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STUDY OF THE PROTEIN EFFICIENCY RATIOS (PER) AND GROSS FOOD CONVERSION EFFICIENCIES (GFCE) OF *OREOCHROMIS NILOTICUS* FED WITH AND WITHOUT PROBIOTICS FORMULATED FEED

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Abstract: In this study, the Protein Efficiency Ratio (PER) and Gross Food Conversion Ratio (GFCE) of freshwater fish fed on a diet supplemented with probiotics were evaluated. Such fish appeared to be healthier than the control set of fishes when given a diet supplemented with probiotics formulated feed as compared to those not receiving without probiotics formulated feed. Fishes that consumed probiotics formulated feed exhibited higher Protein Efficiency Ratios and Gross Food Conversion efficiencies than without probiotics formulated feed.

Index Terms **- Probiotics, PER, GFCE**

INTRODUCTION

Aquaculture is currently the world's fastest growing animal production sector, aided by increased production of formulated supplemental feeds for aquatic animals (National Research Council 1993). Furthermore, in aquaculture, as in other animal production systems, the primary goal of feed formulation is to ensure good fish flesh and to prevent environmental deterioration, both of which are related to nutrition (M.P .Bhilave 2016).

In monoculture systems, the adding price of feed is considered as one of the most important factors that limit profitability, substantially caused due to the high cost of fishmeal used as a principal source of protein (Usmani *et al.*, 1997).

Nutritional balance of the feed affects feed conversion rate and fish growth (Winfree R.A.1992, Wilson, R.P. 2000, Tom L, Van-Nostrand R 1989). For optimal growth of fish species and the composition of a balanced diet, it is very important to know their nutritional requirements, especially protein, lipid and energy (De Silva, S.S. and T.A. Anderson. 1995). Dietary protein and energy content are known to influence fish growth and body composition (Lovell, 1989). Insufficient energy in the diet increases proportion of food protein used for energy, thus causing protein wastage and the ammonia produced can degrade water quality (Phillips, 1972; Prather and Lovell, 1973)

In recent years, there are considerable interested in using probiotics microorganisms, organic acids, etc. as an alternative to use of antibiotics in the feed(Suzer, C. 2008, Serigne Thiam 2015). Probiotics are viable microorganisms single serving support substance humans and animals, produce useful things physiological effects by assisting establishment of intestinal population beneficial to the host's business, antagonizes harmful bacteria (Serigne Thiam2015). Probiotics have been directly supplied through feed, in some cases using binders for stabilization (Kolndadacha et al., 2011).

The application of probiotics outcomes in reduced feed costs, which plays a critical part in determining practices. Probiotics are utilized to motivate aquatic animal development of aquaculture. Interestingly, preceding research findings have displayed that the helpful effects of probiotics can manifest as improved feed utilization of cultured aquatic animals over the supplementation of digestive enzymes, enhanced feed effectiveness and higher advancement, the prevention of intestinal disorders and the pre-digestion of anti- nutritional factors exhibit in mixed feed(Suzer *et al.*, 2008).

MATERIAL AND METHOD

Experimental set:

20 fingerlings of *Oreochromis niloticus* fish were randomly placed in each aquarium. The average starting weight of fingerlings was determined. During experiment, all physicochemical parameters remained within normal limits. The fish were fed 5% of their total body weight once per day (M.P .Bhilave 2016). Fish body weights were also recorded at various time intervals. The PER and GFCE values were calculated using the associated formula and the weights of the fish.

Procurement of Microbes:

Probitics microbs (*Lactobacillus plantarum* MCC 3595, *Saccharomyces cerevisiae* MCC 1941, *Lactococcus garvieae* MCC 2824, *Bacillus licheniformis* MCC 2297, *Bifidobacterium breve* MCC 4634) were collected from National Centre for Microbial Resource affiliated to National Centre for Cell Science, Pune, India.

Formulation of feeds:

Following the above process the feeds have been formulated in 6 combinations with probitics and without probiotics, viz. with probitics 100% formulated feed (soybean meal + sorghum) & without probitics 100% formulated feed (soybean meal + sorghum), with probitics 100% formulated feed (soybean meal + fish meal) & without probitics 100% formulated feed (soybean meal + fish meal), with probitics 100%

formulated feed (soybean meal + fish meal + sorghum) & with probitics 100% formulated feed (soybean meal + fish meal + sorghum).

Statistical analysis:

Protein Efficiency Ratio (PER): (Laird and Needham, 1998)

The Protein Efficiency Ratio (PER) is based on Total wet weight gain (growth of fish) divided by Total dry weight protein fed during the test period.

PER is calculated as:

$$PER = \frac{\text{Total wet weight gain (growth of fish)}}{\text{Total dry weight protein fed}}$$

Gross Food Conversion Efficiency (GFCE): (Elliot and Davison, 1976)

GFCE is calculated as:

$$GCE = \frac{\text{Specific Growth Rate}}{\text{Relative Food Intake (RFI)}} \times 100$$

RESULTS AND DISCUSSION

Table 1: Proximate analysis of experimental diets fed *Oreochromis niloticus*

Parameter	**Unit**	**Company Food (Control)**	**Sample 1 (Plant origin + Animal Origin)**	**Sample 2 (Plant origin)**	**Sample 3 (Animal Origin)**
Moisture	(%)	8.98	09.12	08.07	07.96
Total Minerals	(%)	5.60	18.72	16.42	19.45
Crude Protein	(%)	32.23	25.37	28.76	19.35
Crude Fat	(%)	6.40	06.49	04.02	03.66
Crude Fiber	(%)	2.45	02.85	03.45	03.20
Carbohydrate	(%)	40.31	37.45	39.28	46.38
Energy	Kcal/100g	302.25	309.69	308.34	295.86

Fig. 1: Weight gain (g) of *Oreochromis niloticus* fed with probiotics formulated feed

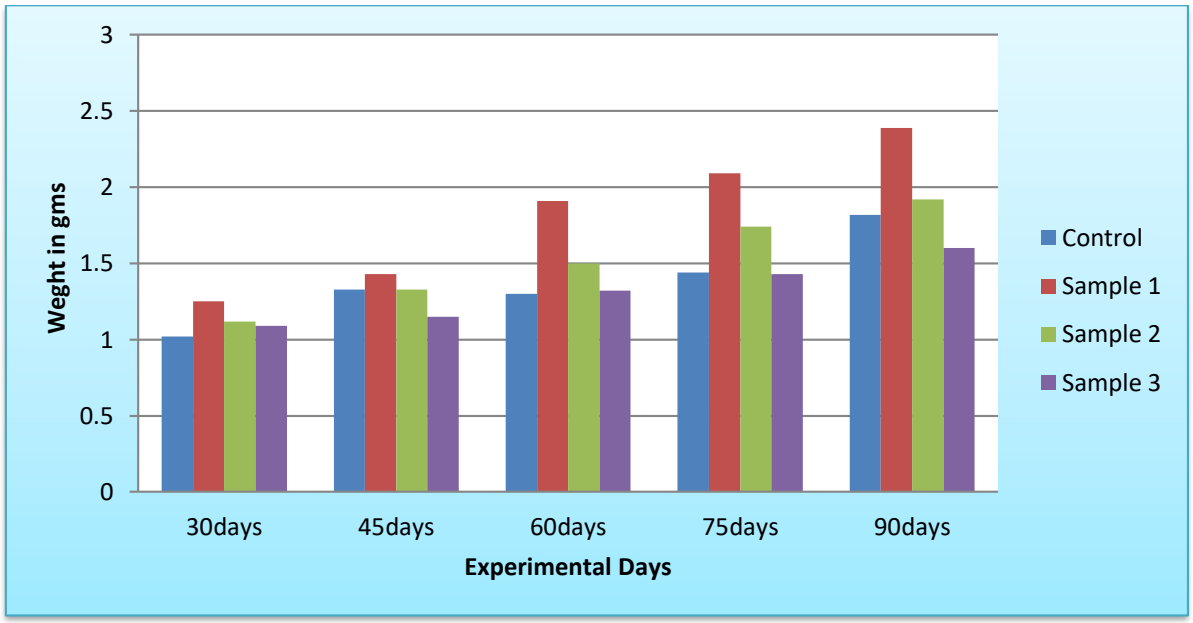
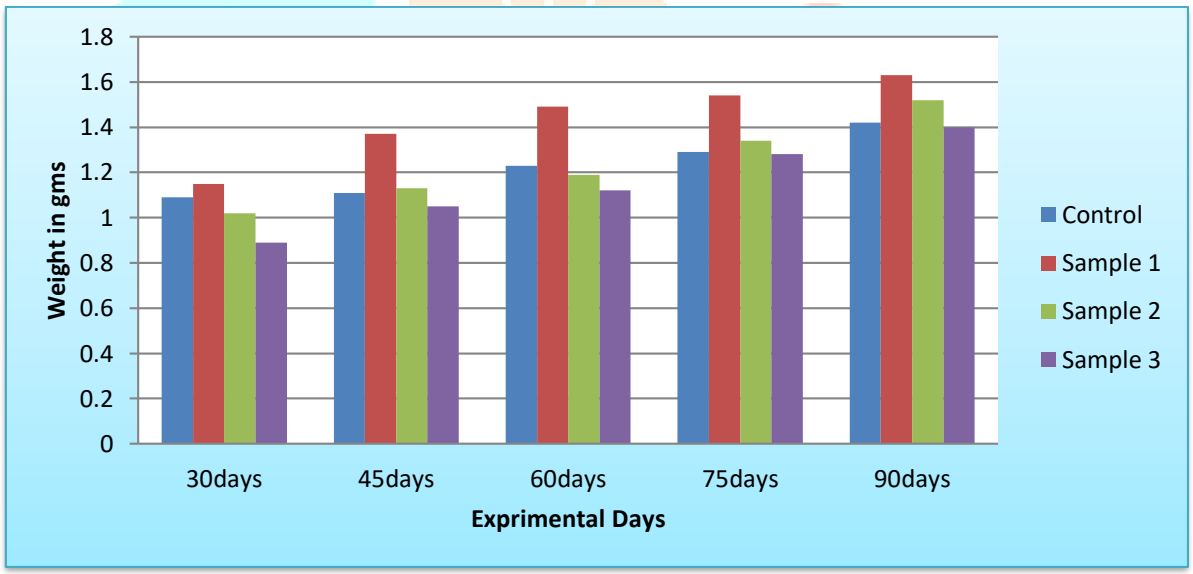


Fig. 2: Weight gain (g) of *Oreochromis niloticus* fed without probiotics formulated feed



In comparison of figure 1 and 2 it was observed that there is weight gain of *Oreochromis niloticus* who are fed with feeding probiotics formulated feed than without probiotics formulated feed.

Fig. 3: The PER of *Oreochromis niloticus* fed with probiotics formulated feed

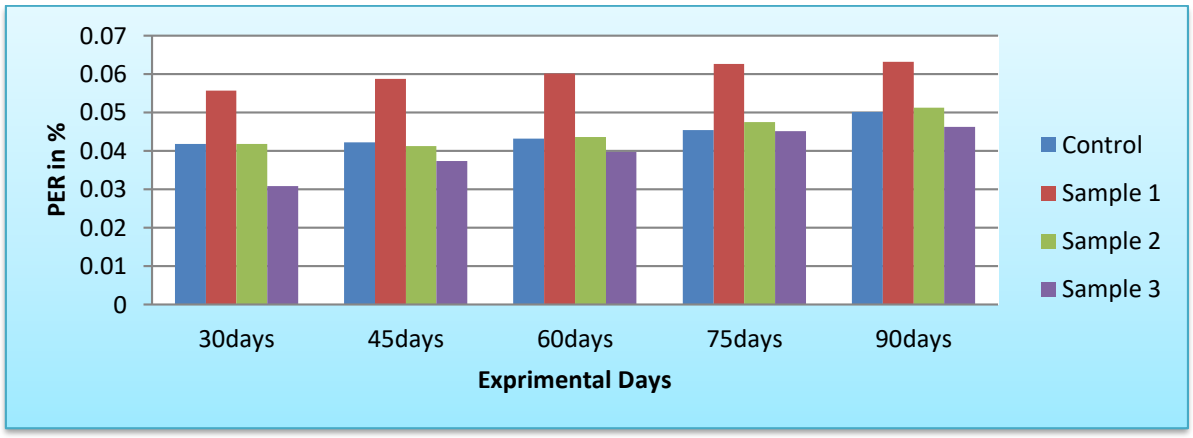
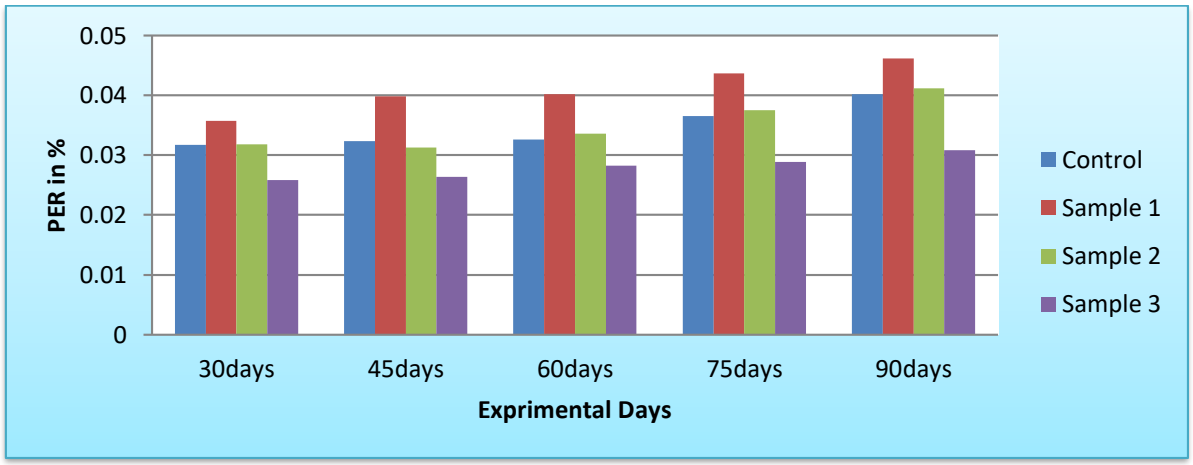


Fig. 4: The PER of *Oreochromis niloticus* fed without probiotics formulated feed



In comparison of figure 3 and 4 it was observed that PER of *Oreochromis niloticus* who are fed with feeding probiotics formulated feed are higher than PER of *Oreochromis niloticus* fed without probiotics formulated feed.

Fig. 5: The GFCE of *Oreochromis niloticus* fed with probiotics formulated feed

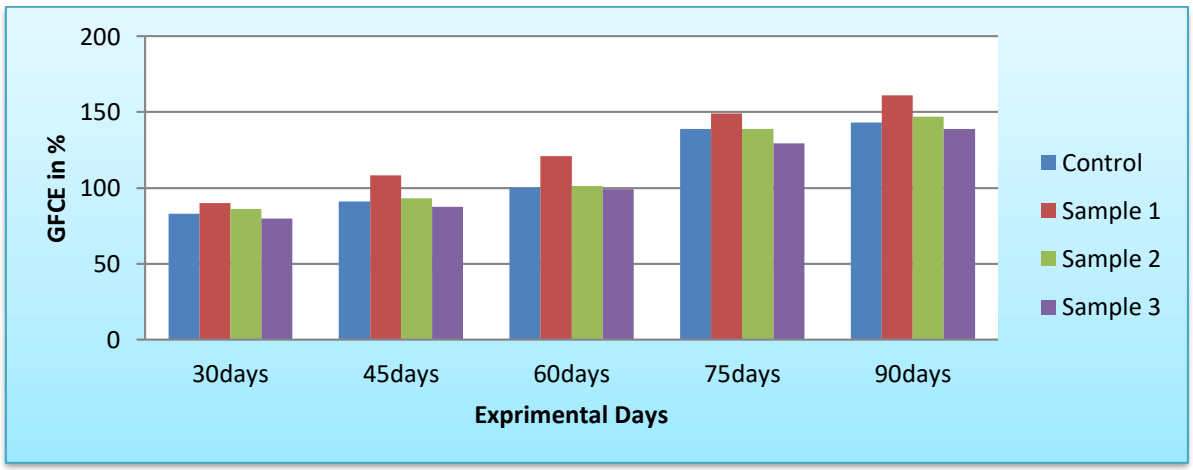
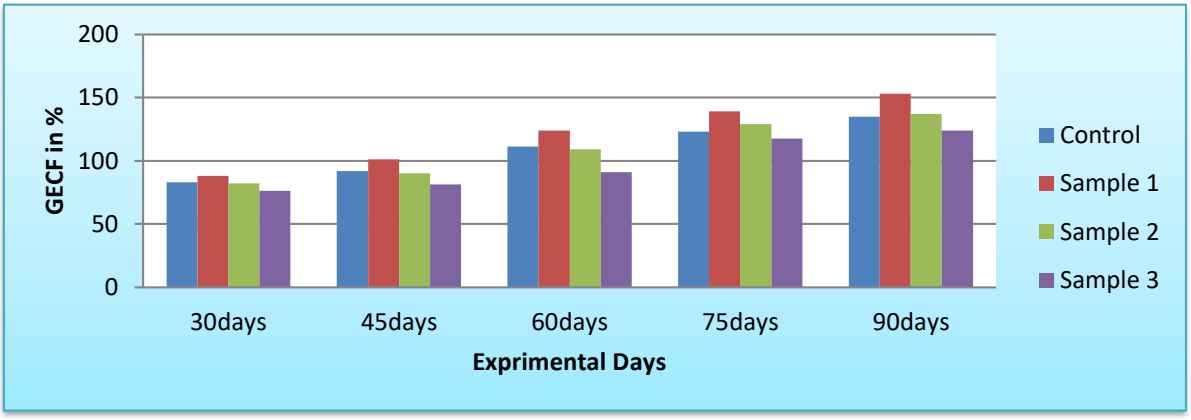


Fig. 6: The GFCE of *Oreochromis niloticus* fed without probiotics formulated feed



In comparison of figure 3 and 4 it was observed that GFCE of *Oreochromis niloticus* who are fed with feeding probiotics formulated feed are higher than GFCE of *Oreochromis niloticus* fed without probiotics formulated feed.

Commercial fish and other aquatic animals' growth, health, and reproduction are primarily dependent on an adequate supply of nutrients, both in quantity and quality, regardless of the culture system in which they are grown (AYUBA V. O. 2010, Royes J-AB, Chapman FA 2000). As a result, input supply (feeds, fertilizers, etc.) must be ensured in order to meet the nutrient and energy requirements of the species under cultivation and achieve the system's production goals (Hasan, 2001).

This is justified by the PER in with probiotics formulated feed than in the without probiotics formulated feed and also GFCE shows highest value in with probiotics formulated feed i.e. 179 % (Fig.5) as compared to without probiotics formulated feed 133 % (Fig.6). Similar results have been reported for *Heterobranchus longifilis* (Sonbesan and Ugwumba, 2008) and the *catfish Clarias batrachus* (Otubusin et al., 2009).

In present study, the feed containing with probiotic formulated feed shows good performance and exhibit significant results of PER and GFCE (Figure 3 and 5).

Commercial fish feeds are now widely used to increase aqua cultural production(Tom L 1989). Protein is the most important growth factor in feed (Winfree R A1992). Various factors influence commercial fish protein requirements, including commercial fish size, water temperature, feeding rate, availability and quality of natural foods, and overall digestible energy content of diet (Satoh, 2000; Wilson, 2000).

All herbal ingredients contain some amount of dietary fiber (Eyo, A. A. 2003). Fiber adds physical bulk to the feed (Hertramp f, J. W. 2000). A certain amount of fiber in the feed allows for better binding and eases passage of the feed through the digestive tract (AYUBA V. O. 2010). However, dietary fiber content in fish diets should not exceed 8-12%. This is because increasing fiber content reduces the quality of nutrients that are not available in the diet(De Silva and Anderson 1995).

CONCLUSION

From the above observation and discussion it can be concluded that probiotics formulated feed has potential to improve the growth rate of the fish. Such type of feed can be produced by using the byproduct and other waste materials from organic industries.

Further studies using different percentage of material will give the best combination for improving PER & GFCE.

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