Formulation of flake feed using indigenous Artemia, (*Artemia franciscana*) and its effect on growth and survival of Guppy (*Poecilia reticulate)* fish

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Abstract

The brine shrimp Artemia ***(Artemia fransicana)*** *is widely used as a live feed for shrimp and fish hatcheries all over the globe. In this study using the artemia collected from the salt pans of Tuticorin region in the form of cysts, naupli and biomass are used as a primary ingredient in formulated flake feed Biochemical analys and experimental trials were carried out for 30 days. 10 guppy (*Poecilia reticulate*) fishes were made into a batch.Threer such batches were stocked in individual glass tanks and fed with formulated flake diet with an average three time feed intervals in a day. Formulated flake diet made with Artemia cyst,nauplii and biomass were tested for growth characteristics, feed acceptability and FCR. Experiments shown that the Flake feed formulated with Artemia biomass has shown a better growth and survival rate compared to other formulations.*

Key words: *Brine Shrimp, Artemia Cysts, Nauplii, flake diets*

INTRODUCTION

The brine shrimp *Artemia* ***(Artemia fransicana)*** are widely used as a live feed for Shrimp and fish hatcheries all over the globe. The brine shrimps are the most popular live feed in aquaculture. Its nauplii and metanauplii are used as food for larvae and juveniles of crustaceans and fish, and the use of mass produced juveniles and adults of Artemia has become increasingly popular in ornamental fish culture and in hatcheries, where they are used to enrich the maturation diets for shrimp and fish brood-stock (Dhont and Lavens, 1996). Mean while the Indiginius *Artemia* collected from salt pans of Tuticorin region has a very less demand among hatchery operators. This is mainly due to lack of presevation methods and lack of biosecurity. Modern techniques for preservation of *Artemia* biomass (e.g. blast-freezing or drying) are often cost prohibitive and in several cases not applicable at the remote and scattered sites. An inexpensive technique which can be readily applied under field conditions and allowing to stabilize and retain the nutritional quality of *Artemia* at ambient

temperatures, would greatly enhance the quality for exploitation of this resource for aquaculture. In this study using the *Artemia* that collected from the salt pans of Tuticorin region in the form of cysts, nauplius and biomass were added as a primary ingredient in formulated flake feed and the effect of growth and survival rate of the guppy fish (*Poecilia reticulate)* were analysied.

MATERIALS AND METHODS

Collection of Cysts, Nauplius and Biomass

Tuticorin is situated in extreme south end of Tamil Nadu and constituting about 3.5 percent coast line covering 121 km. In this district about 25000 acres are converted into salt pan for salt production. Tuticorin is the second largest producers of salt in India compared with Gujarat, which has the geographical area of about 4621 Sq Km. Saline ground water having 55 to 65 ppt of salinity helps in salt production. Veppalodai (Lat. 8° 53' 45.97"N ; Long.78° 09' 56.68"E) and Tharuvaikulam (Lat.8° 44' 40.07"N ; Long.78° 07' 27.87"E) are the main areas for salt production which was chosen as sampling sites, situated 10 km and 20 km north to Tuticorin city respectively. The *Artemia franciscana* populations were found throughout the year in Tuticorin saltpan ecosystem (Balachandar *et al.*, 2017). Samples of adult *Artemia* (Fig.1) and cyst were collected from wild at Veppalodai, situated in Tuticorin coast. Adult brine shrimp (*Artemia)* samples were collected using 150 µm mesh plankton net and preserved in a deep freezer for further studies in the laboratory. Wet cysts were collected and dried, few quantity of dried cysts were used to hatch out the nauplii and adult biomass were collected from wild are used as an individual ingredient for formulating three different types of flake feed.

After collecting the prime ingredient for preparing the three different types of flake feed, the formulations are made as per the composition listed in Table 1 for the desired output. The measured ingredients are finely grind using a pulverizer and blended well to form a homogenous mixture. Sterile distilled water was added to the dry mixture and mixed well to prepare liquid slurry of 40% concentration without lumps and poured in tray and placed in electric oven and it was dried at 120°C for 2 - 3 minutes. The resulting flake sheets were collected and tested for their stability in water up to 2 - 3 hours.

Growth trial

Three batches containing each ten male guppy fishes (*Poecilia reticulate)* were taken for trials in separate glass tanks. The initial body weight of the fishes was recorded before starting the feed trials. Feeds were formulated to contain more than 40 percent crude protein and 5 percent crude lipid. Different forms of *Artemia (Artemia franciscana)* were used as a major ingredient to produce three variants of flake feed. The fishes were fed manually with 5% of their total body weight up to three times daily. The remains were siphoned out at the end of the day and accounted.

Feed intake was thus quantified and evaluated in relation to growth response. The feeding trial was carried out for 21 days and they were evaluated initially and at the end of the experiment for subsequent growth analysis. Protein and energy deposition was also

assessed, which allowed estimation of the utilization efficiency of the feed ingredients incorporated in the diets.

Collection of artemia biomass, artemia eggs and artemia nauplii

Fig. 1. These three types of formulated flake feeds were used for assessing growth and survival of guppy fish (*Poecilia reticulate)*

Table 1. Formulation of flake feed using *artemia* (*Artemia fransiscana*)

Formulation	Flake feed using Artemia cysts	Flake feed using Artemia nauplii	Flake feed using Artemia biomass
Ingredients (weight in grams)			
Fish Meal	350	350	350
Artemia ingredient	250	250	250
Refined wheat flour	200	200	200
Refined Starch	100	100	100
Fish Soluble paste	50	50	50
Refined Fish oil	10	10	10
Soya lecithin	10	10	10
Sodium Alginate	10	10	10
Vitamins and minerals	10	10	10
Preservatives	5	5	5
Di-calcium phosphate	5	5	5

Analyzed Composition			
Crude Protein	42 %	44 %	46 %
Crude Fat	4 %	6 %	8 %
Crude Fiber	3 %	3 %	3 %
Moisture	10 %	10 %	10 %

Table 2. Performance parameters of guppy (*Poecilia reticulate)* fish fed with different types of flake feed

Diet Treatment	**Batch 1 Flake feed using Artemia cysts**	**Batch 2 Flake feed using Artemia nauplii**	**Batch 3 Flake feed using Artemia biomass**
Weight initial (gm)	10.5±0.05	10.6±0.05	10.5±0.05
Weight final (gm)	12.5±0.05	12.8 ±0.05	13.0±0.05
SGR	0.0036±0.05	0.0039±0.05	0.0044±0.05
Feed intake (gm) Day/fish	0.525±0.05	0.53±0.03	0.525±0.05
FCR	5.51±0.12	5.06±0.15	4.41±0.15
Survival rate	80%	90%	100%

RESULTS

Variants of flake feed with different forms of *Artemia* were well accepted by the guppy fishes and the results indicated that digestibility and efficiency of *Artemia* variants was equivalent to fishmeal. Effects on the supplementation of various stages of *Artemia* to a basic formulated flake diet has not been yet well documented. Survival of guppy fishes on all dietary treatments was above 90% for the entire flake feed variants. There was significant difference in the growth and FCR of guppy fishes during the experiment (Table 2)

The first batch fed with flake feed formulated using *Artemia* cysts has shown an average growth rate. Though the feed acceptability was good, the growth rate was not up to the mark. The fishes were eager to eat but not much attracted by the feed. It is presumed that, the color, texture and flavor were less attractive for the fish to feed on. All the fishes in the group showed similar characteristics. The second batch fed with flake feed formulated using *Artemia* nauplii has shown a better growth rate. The feed acceptability was good. The fishes were attracted to the feed and accepted it. The body coloration and pigmentation were comparatively better than the first batch. Using nauplii as an ingredient will be expensive when compared with the other two variants as the nauplii has a demand to use as an infant stage feed in hatcheries. The hatcheries are ready to pay premium price for *Artemia* nauplii. The third batch fed with flake feed formulated using *Artemia* biomass has shown very good growth rate (Table. 2). The guppy fish showed excellent pigmentation, color development

and fin growth. The feed acceptance was good due to the attractant that enhanced flavor of the flake. The fish also showed 100% survival rate.

DISCUSSION

Flakes supplied in the experiments have a high nutritional value, coloration was more intense in fish that consume any live food. This difference could be the result of the diet digestibility and in stimulating fish catches. Additionally, the live food does not undergo drying processes, freezing, or packaging, which decreases its original value (Coutteau and Sorgeloos, 1992; Garcia-Ortega, 2000: Glencross *et al.,* 2007). On the other hand, increasingly colour intensity using live food in comparison with commercial flakes could be attributed to crustacean used (*M. wierzejski and A. franciscana*) which are filter feeders, so they obtain sources of carotenoids from microalgae present in cultured (Delgado Vargas *et al.,* 2000; Pan *et al.,* 2001; Agwa and Abu, 2014). Growth is a good indicator of the health of an organism (Moyle and Cech, 2000).

Fish age, size, and culture conditions, including food quality, amount of feed provided, and water temperature affect the optimum feeding frequency for maximum growth of fish (Kestemont and Baras, 2001). Studies conducted on other fish species have shown that feed consumption and growth generally increased with feeding frequency up to a given limit (Bascinar *et al.,* 2007 and Wang *et al.,* 1998). This is in agreement with our findings in this study that feeding frequency had a significant effect on feed conversation ratio and growth in the angelfish. The optimum feeding frequency may vary with species and size of fish (Goddard, 1996). Tsevis *et al*. (1992) reported that increasing feeding frequency resulted in an inferior feed efficiency by sea bass reared at around 20 °C. Lee *et al*. (2000) documented that a better feed efficiency in 3.5 g flounder, *Paralichthys olivaceus*, fed to satiety was obtained at a feeding frequency of 2 or 3 times daily than once in 2 days. It is evident that a higher growth rate depends on both higher and more frequent daily feed supply. In general, feed conversion improves increasing feeding frequency (Goddard, 1995).

CONCLUSION

Present study undertaken the formulation of flake feed using different variants of *Artemia* (*Artemia franciscana*) was successful and we could infer some valuable results. Out of the three variants using *Artemia* biomass as an ingredient would be an optimal choice both nutritionally and commercially. Based on the performance, the feed formulated using biomass was the most attractive, acceptable, flavorful and nutritious. The *Artemia* biomass is abundantly available in the wild in the Tuticorin salt pans and the study revealed the proper usage of the biomass as an ingredient in preparing flake feed. The study gives lead for making commercially viable to use the formulated flake diets with supplementation of *Artemia* biomass to get better survival and growth in marine finfishes.

ACKNOWLEDGEMENTS

Author is grateful thanks to the Principal, Head of the Department and other staff members of Zoology and Biotechnology, Govt. Arts College, Nanthanam, Chennai, India for providing necessary facilities.

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