime (figure-6). However the minimum increase in bodyweight was 0.26 in control feed at 4% feeding.

Changes in length gain of *cirrhinusmrigala* for 60 days were depicted in figure-8. The highest enhancement in length (1.4cm) was found when fishes fed with feed-A at 8% feeding and minimum (0.6cm) with control feed at 4% and feed-B at 4% feeding regimes. Results of the present study substantiates the fact that probiotics have direct growth promoting effects on mrigal fingerlings. The survival rate of *cirrhinusmrigala*fingerlings in all the treatments was found to be 100% after 60 days of experiment.Based on the results obtained in this study, it can be concluded that probiotic diet containing spirulina (feed-A) resulted in simultaneous increase in weight (2.92) and length (1.4cm) at 8% body weight feeding regime.

DISCUSSION

The food conversion was higher (3.02g) in feed-A at 8% feeding regimes.Similar trend of results were reported by El-Haroun (2007). Probiotics supplementary diets had significantly enhance feed utilization performance in cat fish. FCR increased dietary protein and decreased for diet above 40% protein. The better food conversion value (3.02, 2.54) observed with probiotic supplemented diets (feed-A & feed-B) suggested that addition of probiotics improved feed utilization. Similar observations were reported by Matijastic*et al*., (2004).These results were in accordance with the values reported by Das and Ray (1991). The highest percent weight gain was 78.61 observed in the *cirrhinusmrigala*fingerlings fed with feed-A type at 8 % feeding regime. Similar results have been reported in *macrobrachiumrosenbergi* post larvae. The growth was increase in feed containing spirulina (feed-A) and also several researchers are reported that probiotic supplemented diets had improved the growth performance in *cirrhinusmrigala* (Parthsarathy and Ravi 2011; Bagheri*et al.,* 2008; Hidalgo *et al.,* 2006; Seenivasan*et al.,* 2011).

Probiotic enriched feed type (feed-A and feed-B) showed better growth at different feeding regimes (2.48, 2.20, 2.92, 1.20, 1.20&0.76g)than control groups (0.26, 0.62, 1.10g) (figure-6). This results in agreement with the findings of sugita*et al.,* (1998) who reported that probiotic bacteria produce digestive enzymes and required growth nutrients such as vitamins and amino acids thereby improving feed absorption resulting in an enhanced growth rate in host. Fish fed with the diets supplemented with spirulina (feed-A) showed better feeding efficiency than those fed with diets containing the bacterial mixture (feed-B). Similar results were observed by Vazguaz-juarez*et al.,* (1993)probiotics produced significant increase in the growth of cultured trout. Results of the present study proves the fact that probiotics have direct growth positive effects on mrigal fingerlings.

CONCLUSION

All the probiotic supplemented diets (feed-A and feed-B) resulted in higher growth than that of control diet, suggesting that the addition of probiotics mitigated the effects of stress factors. This results in better growth of *cirrhinusmrigala.* In the present study no mortality was observed in fishes fed with diets containing probiotic bacteria and spirulina with different feedind regimes which proved that the probiotic used in this study considered to be of primary importance in fish feeding, results revealed that the optimum dietary protein level is 40% for *cirrhinusmrigala*fingerlings (~3g / fish). However the duration of the study is short and has to be extended for another two months so that a constant conclusion may be derived.Based on present encouraging results, it could be concluded that the addition of probiotics in carp basal diets improved growth performances, feed utilization and could be recommended to stimulative productive performance, which proved to be remarkable advantage for the fish industry, fish entrepreneurs and fish farmers at large.

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