FEED FORMULATION WITH ANIMAL WASTE AS SUPPLEMENTS FOR ORNAMENTAL FISHES Poecilia sphenops

Murugan Vasanthakumaran1*, Suresh Babu Sujayakumari Basu1, Krishnamoorthy Deekshanya2 and Selvaraju Raja1

1Department of Zoology, Kongunadu arts and Science College, Coimbatore – 641029, Tamil Nadu, India
2Department of English, Kongunadu arts and Science College, Coimbatore – 641029, Tamil Nadu, India

DOI: http://dx.doi.org/10.24327/ijrsr.2020.1107.5468

ABSTRACT

Aquaculture is not only a way of producing food but also keeping fish for aesthetic pleasure and financial openings. There is considerable trade in aquarium or ornamental fish and supplies. Most of the ornamental fish farmers buy the bulk of their feed commercially. However, small amount of specialized feeds are often needed for experimental purposes. It is not costly effective for commercial manufacturers to produce very small quantities of specialized feeds. Small quantities of fish feeds can be made quite easily in the laboratory, classroom, or at home, with common ingredients and simple kitchen or laboratory equipment. This present work is to check if animal waste, fish waste and shrimp waste generated in every place of the municipal city in Coimbatore, Tamil Nadu, India could be used economically in the production of ornamental fish feed. To prepare and evaluate the feeds, proximate compositions (Nutritional) of the waste were analyzed and its growth and tissue development

INTRODUCTION

The farming of aquatic organisms, including fish, mollusks, crustaceans and aquatic plants is aquaculture. Aquaculture is practiced for a number of reasons, chief among them being food production and income generation. Fish and fish products constitute a major source of income, food and recreation in the global economy. Global aquaculture has grown dramatically over the past 50 years to around 52.5 million tons in 2008 worth US $98.5 billion. Aquaculture is also the world’s fastest growing food production activity based on animal protein. Freshwater aquaculture has also improved economies of many areas by providing new job opportunities. In the past decade, a number of developments have contributed to the significant growth of the global aquaculture sector, namely: formulation and implementation of policies, strategies, plans and legislation; dissemination and use of applied research; and emergence of new domestic and international markets (FAO, 2011).

Aquaculture is not only a way of producing food but also their branch of ornamental fish keeping for aesthetic pleasure and financial openings at different scale of people. There is considerable trade in aquarium or ornamental fish and supplies. An estimated one billion ornamental fish are exported annually (Dykman, 2012). The majority (>90%) of fresh water ornamental fish are captive bred compared to only about 25 of a total of 8,000 in the case of marine fish (FAO, 2005). The industrial development of freshwater ornamental fish culture has been hampered by the lack of suitable live feeds for feeding the fish at the various production stages (Lim et al., 2003).

Feed represents the largest single expenditure item in semi-intensive and intensive fish culture systems; of the feed ingredients, protein is one of the most expensive components of diets for aquarium fishes. Fishmeal is known for its high protein content and balanced essential amino acid profile and therefore has been the preferred protein source for most fish feeds (Nguyen et al., 2009; El-Sayed 1999). However, there is limited supply of fish meal, and there are growing concerns over the long-term sustainability of this resource, and the high price

*Corresponding author: Murugan Vasanthakumaran
Department of Zoology, Kongunadu arts and Science College, Coimbatore – 641029, Tamil Nadu, India
also adds to the cost of production of formulated fish feeds (Borgeson et al., 2006). There is an increasing need to utilize less-expensive and locally available plant and animal protein sources to reduce feed costs (Nguyen et al., 2009).

Ornamental fish trade is a multibillion-dollar industry in which approximately more than 125 countries involved the trade. The global Ornamental fish trade is estimated to be more than US $15 billion and more than 2 billion live ornamental fishes are traded. The 99% of the global market is confined to hobbyist and less than 1% is used for public aquaria and research institute. Developing countries are the major producers and suppliers in the world supplying more than 60% of the ornamental fish. Over 2,500 species are involved in the global ornamental fish industry, of which over 60% are of freshwater origin and the rest are marine.

Ornamental fish trade also involves larger numbers of wild caught fish and invertebrates, in addition to the much popular farm reared ornamental fishes. Neon tetras, Angels, Gold fish, Danios and discus dominate the world ornamental fish trade, with Guppy and Zebra danio both together contributing to more than 14% in value of the fishes traded. The ornamental fish sector is primarily dependent on freshwater fish species, with nearly 15% of the total traded species being marine, contributed by wild collections. The marine ornamental species have greater potential for export trade because of their most exquisite colours and attention rubbing behaviour, but there are apprehensions pertaining their collection from the natural environment, biodiversity and sustainability perspectives.

The Chocolate molly, Poecilia sphenops, is a common aquarium fish native in freshwater streams and brackish water habitats in Central and South America (from Mexico to Columbia), which often interbreeds with the Sailfin molly (Shipp, 1986). This species has been introduced into parts of Southeast Asia. They are omnivorous and feed on various aquatic invertebrates, such as insects and worms, as well as plant and other organic debris. In natural conditions, fish can regulate and maintain their food intake and therefore their nutritional requirements, reducing the possibility of suffering nutritional deficiencies; however, this problem can be observed when the fish are subject to confinement conditions (Lovell, 2000).

Aim of the present study on breeding biology and allometry of Poecilia sphenops. To find out the variation of the growth and survival of fries and fingerlings with the help of the feed prepared (Chicken waste materials- CMW, fish waste materials- FWM, and shrimps waste materials- SWM) as supplements and compare the growth of the fishes with the prepared feed to the commercial feed and conduct feeding trials on fries and fingerlings of P. Sphenops to evaluate their growth and survival.

MATERIALS AND METHODS

Experimental fish

The freshwater fish P. sphenops were obtained from the commercial aquarium shops in Tamil Nadu Coimbatore District, India. Fish were acclimatized to laboratory condition in a large cement tank (6" × 4" × 3") with ground water with an optimal level of physico-chemical characteristics (temperature, 27.33 ± 0.57 °C; Dissolved Oxygen (DO), 7.23 ± 0.58 mg/L; pH, 7.2 ± 0.1; total dissolved solids, 0.68 ± 0.06 g/L; Biological Oxygen Demand (BOD), 18.63 ± 0.35 mg/L; Chemical Oxygen Demand (COD), 67.33 ± 5.03 mg/L; ammonia, 0.4 ± 0.1 mg/L) for 2 weeks. During the acclimatization period, fish was fed with commercial feed thrice (at 06:00 h, 12:00 h, and 18:00 h) per day. Faeces and unfed feeds were cleared out daily while renewing the 80% of tank water to maintain the healthy environment.

Feed formulation

Feed preparation was made in the laboratory according to Table 1. The ingredients including fishmeal, soybean meal, wheat bran, tapioca flour, eggs, and cod liver oil and vitamins mix were purchased from the local markets. For this diet preparation, the fish meal and soybean meal were served as the protein source, the carbohydrate sources were wheat and tapioca flour, and lipid source was cod liver oil. Also, tapioca flour and egg albumin were taken as binding agents, and Vitamin B complex with Vitamin C was also added as an essential micronutrient. The above ingredients except egg albumin, cod liver oil, vitamins, and minerals were mixed thoroughly and steam cooked for 20 min at 105 °C. Different concentrations of dried waste materials (2g kg⁻¹, 6g kg⁻¹, and 10g kg⁻¹) were added along with the heat-sensitive ingredients like vitamin, mineral premix, egg albumin, and cod liver oil to the steam cooked bald diet and mixed well to form a dough. Further, the dough was pelleted using indigenous hand pelletizer (Retro stainless steel, BM brand) and dried at room temperature until the constant weight was reached.

Experimental procedure

Four groups of P. sphenops were assigned for 35 days of the experiment in triplicate. Three groups were fed with Diet I, Diet II, Diet III and feed pellets g kg⁻¹ Animal waste-supplemented diets. The remaining one group was served as control (fed with “0” concentration of Animal waste - supplemented diet). Each group consisted of 50 fishes. The water medium was renewed every day by siphonning method. At the end of the feeding experiment, fish from each treatment were sampled to analyze various parameters.

Assessment of survival, growth, and food index

Survival, growth, weight gain, length gain, specific growth rate, and food index parameters, such as feed intake, feed conversion ratio, and protein efficiency ratio were calculated according to the following equations (Tekinay and Davies, 2001)

Survival (%) = no. of live fish/ no.of fish introduced × 100

Length gain (cm) = final length (cm) – initial Length (cm)

Weight gain = final weight (g) – initial weight (g)

Specific growth rate (SGR) = logW2-logW1/T × 100

Where is w1 and w2 = initial and final weight (g), and T = duration of an experiment in days

Statistical analysis

The data were expressed as mean ± S.D. and analyzed by one-way analysis of variance (ANOVA) using SPSS (21.0), followed by Duncan’s multiple range test (DMRT) to compare the differences among treatments. Differences were considered significant at P < 0.05.
RESULTS AND DISCUSSION

Ornamental fishes provide aesthetic beauty to home and garden along with the mind relaxation. Fishes with attractive colour pattern, swimming behaviour and more resistant to captivity stress considered as good candidate species. In ornamental fish farmers chooses the criteria of economic value of the fish and the familiarized breeding technology. The ornamental fishes are known to their brand name and top ten groups in the freshwater aquarium are Tetra, Guppy, Gold fish, Catfish, Molly, Gourami, Platy, Loach, Cichlid and the Barbs. Formulated feeds are complete feeds which supply all the nutrients necessary for optimal growth and health of the fish in culture practices. Fish nutrition has advanced dramatically in recent times with the development of new and balanced commercial feeds that promote optimal fish growth and health.

Ornamental fishes are reared in high density in indoor systems and cannot forage freely on natural feeds, they should be provided with a complete diet. Complete diets supply all the ingredients necessary for the optimal growth and health of the fish. In general, complete diet formulated with organic and inorganic components constitute the following proportions, protein, lipid, carbohydrate, ash, phosphorus, water, moisture and Gross Energy (GE) are listed in the Table 1. In the present study fishes were reared in aquarium tanks and hence complete artificial diet was formulated. All the experimental diets supported the growth of the mollies as evidenced by their growth parameters. Protein is fish silage prepared from whole fish, trash fish, fishing waste/fish by-products, or fish farm mortalities, which have been widely used (Vidotti et al., 2003).

Results pertaining to length and weight gain, specific growth rate (SGR) and survival of feeding trials of P. sphenops with experimental diets and commercial pellet diet are presented in Table 2. Of the four formulated experimental diets, diet III (SWM) with fish meal exclusively as major macro-nutrient has given growth performance similar to the commercial pellet diet, while diet I (CWM) and diet II (FWM) showed relatively lower length and weight gain. Nevertheless, significantly higher percent of survival rate of P. sphenops was recorded in the experimental diets than in the commercial pellet diet. In view of higher cost and mortality rate of imported commercial pellet feed compared to experimental diets. Experimental diets formulated with locally available animal protein sources could be used in commercial production of molly fish.

In all the three diets experimented in the present study the proximate composition, vitamins and minerals were included as per the requirements of these components in fish feed. Growth and development of P. sphenops suggest all the diets supported normal growth; never the less variation in the growth performance with different diets might be due to the difference in the composition of the macro-nutrient of these diets. Growth performance revealed the possibility of replacing 50% of FM by FFS in catfish diets without negative effects on BW, WG and SGR and these results may be attributed to the IAA content of FFS which covered the requirements of IAA for catfish except for lysine, isoleucine and arginine. The other reason for the good response of fish fed the FFS diets might be the presence of pre-hydrolyzed proteins, which facilitate digestion (Soltan and Tharwat, 2006).

CONCLUSION

The use of Chicken waste materials CMW, fish waste materials (FWM), and shrimps waste materials (SWM) as a replacement for fish meal at 0–100% levels showed that the proximate composition of the feeds are don’t have difference compared commercial feeds statistically, except for a higher protein content than the commercial feed. Nutritional evaluation of these feeds did not show any statistical difference among themselves and with control commercial feed, in terms of gain in length, weight, and growth factor. The mortality rate during the feeding trial did not present any conclusive trend. Chemical analysis of ornamental fishes fed on the diets for a period of sixty days also did not differ statistically. The results of this study showed that CMW, FWM, SWM could substitute for fish meal in tilapia fish feed without affecting the nutritional quality of the feed and, at the same time, being economical.

References


How to cite this article:

********