



## Effect of Papaya leaf containing Spirulina feeds on growth and survival of Black Molly fishes

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### Abstract

The present study examines the effects of varying levels of papaya leaf powder (PLP) to prepare a low-cost with herbal medicinal value-added feed for the growth and survival of black molly (*Poecilia sphenops*). Molly fishes were reared in glass aquaria for 40 days using diets at 0%, 2.5 %, 5.0%, 7.5 % and 10% PLP level concentrations and their effectiveness were compared with control diet. The results revealed that 2.5 % level PEP shown highest growth and with increasing PLP percentage led to low growth in length and weight. The result of the experiment showed that there was significant difference found in specific growth rate of the molly fish ( $P < 0.05$ ) in the formulated PLP additive diets. The results found that the 2.5 percent PLP fed fishes showed higher mean weight gain than the other treatment groups. The survival rate of black molly fishes was also high in 2.5 percent PLP fed fishes. Thus, this study emphasizes to take PLP for the preparation of fish food, to add medicinal value, to reduce the cost of food and increase income of fish farmers. Sustainable aquaculture development can only be possible when aquaculture implements sustainable aquaculture practices such an application of low-cost ingredient like papaya leaves to improve the health of aquatic organisms and also to produce quality food from natural waste ingredients.

**Keywords:** Black molly fish, growth, PLP, sustainable development

### Introduction

At present, papaya leaves are used as an important 'Ayurvedic herb' to protect against terrible fevers such as dengue, malaria, and chikungunya. According to Singh, S. P. *et al.* (2020) [9], "*Carica papaya* leaf contains active components such as alkaloids, glycosides, tannins, saponins, and flavonoids, which are responsible for its medicinal activity" and in addition, their major findings revealed that "papaya leaf extract has strong medicinal properties such as antibacterial, antiviral, antitumor, hypoglycemic and anti-inflammatory activity." According to Hariono M. *et al.* (2021) [4], "the development of science and technology has subsequently made it possible to provide evidence that this plant is not only beneficial as an informal medication, but also that it has scientifically proven pharmacological and toxicological activities, which have led to its formal usage in professional health care systems". According to Mic Salomiya A. *et al.* (2023), "Feeding the fishes with different concentrations of *C. papaya* leaf diet had an impact on the growth rate of the fish. Incorporation of 10% of papaya leaf in the feed enhances the assimilation and conversion efficiency of *Labeo rohita*. This finding confirmed *C. papaya* leaf as a growth promoter."

In the Sakra Blog (2024) [7], the following are "the nutritional components of papaya leaves:

**Vitamins:** Papaya leaves are rich in vitamins A, C, and E. Vitamin C, in particular, is known for its immune-boosting properties and ability to promote healthy skin.

**Minerals:** They contain important minerals such as calcium, potassium, and magnesium, which are vital for bone health, muscle function, and overall cellular health.

**Enzymes:** Papaya leaves are high in papain, an enzyme that aids in digestion and can help reduce inflammation. This enzyme is particularly beneficial for breaking down proteins and can assist those with digestive issues.

**Antioxidants:** The leaves are rich in antioxidants, which help protect cells from oxidative stress and may reduce the risk of chronic diseases".

In aquaculture industry, quality feed for their culture fishes is one of the most essential requirements. Human edible vegetable and grain ingredients are generally expended as the major nutritional additive in the fish diet. The rising cost of this vegetables and grains inflicted the aquaculture industry to seek a substitute in minimizing the pellet cost. When there is need of fast development of our nation, proper waste management and take more benefits from the low-cost ingredients as fish feed additive, can be a part of sustainable development. Thus, looking to the nutritional values of papaya leaves and low cost its availability as an agricultural waste, papaya leaf powder was tested in this study to investigate its effectiveness on black molly fishes. Molly fishes are hardly in nature. Black molly fish is one of the popular ornamental fish; they can easily culture in small tank and due to its omnivorous feeding habit, beginners can also work on this experimental animal. By substitution of wheat flour in diets, different concentrations of papaya leaves powder additive diets were prepared and applied to observe its effectiveness on the experimental fish.

### Materials and Methods

Experimental fish, Black molly, *Poecilia sphenops* L. were stocked in glass aquaria. All aquaria were filled by fresh tap water during the experiment of 40 days in the laboratory. Length and weight of individual black mollies were recorded before starting of the experiment using measuring scale and electric balance. Separate sets of aquaria were marked regarding six different diets. Among those five experimental diets were formulated using different commonly available ingredients; those types containing papaya leaves powder with different level (0, 2.5, 5%, 7.5 % and 10%) and last one type was commercially available pellet feed as a control. Fish were fed with pellet feed at the rate of 5% fish body weight twice a day. Continuous aeration was provided by aquarium air pump. Excreta and

leftover feed were removed from the bottom of each aquarium through siphoning and along with that one third

volume of water was changed every day from each experimental unit.

**Table 1:** Ingredients quantity of prepared diets of experimental diets

Ingredients (g/100g)	Diet1 P1(g)	Diet2 P2(g)	Diet3 P3(g)	Diet4 P4(g)	Diet5 P5(g)	Diet C. or Control
Papaya leaves powder (PLP)	0	2.5	5	7.5	10	Commercial pellet feed
Wheat flour (WF)	25	22.5	20	17.5	15	
Spirulina Powder (SP)	10	10	10	10	10	
Marine Water Fish (MWF)	10	10	10	10	10	
Fresh Water Fish (FWF)	30	30	30	30	30	
Corn Flour (CF)	10	10	10	10	10	”
Soyabean Meal (SbM)	20	20	20	20	20	
Sunflower Oil (SO)	4	4	4	4	4	
Vitamin tablet (Vt)	1	1	1	1	1	

Mollies were measured at the beginning and then at the end of the experiment. Water quality parameters were studied at regular intervals. Specific growth rate (SGR) and survival rate of *Poecilia sphenops* were calculated for a period of 40 days using following equations:

1. Body weight increase (BWI) (g) =  $W_t - W_0$  (Tacon, 1990) <sup>[10]</sup>.
2. Percent body weight increase (PBWI) (%) =  $[(W_t - W_0) / W_t] \times 100$  (Bekcan *et al.*, 2006) <sup>[2]</sup>.
3. Length gain (cm) = Mean final length (Lt) – Mean initial length (L0)
4. Percent length gain (%) =  $[(\text{Mean final length (Lt)} - \text{Mean initial length (L0)}) / \text{Mean final length (Lt)}] \times 100\%$
5. Specific growth rate (SGR) (%/day) =  $(\ln W_t - \ln W_0) / t - 1$  (Hevroy *et al.*, 2005) <sup>[5]</sup>.
6. Body weight gain (BWG) (g) =  $(W_t - W_0) \times N_t$  (De Silva and Anderson, 1995).
7. Daily growth rate (DGR) (%) =  $[(W_t - W_0) / t] \times 100$  (De Silva and Anderson, 1995).
8. Survival (%) =  $N_t \times 100 / N_0 - 1$  (Ai *et al.*, 2006).

Here,  $W_t$  and  $W_0$  were mean final and initial fish weight (g) and  $L_t$  and  $L_0$  were mean final and initial length (cm) respectively;  $N_t$  and  $N_0$  were final and initial numbers of fish in each treatment aquarium respectively and  $t$  is the experimental duration in days.

The collected data from the feeding trials were incorporated in Microsoft office excel sheets. Processed data then were

analyzed to compare the effect of different experimental diets on the growth and survival of molly. Growth parameters according to six different diets were compared by using one-way ANOVA. Statistical data analysis was accomplished with SPSS software to evaluate the significant differences among treatment at 5% significant level ( $p < 0.05$ ).

**Result and Discussion**

The growth was analyzed and compared with control diet. Growth pattern, survival and weight gain (%) had significantly varied among all experimental diets (Table 2). The maximum body length gain (0.04 cm) was measured from fish fed with diet P2 (2.5% Papaya leaf powder); whereas the lowest (0.01 cm, 0.02cm & 0.02 cm) was found in control and in diet P4 & P5 (control, 7.5% & 10%) respectively. The highest body weight increase (0.15 g) was found in diet P2; whereas the lowest (0.05 g) was found in control diet. As the stocking density remained same, the variations resulted for the ingredient composition of the diets. Highest body weight gain (4.05 g) was observed in diet P2, on the other hand, lowest weight gain (1.00 g) was investigated from the control. It was resulted the highest (15.96%) percent body weight increase (PBWI) while lowest (5.43 %) was reported from commercial (control) diets. Specific growth rate (SGR) was recorded highest (0.43 %/day) in diet P2 and lowest (0.14 %/day) in the control.

**Table 2:** Growth performance of *P. sphenops* fed with formulated and commercial diets.

Diet types Growth parameter	Control (gm)	P1 (0%) (gm)	P2(2.5%) (gm)	P3(5 %) (gm)	P4(7.5%) (gm)	P5(10%) (gm)
Initial length(cm)	3.52	3.55	3.51	3.51	3.50	3.51
Final length (cm)	3.53	3.58	3.55	3.54	3.52	3.53
Initial weight (g)	0.87	0.90	0.79	0.82	0.80	0.85
Final weight (g)	0.92	1.03	0.94	0.92	0.89	0.91
BWI (g)	0.05	0.13	0.15	0.10	0.09	0.06
Length gain (cm)	0.01	0.03	0.04	0.03	0.02	0.02
BWG (g)	1.00	3.38	4.05	2.70	2.16	1.38
DGR (%)	0.13	0.33	0.38	0.25	0.23	0.15
PBWI (%)	5.43	12.62	15.96	10.87	10.11	6.59
PLG (%)	0.28	0.70	1.13	0.85	0.57	0.43
(SGR) (%/day)	0.14	0.34	0.43	0.29	0.27	0.17
Survival fish	71.43	92.86	96.43	96.43	85.71	82.14

In the present experiment, mollies fed with commercial feed had the survival rate of 71.43% which was lowest in all experimental diets. By contrast, the highest survival rate (96.43%) was reported from diet P2 than other diets. The results indicated that mortality rates were higher in fishes

feed with commercial feed rather than formulated diets. Growth parameters data from different diets were positively and significantly correlated with each other throughout the experiment. It was resulted from the study that diet P2 (2.5% PLP) evidenced the better growth rate in black molly

fish compared with the other prepared diets and control. Moreover, formulated diets reported the better growth pattern than that in commercial feed. No toxicity, abnormal behavior and disease prevalence was recorded and mortality rate was also lower during the study.

### Conclusion

The study showed that, among the formulated diets those which were prepared using papaya leaf powder (PLP), resulted better growth than the commercial pallet feed (table 2). Thus, the experimental diets could be used in commercial molly fish farming by improving survival rate and its growth. On the other side, the less cost involvement and quality assured formulated feeds can bring a lot of change in this sector. Future studies are required to determine its potential and other benefits hoped for papaya leaves rather than being a discarded as agricultural waste.

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