Practical significance of restricted feeding regime in aquaculture

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Feed is the most expensive component of an aquaculture enterprise, typically accounting for 40-60% of the operating cost depending on the intensity of production. Successful cultured fish production therefore requires optimisation of feeding practices to ensure the most economically effective growth rates and feed utilisation efficiencies. One of the major problems faced by fish culturists is the need to obtain a balance between rapid fish growth and efficient use of the supplied feed. Due to day-to-day and rhythmical variations in appetite, regular feeding practices may lead to feed waste and reduced feed conversion. When fish are fed using self-feeders fish can regulate feed intake in relation to their energy needs and feeding rhythms. Nevertheless, a restriction of the time during which feed is made available may lead to reduced feed waste without any alteration of growth performance, provided that the feeding periods are in phase with their feeding rhythms.

Reducing feed costs for culture practices in practical manner, can be achieved by taking the advantage of the phenomenon of restricted feeding strategies. In a broad sense, restricted feeding supports compensatory growth, which has been demonstrated in a variety of warm-water and cold-water fish species. Various feed restriction and refeeding protocols have been utilised to express the phenomenon of compensatory growth amongst these fish species often with a variety of physiological responses. Some responses to the period of feed restriction upon refeeding have included hyperphagia, enhanced feed efficiency, and improved growth rates. These responses have increased interest in the study of compensatory growth as a management tool in aquaculture. Such feeding strategies could improve management of personnel time, water quality, as well as fish-feeding activity and improvement of economic performance. The improved rates of gain during the compensatory phase would be expected to place extra demands for metabolic energy as well as increase amino acid requirements for protein synthesis during this period. The added demands for energy would be expected to come from increased rates of protein growth and elevated metabolic processes to support this growth.

Moreover, an important approach to reduce feeding costs and thus increasing profits in aquaculture farming system is to develop proper feeding management. Feed management strategies must match feed supply (feed delivery) to demand (appetite and the nutritional requirements of fish) incorporating such factors as feeding rate, frequency, duration and the choice of feeding regime. Efforts have been made to reduce feeding cost, while increasing growth rate and maximising feed utilisation by including digestive enzymes in the diet. Other methods tested include the use of mixed feeding schedules of varying high and low dietary protein levels in feed and optimising the feeding rate. Feeding regimes using restriction and re-feeding strategies have been shown in many species as a simple, easy, practically applicable and affordable means of reducing feeding cost. Under a restricted feeding regime, some fish convert a greater portion of feed to body weight without any adverse effect on their growth and nutrient utilisation than they do under unrestricted daily feeding ration regime.

Growth in fishes obtained through restricted feeding strategies, seemed to be closely related to the duration and severity of feed restriction imposed before refeeding. Thus, knowing the appropriate feeding regimes that achieve compensatory growth of fish is necessary before the practical application to aquaculture. The duration of feed deprivation that provokes compensatory growth also varies among fish species.

Effect of restricted protein feeding on growth performance, nutrients utilisation and body composition in fishes

Researchers have demonstrated that improvements in growth rates in response to a period of feed restriction may be as simple as an increase in feed consumption driving the higher plane of growth. Such feeding strategies to elicit compensatory growth could be beneficial in commercial aquaculture in ways other than just enhancing growth and feed efficiency. Feed restriction and re-feeding has been described for many groups of fishes including cyprinids, gadoids, pleuronectids, molatids, cichlids, ictalurids, salmonids and clariids.

Furthermore, results of feeding trial in farmers' ponds clearly demonstrated that the mixed feeding schedule of a low protein diet alternated with a high protein diet resulted in better growth, feed utilisation and production than feeding sutchi catfish and silver carp with a high protein diet continuously. This was considered as a possible way of reducing feed cost. Mixed feeding schedules using diets containing low and high-protein provided an increased and decreased nitrogen retention and loss, respectively, in tilapia and carps. The existence of rhythmic metabolic activities in fish indicates that they may not require a similar amount of nutrient intake daily. It has been reported that a mixed-feeding schedule of alternating the high-dietary protein diet with lower dietary protein level diet reduced the overall feeding cost without compromising growth of tilapia.

Conclusion

It is apparent from the various studies that, the discriminate restriction to feed for one or two days offers an opportunity to protect fish farmers against unfavourable situations such as feed shortages or high cost of feed. This strategy provides opportunities for fish farmers to reduce the cost of production. Restricted feeding regimes may be promising tools for increasing the efficiency of fish production. By not feeding or by limiting feed during the winter, producers can save money by reducing feed and labour costs, and possibly decreasing disease losses as well. Further research is needed to determine the optimum length of time to restrict feeding for different sizes of fish in order to maximise the effects of compensatory growth and optimise disease resistance. Satiation feeding may cause severe deterioration in water quality.