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# Influence of Nutripro-Aqua Incorporated Feed on Water Quality, Primary Pond Productivity and Growth in the Culture of Pearl Spot

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Supplementary feeding may influence the water quality parameters, especially the productivity. Productivity is one of the principal water quality parameters that determine fish production. An experiment was carried out to evaluate the relationship between productivity and growth in *Etroplus suratensis* fed diet containing Nutripro-Aqua, a commercial growth promoter. Fishes were cultured in cement tanks for 180 days and the growth and productivity were monitored periodically. Nutripro-Aqua was administered through a standard pelletized feed with 40% protein at four dosages, 0, 8, 9.5 and 11%. Productivity and growth of fishes were found to be significantly high in 11% treatment, which indicates the influence of the pond productivity on growth of fishes.

**Key words: Nutripro-Aqua, primary productivity, growth, pearl spot, *Etroplus suratensis***

Maintenance of good water quality accounts for a major part of the production cost and is considered as a determining factor in the economics of fish culture. Optimum physico-chemical parameters of water such as temperature, pH, dissolved oxygen and productivity ensure maximum utility of the feeds, increase food conversion efficiency and thereby production. In confined controlled conditions, the supplementary feeding may affect water quality of culture ponds, which in turn affect the growth of fish. The unutilized feed and the metabolic wastes in high quantity sometimes result in deterioration of water quality which limits the growth of fish (Ghosh *et al.*, 1984); but within limited quantities, it may act as organic manure and enhance the nutrient content and productivity of ponds, which in turn will increase the growth and fish production. Schroeder (1978) suggested that microbial community rapidly digests the fibre-like particles in the unutilized feeds.

Several studies have been conducted on the water quality of aquaculture ponds (Banerjee, 1967; Swingle, 1968; Boyd *et al.*, 1979; Tucker *et al.*, 1979; Ghosh *et al.*, 1984; Chattopadhyay *et al.*, 1990; Nayak & Mandal, 1990). Photosynthesis is well correlated to fish production in ponds (McConnel *et al.*, 1977; Chattopadhyay *et al.*, 1990). Effect of feeding rates on water quality and production has been studied by Tucker *et al.*(1979) and Ghosh *el al.* (1984). An attempt has been made in this investigation to evaluate the influence of Nutripro-Aqua, a commercial growth promoter, on primary productivity and fish production in the culture of *Etroplus suratensis.*

## Materials and Methods

Experiments were carried out in cement tanks of size 5x4x1 m, for 180 days in triplicate. The experimental tanks were totally devoid of soil/sediment to avoid leaching of nutrients into the water and no manuring was done at any stage of the culture period. The water depth was kept at 75±5 cm throughout the culture period.

Juveniles of *E. suratensis* (Bloch) (1.69+0.04 g) were collected from Akkulam-Veli Lake in Trivandrum District (Kerala

Table 1. Proportion of ingredients of the experimental diet

| Ingredients | Proportion (g) | Protein (%) |
|---|---|---|
| Rice bran | 16.685 | 1.23 |
| Tapioca flour | 16.685 | 0.77 |
| Fish meal | 33.315 | 21.48 |
| Goundnut oil cake | 33.315 | 16.52 |
| **Total** | **100.000** | **40.00** |

State, India) and transported to culture site without disturbance and kept for two weeks for acclimation. Uniform sized juveniles were randomly stocked at the rate of 50 per tank. Fishes were fed twice daily at 5% of the total body weight. The quantity of feed was re-adjusted after every sampling. Fishes were sampled fortnightly for growth measurements. Growth was measured in terms of length and weight. Survival rate was also monitored during the culture period. Nutripro-Aqua containing full fat soya, vitamin B, sodium selenite, methionine, ethoxyquin and cobalt chloride was added to improve feed quality at 0%, 8 %, 9.5% and 11% levels to a standard fish meal based pelleted feed with 40% protein content. The different levels of Nutripro-Aqua were selected after a short trial run with the growth promoter in the species. The proportions of the ingredients of the experimental feed are given in Table 1. Productivity was measured using Dark and Light bottle method (Santhanam *et al.* 1989) and physicochemical quality parameters of water such as temperature, pH, hardness, alkalinity and dissolved oxygen were monitored (APHA, 1992) every $10^{th}$ day during the course of culture period.

Statistical analyses were carried out by analysis of variance (ANOVA) (Snedecor & Cocharan, 1968) and Duncan's Multiple Range Test (Steel & Torrie, 1980). Correlation between productivity and growth of fishes was found out by regression analysis (Ricker, 1973).

## Results and Discussion

The importance of water quality management in pond culture has been well elucidated by Boyd (1982), Fast (1983) and Rijn & Shilo (1989). The mean values regarding water quality parameters such as temperature, pH, hardness, alkalinity, dissolved oxygen and productivity were found to be optimum.

Temperature ranged from 25.8 to 32.0°C, which was within the optimum range for fish. The activity of fish and their growth in particular depends on temperature. Fry (1971) categorized temperature and pH as important controlling factors of growth as they govern the rate of reaction by influencing the rate of molecular activation of metabolites. The pH of freshwater ponds is generally controlled by the carbonate - bicarbonate buffer system. In the present study, the pH ranged from 7 to 8.5 which may be ideal for growth of pearl spot. The relationship of pH to pond fish culture has been summarized by Swingle (1961) and according to him and Mount (1973), the acid and alkaline death points of fish are about pH 4 and 11 respectively. The small fluctuations in pH, according to Huet (1986), is due to alkalinity and slightly alkaline water with pH 7 to 9 is suited for fish culture.

In the present study, the hardness ranged between 40 and 65 mg $CaCO_3.l^{-1}$. Small quantity of Ca and Mg are needed in water for fish culture but the necessary quantities are apparently present if total hardness is above 20 $mg.l^{-1}$ (Swingle, 1967). Similarly, natural waters that contain 40 $mg.l^{-1}$ or more alkalinity are considered to be more productive than waters of lower alkalinity (Mairs, 1966) and this greater productivity may be due to phosphorous and other nutrients that increase with increase in total alkalinity (Moyle, 1946). In the present study, the alkalinity ranged between 1.75 to 3 milli $eq.l^{-1}$.

One of the most important physico-chemical parameters of water is the dissolved oxygen content, which is a critical factor for maintenance of life and survival of fishes (Boyd, 1982). McKee & Wolf (1963)

Table 2. Mean primary productivity, correlation coefficients and regression equation of productivity with percentage weight in *E. suratensis* fed different levels of Nutripro-Aqua

| Parameters | Mean productivity (± SD) | Correlation coefficient | Regression equation (y = % Wt) |
|---|---|---|---|
| Control | $3.62 \pm 1.67^{a}$ | $0.9421^{**}$ | y=151.01x-186.85 |
| 8% | $4.41 \pm 7.34^{b}$ | $0.5205^{NS}$ | y=10.499x220.15 |
| 9.5% | $3.48 + 1.82^{a}$ | $0.9870^{**}$ | y=167.70x-200.75 |
| 11% | $4.71 \pm 2.76^{ab}$ | $0.9818^{NS}$ | y=158.93x-242.68 |
| F value | 3.747* | | |

NS - Not Significant, **p<0.01; *p<0.05; a, b - means with same superscript do not differ significantly

reported that less than 3 $mg.l^{-1}$ of dissolved oxygen in warm waters would be detrimental to fishes. In the present study, the dissolved oxygen ranged between 6.23 and 11.95 $mg.l^{-1}$ in different treatments.

Banerjee (1967) reported that oxygen concentration above 5 ppm is an indication of productivity, while below that level, water is unproductive. In the present study, productivity ranged from 1.01 to 9.20 $mgC.m^{-3}$. The productivity range differed from tank to tank in which different experimental feeds were administered (Table 2). The productivity ranges were 1.03-6.60; 1.01-4.83; 1.32-6.81 and 1.20-9.20 $mgC.m^{-3}$ in 0%, 8%, 9.5% and 11% Nutripro-Aqua administered tanks, respectively. The high productivity in 11% Nutripro-Aqua tank may be due to the leaching of nutrients from unconsumed feed present in the tanks. ANOVA showed a significant difference ($p<0.05$) in percentage increase in productivity between treatments and the mean productivity values at 11% Nutripro-Aqua treatment showed better production (Table 2). Ghosh *et al.* (1988) stated that organic matter is the main source of nutrients in fish pond fertility. Excess of protein-rich food with added nutrients in the Nutripro-Aqua might have enhanced the productivity of the pond.

Growth measurements at fortnightly intervals showed that the highest growth was obtained in 11% Nutripro-Aqua treatment followed by 9.5%, 0% and least growth was shown by 8% treatment ($p<0.01$) (Table 3; Fig. 1 & 2). Elevated growth rate in fishes that received 11% Nutripro-Aqua may be due to the synergistic effect of growth promoter and high productivity of pond water. Keshavanath & Hanumanthappa (1995) reported that 7.5 and 2.5 $mg.kg^{-1}$ Nutripro-Aqua enhanced the growth of *Cyprinus carpio*. Sherine (1996) tested the same growth promoter in *Oreochromis mossambicus* and reported that 8% and 9.5% performed better. Sherly (I997) studied the effect of Nutripro-Aqua on growth of *Labeo fimbriatus* and reported that Nutripro-Aqua enhanced growth significantly. The dosage of the growth promoter is species-specific and some doses may give good results and some may result in ill effects. The survival rate was also found to be higher in 11% treatment (Table 3).

Growth was positively correlated to productivity ($p<0.01$) except for the 8% level (Table 2). One way ANOVA showed that primary productivity of the four treatments differed significantly. All other conditions being similar except the diet quality, variations in productivity might be due to the influence of feed administered in different

Table 3. Growth and survival rate of *E. suratensis* fed different levels of Nutripro-Aqua.

| Parameters | Control | 8% | 9.5% | 11% |
|---|---|---|---|---|
| Initial length (cm) | 4.25±0.28 | 4.27±0.30 | 4.28±0.30 | 4.26±0.45 |
| Initial weight (g) | 1.68±0.36 | 1.60±0.40 | 1.75±0.45 | 1.67±0.39 |
| Final length (cm) (F=14.5084**) | $9.43\pm0.44^{b}$ | $8.73\pm0.59^{a}$ | $9.36\pm0.35^{bc}$ | $10.05\pm0.42^{c}$ |
| Final weight (g) (F=112.8505**) | $15.13\pm1.33^{b}$ | $12.41\pm1.54^{a}$ | $17.50\pm0.82^{c}$ | $22.34\pm1.20^{d}$ |
| Net weight gain (g) | 13.43 | 10.74 | 15.57 | 20.67 |
| Percentage gain in weight | 799.4 | 671.2 | 889.7 | 1237.7 |
| Survival (%) | 94 | 98 | 95 | 99 |

a, b, c, d - means with the same superscript do not differ significantly; **p<0.01

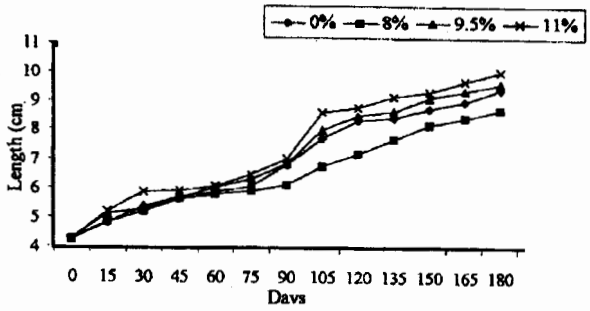


Fig. 1. Changes in mean length of *E. suratensis* fed Nutripo-Aqua incorporated diets

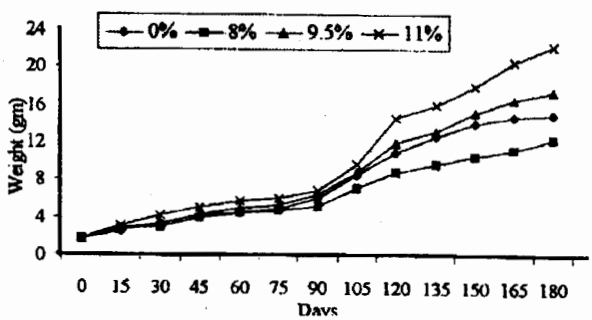


Fig. 2. Changes in mean weight of *E. suratensis* fed Nutripo-Aqua incorporated diets

treatments. The growth enhancement may be due to the synergistic action of growth promoter with the primary productivity of ambient environment. Regression analysis (Table 2) showed good relationship between productivity and fish growth in the culture system.

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