

An approach to reduce feed cost in aquaculture through adopting alternate feeding strategies

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INTRODUCTION

Reducing feed costs in aquaculture is important for the longer term sustainability of the feed industry, and more so in respect of rural aquaculture where the profit margins often tend to be rather marginal. There is a potential for reducing feed costs in aquaculture by reducing unit feed cost per se and also through the adoption of alternate feeding strategies. In regard to the former the most obvious approach to reduce the cost of feed is to decrease the amount of the most expensive ingredient in the feed, fishmeal, through substitution with a suitable, low cost alternative, while ensuring that such substitution will not compromise the growth and quality of the cultured stock.

REDUCING FEEDING COST AS MAJOR CHALLENGE IN AQUACULTURE INDUSTRIES

Reducing feeding cost is another important factor affecting the economic return of tilapia in semi-intensive culture systems. Since natural food is the main energy input in fish ponds, excessive supplemental feeding may result in a considerable economic loss, in addition to a severe environmental impact, while partial reduction of feeding level may improve economic return. For example, Lin and Yi^[1] reported that Nile tilapia reared in fertilized ponds and fed supplemental

diets at 50%, 75%, and 100% satiation, produced comparable yields, but the 50% level achieved considerable reduction in production costs and in nutrient loading. This means that farmers who adopt this feeding level can save about 50% of the feed without reducing their yield.

MIXED FEEDING SCHEDULE

The concept of a mixed feeding schedule was based on the observation that the digestibility of feed varies from day to day, following an apparent cyclic pattern. De Silva and Perera^[2] observed that the digestibility of ingested protein and dry matter in young Nile tilapia, *Oreochromis niloticus* (L.), varied rhythmically feeding schedules, where presentation of a high protein diet (30% protein content) was alternated with a low-protein diet (18% protein content), rhythmically resulted in improved nutrient utilization.

ROLE OF ALTERNATE FEEDING SCHEDULE IN AQUACULTURE

Level of dietary protein is of fundamental importance, because it significantly influences growth, survival, and yield of fish as well as economics of a farming industry by determining the feed cost which is typically the largest operational cost. Increase in dietary protein

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has often been associated with higher growth rate in many species. However, there is a certain level beyond which further growth is not supported, and may even decrease^[3-7]. Considerable research effort has been expended to determine the quantity and quality of dietary protein necessary to achieve optimum performance of fish.

EFFECT OF ALTERNATE FEEDING ON GROWTH PERFORMANCES AND BODY COMPOSITION IN FISHES

Nandeasha et al.^[8] reported that growth and feed conversion efficiency indicators like specific growth rate, feed conversion rate, protein efficiency ratio, protein retention, biomass production and energy content of fish indicated feeding for 1 or 2 days with low protein diet followed by 3 days of high protein diet is the best schedule for catla. In rohu, feeding alternately with low and high protein diet or 1 or 2 days of low protein diet followed by 2 or 3 days of high protein diet were the most suitable feeding schedules.

Dietary formulations consisting solely of plant proteins have not yielded comparable results to those of fish meal^[9-11]. Moreover, replacement of fish meal with plant proteins, derived from *Leucaena* leaf meal, in the diets of *O. niloticus*^[12], female brood *O. niloticus*^[13] failed to yield comparable growth of fish than the respective controls.

Santiago and Laron^[14] fed Nile tilapia fingerlings high protein (HP; 25%) or low protein (LP; 18%) diets at different feeding schedules. Weight gain was highest in fish fed the HP or LH for 23-days followed by LP for one day (2-3 HP-1LP). When the broodstock were fed HP (40%) or LP (25%), fry production was not affected by feeding schedules. However, when reproductive performance and economic evaluation were considered, broodstock on 1HP-1LP and 3HP-2LP gave the best overall performance. All these studies confirm that mixed-feeding schedule presents a viable alternative to a continuous feeding of one dietary protein level in enhancing growth and feed utilization in tilapia. Studies with snakehead, *Channa striata* fry showed higher overall growth performance and nutrient retention with the continuous 35% dietary protein feeding as compared to mixed-feeding schedules.

CONCLUSION

Experiments on mixed feeding schedules with alternate feeding strategies of high and low protein diet resulted in comparable improvement towards nutrient utilization parameters such as weight gain, SGR, apparent PCE and PER. But it is of considerable interest to point out that, the reduction in feed cost per unit kg of fish production and increase in net return over the feed cost were more impressive. Mixed-feeding trials showed that for several important cultured species such as carp and tilapia, it is not necessary to continuously provide an optimum dietary protein level to obtain good growth. This feeding concept thus presents new options for farmers in particular for the culture the more expensive carnivorous fish which tend to require a higher protein input. Such a feeding schedule will significantly reduce the total feed costs.

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