HSPI The Open Access Publisher

AAC ANNALS OF ADVANCES IN CHEMISTRY
ISSN 2576-3768

Research Article

A Study on Potential Feed Sources to Boost Guppy Fish, *Poecilia reticulata* Productivity

CV Vedhavarshini, Swetha A, Harini Sri M, Kaviya K, Ann Suji H, and Deivesigamani B*

CAS in Marine Biology, Faculty of Marine Sciences, Annamalai University Parangipettai-608502 Tamil Nadu, India

More Information

***Address for correspondence:** Deivesigamani B, CAS in Marine Biology, Faculty of Marine Sciences, Annamalai University Parangipettai-608502 Tamil Nadu India, Email:b.deivasigamani@gmail.com

Submitted: August 28, 2023
Approved: May 01, 2024
Published: May 02, 2024

How to cite this article: Vedhavarshini CV, Swetha A, Harini Sri M, Kaviya K, Ann Suji H, et al. A Study on Potential Feed Sources to Boost Guppy Fish, *Poecilia reticulata* Productivity. Ann Adv Chem. 2024; 8: 008-011.

DOI: 10.29328/journal.aac.1001049

Keywords: Aquaculture; Guppy; *Poecilia reticulata*; Feed; Ingredients; Growth

Check for updates

OPEN ACCESS

Abstract

Aquaculture may simply be referred as "Underwater Agriculture."India is a major maritime state and an important aquaculture- based country in the worldhaving major aquaculture activitiesin the production of Carp from Freshwater,Shrimp from Brackish water, etc. Feed requirements of fish vary in quantity and quality according to the feeding habits, physiological stages of the species and environmental variations viz., temperature; amount and type of natural food availability in the culture system.A nutritious and cheap feed is a pre requested for profitable aquaculture. Though, use of commercially available feed is in practice in many countries. The feed cost consumes more Than half of running expenditure. Therefore, the search of nutritionally well-balanced feed Prepared from very cheap locally available ingredients in progress in all the aqua farming countries. In the present study, an attempt has been made to well-balanced nutritious feed Particularly from the locally available cheaper ingredients. The objectives of the present study are: to assess the effect of feed on the growth of finfish and shellfish in the laboratory, to prepare the conventional feed with traditional ingredients and to check the effect of feed on the growth performance of ornamental fish - Guppy, *Poecilia reticulata.*

Introduction

Fish production in India has registered excellent growth in past half a century from 0.75 million tons in 1950s to around 7.5 million tons in 2008. To the fisheries sector in India,capture fisheries contribute around 4.1 million tons and Aquaculture contributes around 3.4 million tons.Aquaculture involves breeding and growing fish in a captive environmentto be productive and to yield high volumes of good quality fish. According to the Food and Agriculture Organization (FAO), the world harvest by commercial fisheries in 2010 consisted of 88.6 million tons of aquatic animals captured in wild fisheries, plus another 0.9 million tons of aquatic plants (seaweed etc.). This can be contrasted with 59.9 million tons produced in fish farms, plus another 19.0 million tons of aquatic plants harvested in aquaculture.Feed has got a significant impact on the quality, safety and nutritional value of farmed fish [1].

Feed is defined as the mixture or compound of various ingredients which accomplish the nutritional requirement of any organism feeds can be farm made single section feeds like rice bran or mastered oil cake to commercial feeds. Kitchen wastes also are considered as one of the types of farms made feeds produced economically for a small-scaleventure [1], Farm-made or on farm feed consist of one or artificial and natural ingredients subjected to a few types of processing done on farm or in small processing plants are normally regarded as farm made feeds & are often used in small scale semi-intensive aquaculture particles. Commercial feeds are formulated and manufactured from a homogenous mixer of several ingredients, in different properties that ensure precise quality targets in term of size and texture, stability &nutritional composition at highly competitive price [2], Commercial complete feeds are used generally in intensive and semi-intensive practices.

Fish, especially when reared in high densities, require a high-quality, nutritionally complete, balanced diet to grow rapidly and remain healthy". Accordingly, there has been a significant rise in the demand for aquaculture feed across the industry.Using fish meal as a major protein source will make this unavailable in future and as an alternative plant protein source like seaweed can be utilized in a sustainable way as a feed ingredient. Wet feed are those which are made entirely or

almost entirely from high moisture ingredients, such as 'trash' fish, waste slaughterhouse products, undried forage, etc. [3]. Feed formulation is the method to measure the amount of feed ingredients that need to be combined to form single uniform mixture for poultry that supplies their entire nutrient requirement.

Material collection and preparation of ingredients for fish feed formulation

Major ingredient, Seaweed was collected from the Gulf of Mannar with the help of CAS in Marine Biology laboratory. After seaweed collection it washed through the distilled water and it was dried under shade drying method (Figure 1a,b).

(Ulvaintestinalis)

Other locally available ingredients:

Rice bran

Wheat bran

Soyabean cake

Cotton seed cake

Groundnut cake

Corn

Sesame seed and

Potato

Feed preparation (Table 1)

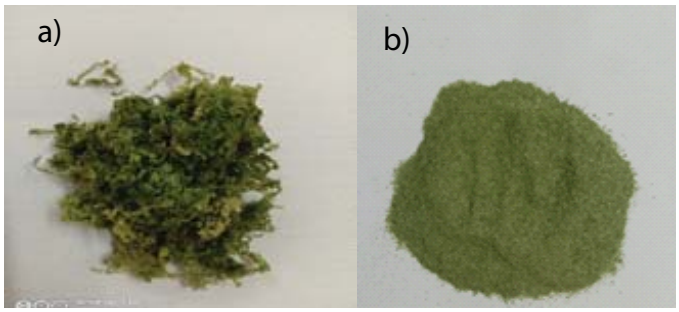

Figure 1: a) Dry Green Seaweed, b) Powder form of green seaweed

Table 1: Composition of Feed Ingredients.

S.No.	Feed Ingredients	Feed Composition
		Sinking Feed (gms)
1	Rice bran	15 gm
2	Wheat bran	10 gm
3	Soyabean cake	15 gm
4	Cotton seed cake	10 gm
5	Groundnut cake	15 gm
6	Seaweed *(Ulvaintestinalis*)	14 gm
7	Corn	10 gm
8	Potato	3 gm
9	Starch	10 ml
10	Sesame seed	5 gm
11	Fish oil (Seacod , Sanofi)	2 capsules

The detailed preparation of feed was followed as 15 gm of Soybean meal was taken in powder form as principal ingredients. Other ingredients like, 10gm of corn, 15 gm of groundnut, 10 gm of dry fish, 10 gm of cotton seed, 15 gm of rice bran, 10 gm of wheat bran and 14 gm of seaweed (*Ulva intestinalis*) were added and mixed well through mixer grinder. 10 ml of starch was added as binding agent, in addition, nutrient source as 3 gm of potato and 10 gm of sesame seed was incorporated. The mixture was cooled at room temperature.After cooling, 3.5 ml of cod liver oil, 2 gm mixture of vitamin B complex and 1 gm of vitamin E were added.The whole mixed component was made into different size and shapes. It was dried in room temperature for 48 hours over the polythene sheet. The dried nodules are crushed into small pellets then pellets are sun dried to avoid fungal infection, weighted and stored in bottles. The fish species chosen for testing was guppy, *Poecilia reticulata*and the testing period was about 30 days. The fishes were grown separately in 3 testing tanks (Figure 2).

A – Control (The control was fed with Commercial feed)

B – Test 1

C – Test 2

Feeding schedule - Time 8.00 am and 5.00 pm

Result and discussion

Aquaculture is one of the fastest growing food producing sectors in the world. It's contributing nearly half to the global food fish consumption. It is estimated that currently 50% of the food fish needs are met by aquaculture and with the expectation that this figure will reach up to 60% - 70% by the year 2030 [4]. The growth of global aquaculture production increases the demand for aqua feeds. Feeds provide nutrient to fish for their faster growth, survival and sustaining their healthy life. It represents one of the major 30-70% of total operational cost in aquaculture production system. The overall production of aquaculture feed reached at 40.1 million metric tons in 2018, showing growth of 4% over last year [5].

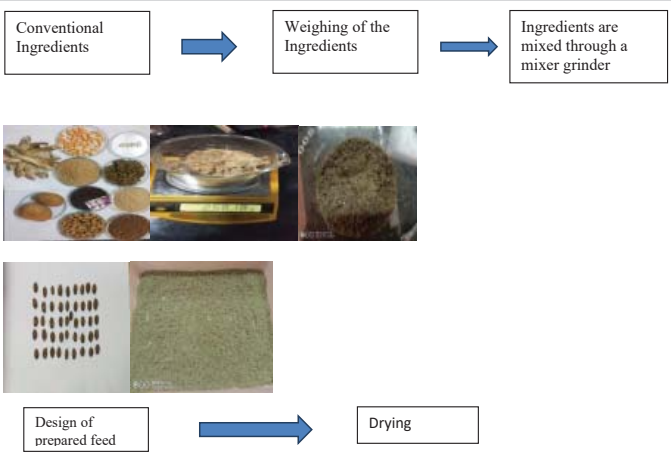

Figure 2: Feed Preperation Process.

The feed ingredient is an important criterion in the evaluation of that ingredient for fish. The growth of fish depends upon the ingredients and its percentage in the formulated feed [6]. The digestibility of a particular feed ingredient reflects in growth of fish. Digestibility depends upon various factors like nature, dietary component, and type of nutrient and level of inclusion [7]. In the present study, in comparison with the commercial feed, Seaweed incorporated feed has given better result in growth performance and colour pattern of the fish which is evidenced from Table 2.

Currently, the search is on for alternative sources of feed ingredients, the main reasons being the increasing cost and uncertainty about the continuous supply of common feed ingredients Seaweed is an excellent source of protein, dietary fiber, alginate (thickener in drinks, ice cream) agar, carrageenan (thickener and clarifier), vitamins (especially A, B1, C, and E) iron and iodine. *Ulvalactuca*contains natural carotenoids, so it prevents the addition of artificial coloring agents. Carotenoids are an important group of natural pigments with specific applications as colorants, feed supplements. El-Tawil reported that the specific growth rate improved significantly with increasing green seaweeds (*Ulva sp.*) level in the diet up to 15% of red tilapia (*Oreochromis sp.*). And increasing green seaweeds (*Ulva sp.*) level beyond 15% had insignificant differences on growth. Abdel-Aziz and Ragabwho reported that, the green seaweed (*Ulva* and *Enteromorpha*) exhibited a positive effect on growth parameters of rabbit-fish (*Siganusrivulatus*) fry and reduce of the feed cost as half of the feeding rate with artificial diet. These things confirm the positive effects reported on promoted growth rates and survival percentage of fishes with the addition of macro algae or seaweeds in fish diets. Using of macro algae (seaweeds) in fish diets may improves growth performance and feed efficiency. *Ulva intestinalis* (Green seaweed) a macroalga distributed in a wide variety of environments from freshwater to seawater including ocean coast, brackish waters, and inland freshwater all over the world [8,9]. *Ulva intestinalis* also called Gut weed. It has high nutritional values such as 9% - 14% protein, 2.0% - 3.6% lipids, and 32% - 36% ash on a dry weight basis. In addition, the n-3 and n-6 fatty acids pose 10.4 and 10.9/100 g of the total fatty acids. It is also rich in essential amino acids, pigments, and minerals [10-14]. In the present study, Protein is the main essential nutrient for maintaining life and promoting growth Not only is protein the substance for fish body and organ-building. It is essential for good growth and health, and also important for enzyme and hormone production essential for normal metabolism Therefore, a liberal and continuous supply of protein is needed Inadequate protein results in reduction or cessation of growth, or a loss of weight due to the withdrawal of protein from tissues to maintain vital functions and to replace dead cells. When protein is supplied in excess in the diet, proportionately less will be deposited in tissues, and the excess dietary protein will be used as a source of energy. Protein is an expensive energy source and requires energy for deamination. It also causes excessive nitrogenous waste to be released in to the pond or cage culture environment. The natural food of seabass is high in protein so it can be assumed that they do not utilize carbohydrates well.

Table 2: Effect of feed on the growth of *Poecilia reticulata.*

Parameter	Control	Test - A	Test - B
Length (cm)	1) 1.7	1) 2.9	1) 2.9
	2) 2.1	2) 2.5	2) 2.5
	3) 2.3	3) 2.4	3) 2.4
	4) 2.1	4) 2.3	4) 2.5
	5) 2.2	5) 2.2	5) 2.7
Weight (gm)	1) 0.16	1) 0.20	1) 0.47
	2) 0.18	2) 0.90	2) 0.48
	3) 0.28	3) 0.40	3) 0.90
	4) 0.23	4) 0.31	4) 0.39
	5) 0.31	5) 0.28	5) 0.37

Summary and conclusion

The findings of this study confirm the positive effects reported on the growth rates and survival percentages of the fish with the addition of macroalgae or seaweed to their diets. *Ulva intestinalis* has improved growth, food efficiency, disease resistance and stress response. Plenty of untapped seaweeds are available along our coastlines, but their utilization is limited. So, by utilizing the seaweed from the coastal areas, the coastal people will get more employment opportunities. Ulva sp. contains a high level of ash, protein, and dietary fiber content, a relatively high level of macro-elements, essential amino acids, soluble and insoluble fiber content, and a high iodine content. *Ulva sp. is a* natural pigment source, so it enhances the color of our formulated feed. Their nutritional compositions, together with their physicochemical properties and positive effects on fish health, support our intention of recommending *Ulva* species as a potential feed for ornamental fish. Using the seaweed supplement feed will improve the water quality in the culture system. The use of macroalgae (seaweeds) in fish diets has positive effects on growth performance and reduces feed costs.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

The authors would like to thank the authorities of Annamalai University Chidambaram Tamil Nadu and would like to acknowledge the co-operation of Department of Plant Pathology, Faculty of Agriculture, Annamalai University for the successful completion of the research work.

References

1. Ali MZ, Hoq ME. Improved fish feed management in Aquaculture Extension manual (38). 2010.
2. Catacutan MR, Coloso RM, Acosta BO. Development and use of alternative ingredients or fish meal substitutes in aquaculture feed formulation:

Proceedings of the ASEAN Regional Technical Consultation on Development and Use of Alternative Dietary Ingredients or Fish Meal Substitutes in Aquaculture Feed Formulation. Aquaculture Department, Southeast Asian Fisheries Development Center. 2015.

3. Abdollahi MR, Ravindran V, Wester TJ, Ravindran G, Thomas DV. Influence of conditioning temperature on the performance, nutrient utilisation and digestive tract development of broilers fed on maize- and wheat-based diets. Br Poult Sci. 2010 Oct;51(5):648-57. doi: 10.1080/00071668.2010.522557. PMID: 21058069.

4. Abowei JFN, Ekubo AT. A review of conventional and Unconventional feeds in fish nutrition. British Journal of Pharmacology and Toxicology. 2011; 2(4):179-191.

5. Prabu DL, Sahu NP, Pal AK, Dasgupta S. Na-rendra, A. Immunomodulation and interferon gamma gene expression in sutchi catfish, Pangasianodonhypophthalmus: effect of dietary fucoidan rich seaweed extract (FRSE) on pre and post challenge period. Aquaculture Research. 2016; 47(1):199-218.

6. Haroon AM, Szaniawska A, Normant M, Janas U. The biochemical composition of Enteromorpha spp. from the Gulf of dańsk coast on the southern Baltic Sea Oceanologia. 2000; 42(1):19-28.

7. Haroon AM, Hussian AM, El-Sayed SM. Deviations in the biochemical structure of some macroal-gal species and their relation to the environmental conditions in Qarun Lake, Egypt. Egyptian Journal of Aquatic Research. 2018; 44: 15-20.

8. Horn MH, Messer KH. Fish guts as chemical reactor: a model of the alimentary canals of marine herbivorous fishes. Marine Biology. 1992; 113(4):527-535.

9. Siddik MAB, Nahar A, Rahman MM. Bossier gut weed, Enteromorpha sp. As a partial replacement for commercial feed in Nile tilapia (Oreochromisniloticus). Culture World J. Fish. Mar. Sci. 2014; 6: 267-274.

10. Kumar V, Sinha AK, Makkar HP, de Boeck G, Becker K. Dietary roles of non-starch polysaccharides in human nutrition: a review. Crit Rev Food Sci Nutr. 2012;52(10):899-935. doi: 10.1080/10408398.2010.512671. PMID: 22747080.

11. Kumar V, Sinha AK, Makkar HP, de Boeck G, Becker K. Dietary roles of non-starch polysaccharides in human nutrition: a review. Crit Rev Food Sci Nutr. 2012;52(10):899-935. doi: 10.1080/10408398.2010.512671. PMID: 22747080.

12. Sinha SK, Abrams JH, Arumugam S, D'Alessio J, Freitas DG, Barnett JT, Weller RS. Femoral nerve block with selective tibial nerve block provides effective analgesia without foot drop after total knee arthroplasty: a prospective, randomized, observer-blinded study. Anesth Analg. 2012 Jul;115(1):202-6. doi: 10.1213/ANE.0b013e3182536193. Epub 2012 Apr 27. PMID: 22543069.

13. Pour YA, Faez K. Ear Recognition Using Bi-Orthogonal and Gabor Wavelet-Based Region Covariance Matrices. Applied Artificial Intelligence. 2010.; 24(9): 863-79.

14. Yousuf OM, Osman MF, Anwahi AR, Zarouni MA, Cherian T. Growth response and carcass com-position of rabbitfish (Siganuscanaliculatus Park) fed diets supplemented with dehydrated seaweed (Enteromorpha sp.). Emir. J. Agric. Sci. 2004; 16: 18-26.