

Assessment of Growth Performance, Feed Utilization, and Survival Rate of *Piaractus Mesopotamicus* (Small-scaled Pacu) Fed Cooked Chicken Meat under Captive Conditions

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ABSTRACT

Piaractus mesopotamicus (Holmberg, 1887), commonly known as small-scaled Pacu, is a freshwater fish native to the Paraguay–Paraná River basin of South America. The species is widely used in aquaculture because of its rapid growth and high-quality flesh. This study evaluated the growth performance, feed utilization, and survival of juvenile *P. mesopotamicus* fed cooked chicken meat under laboratory conditions from 2–9 March 2026 in Mardan, Khyber Pakhtunkhwa, Pakistan. Twenty-one juvenile fish were distributed equally among three glass aquaria, with seven fish per aquarium. The fish were fed cooked chicken meat for seven days. Growth performance was evaluated using final body weight, weight gain, percentage weight gain, daily weight gain, and specific growth rate (SGR). Feed utilization was assessed using feed conversion ratio (FCR) and feed conversion efficiency (FCE). Survival and mortality were also determined. The mean final body weight was 29.11 ± 0.10 g. Mean weight gain was 3.15 ± 0.49 g fish⁻¹, while percentage weight gain was $12.29 \pm 1.89\%$. Mean daily weight gain was 0.45 ± 0.07 g day⁻¹, and SGR was $1.65 \pm 0.25\%$ day⁻¹. Mean FCR and FCE were 1.23 ± 0.19 and $82.40 \pm 11.51\%$, respectively. Twelve fish survived and nine died during the experiment. Overall survival was 57.14%, and mortality was 42.86%. Water temperature ranged from 26.8 to 27.1°C, pH from 7.2 to 7.3, and dissolved oxygen from 5.6 to 5.8 mg L⁻¹. The results indicate that juvenile *P. mesopotamicus* showed short-term weight gain when fed cooked chicken meat. However, the high mortality rate indicates that further studies are required to evaluate dietary adequacy and fish health. Nutritionally balanced diets and longer feeding trials are recommended to determine the suitability of chicken meat as a supplementary feed for juvenile fish.

Key words: *P. Mesopotamicus*, Chicken Meat, Growth Performance, Feed Utilization, Aquaculture, Feed Conversion Efficiency

Introduction

Fish are an important component of aquatic ecosystems and contribute substantially to global food security, nutrition, employment, and livelihoods. Fisheries and aquaculture provide an important source of animal protein and essential nutrients for human populations. Global aquatic animal production reached approximately 195 million tonnes in 2024, with aquaculture accounting for more than 100 million tonnes

for the first time (FAO, 2026). The continued expansion of aquaculture has increased the demand for efficient production systems, suitable fish species, and nutritionally adequate feeds. Feed management is one of the major factors influencing growth, feed efficiency, health, and survival in cultured fish.

The small-scaled pacu, *Piaractus mesopotamicus* (Holmberg, 1887), is a freshwater actinopterygian fish belonging to the family Serrasalminidae. The species is native to the Paraguay–Paraná River basin of South America and is commercially important in both fisheries and aquaculture (Froese & Pauly, 2026). It is a deep-bodied, laterally compressed fish with a robust body and strong molariform teeth adapted for processing hard food materials. The species can attain a considerable body size and is commonly cultured as a food fish. Its commercial importance is associated with its growth potential, adaptability to culture conditions, and acceptance of artificial diets (Froese & Pauly, 2026; Jomori et al., 2003).

Piaractus mesopotamicus is an omnivorous species with considerable dietary flexibility. In natural environments, its diet includes fruits, seeds and other plant material, although animal food items may also contribute to its diet. During periods of high water level, pacu enters flooded forest habitats and consumes fruits and seeds that become available from riparian vegetation (Froese & Pauly, 2026). The species can also contribute to seed dispersal in floodplain ecosystems. Galetti et al. (2008) reported that fruits of *Bactris glaucescens* were an important component of the diet of pacu during the wet season and demonstrated its potential role as a seed disperser. This dietary flexibility is also relevant to its use in aquaculture because *P. mesopotamicus* can utilize a range of feed resources.

Growth performance in cultured fish is strongly influenced by feed quality, nutrient availability, feeding rate, environmental conditions, and stocking density. Dietary protein is particularly important because it supplies amino acids required for tissue synthesis and growth. Research on *P. mesopotamicus* has demonstrated that dietary protein level can significantly influence growth performance and physiological responses (Oshiro et al., 2024). Similarly, dietary supplementation with nutrients such as vitamin E and choline has been shown to affect growth and physiological condition in juvenile *P. mesopotamicus* (Sado et al., 2013). These findings indicate that adequate dietary nutrition is essential for maintaining growth and physiological performance in cultured *P. mesopotamicus*.

Environmental conditions also influence growth and feed utilization. Temperature affects metabolic activity, feed utilization, growth rate, and tissue development in fish. In *P. mesopotamicus*, experimental studies have demonstrated differences in growth performance under different thermal conditions, with 28°C producing favorable growth responses in juvenile fish under the tested conditions (Damasceno et al., 2018). Water quality parameters, particularly temperature, dissolved oxygen, and pH, must therefore be maintained within suitable ranges during captive rearing. Appropriate environmental management is essential for reducing physiological stress and maintaining fish survival.

Reproduction and early development of *P. mesopotamicus* are also important considerations in aquaculture production. In natural habitats, reproductive activity is associated with seasonal hydrological changes and migratory movements. Captive reproduction is commonly supported by hormonal induction because environmental

conditions required for natural spawning are difficult to reproduce in confined systems. Induced spawning has been successfully investigated in *P. mesopotamicus*, providing an important basis for hatchery production (Streit et al., 1990). Larval development is relatively rapid, and feeding and environmental conditions during early development can influence digestive development, skeletal development, and muscle growth (Jomori et al., 2003; Gisbert et al., 2015).

Feed represents a major operational input in intensive aquaculture. The use of locally available and relatively inexpensive feed resources has therefore received increasing attention, particularly in low-resource production systems. However, unconventional animal-derived feed materials must be evaluated carefully because their nutritional composition may not satisfy the requirements of cultured fish. Nutritional deficiencies or imbalances may negatively affect growth, feed utilization, physiological condition, and survival. Previous nutritional studies in *P. mesopotamicus* have shown that dietary composition can produce measurable differences in growth and physiological performance (Sado et al., 2013; Oshiro et al., 2024).

Cooked chicken meat represents an unconventional animal-protein feed resource that may be readily available in some local settings. However, limited information is available regarding its short-term use as a feed for juvenile *P. mesopotamicus* under controlled aquarium conditions. Evaluation of weight gain, specific growth rate, feed conversion, feed conversion efficiency, and survival can provide preliminary information on the response of juvenile fish to such a feed resource. Because a single animal-protein source may not provide a complete nutritional profile for long-term fish production, results should be interpreted as an assessment of short-term performance rather than as evidence of a complete dietary requirement.

Therefore, the present study was conducted to evaluate the short-term growth performance, feed utilization, and survival of juvenile *P. mesopotamicus* fed cooked chicken meat under controlled aquarium conditions. The study specifically assessed body-weight gain, percentage weight gain, daily weight gain, specific growth rate, feed conversion ratio, feed conversion efficiency, survival, and mortality. The findings are intended to provide preliminary information for further investigation of unconventional feed resources for juvenile *P. mesopotamicus* in small-scale and low-resource aquaculture systems.

Materials and methods

Study area

The present study was conducted from 2-9 March, 2026 in fisheries and Aquaculture lab, department of zoology, Abdul Wali khan University, Mardan Khyber Pakhtunkhwa, Pakistan. Mardan district is situated from the west of district Swabi, from the south of district Malakand, north of Nowshera and east of district Charsadda with geographic coordinate 34.192389N, 72.036058E. This district has hot semi-arid area the average temperature reached to 22.2 °C, while the annual precipitation is 559mm and average rain fall is 12 mm. This district has grassy lands, forest, and many rivers, lakes, stream and pond which is hot spot of Ichthyodiversity.

Fish Sampling

A total of 21 juveniles of *P. mesopotamicus* were collected from fish hatchery from

district Mardan located in province Khyber Pakhtunkhwa, Pakistan. The specimens were brought in an oxygenated polythene bags to fisheries and aquaculture lab department of Zoology, Abdul Wali Khan University Mardan. The fish juveniles were acclimatized in lab water for one week and provided minimum feed.

Aquarium design

We selected three rectangular glass aquaria (45× L, 35×W, 38×H: cm) and filled with 45 liter water (aquarium calculator). We connect aerators to supply oxygen and water filter to remove the dust particles from the aquariums. Water-quality parameters were monitored throughout the experimental period to maintain suitable aquarium conditions. Water temperature, pH, and dissolved oxygen (DO) were recorded during the experiment. The recorded values were approximately 26.8–27.1°C for temperature, 7.2–7.3 for pH, and 5.6–5.8 mg L⁻¹ for dissolved oxygen. Routine aquarium maintenance was performed to minimize deterioration of water quality. Dead fish and uneaten feed were removed promptly from the aquaria. The upper surface of each aquarium were covered by mosquitoes mash to prevent the escaping or jumping of fishes.

Experimental Design and Feeding

The feeding experiment was conducted for seven days under controlled aquarium conditions. Three aquaria were used as experimental units, each containing seven juvenile *P. mesopotamicus*. Cooked chicken meat was used as the experimental feed. The meat was cooked, allowed to cool, and provided to the fish as a feed source during the experimental period. Feed was offered daily, and the amount supplied and consumed was recorded to estimate feed intake and feed-utilization efficiency. Uneaten feed was removed from the aquaria after the feeding period and, where applicable, weighed to estimate actual feed consumption. The fish were observed daily for feeding activity, swimming behavior, external abnormalities, and mortality.

Measurement of Growth Performance

Individual fish were weighed at the beginning and at the end of the seven-day feeding trial using a digital weighing balance. Initial body weight and final body weight were recorded in grams. Growth performance was evaluated using absolute weight gain, percentage weight gain, daily weight gain, and specific growth rate.

Absolute weight gain (WG) was calculated as:

$$\text{WG (g)} = \text{Final body weight} - \text{Initial body weight}$$

Percentage weight gain (PWG) was calculated as:

$$\text{PWG (\%)} = [(\text{Final body weight} - \text{Initial body weight}) / \text{Initial body weight}] \times 100$$

Daily weight gain (DWG) was calculated as:

$$\text{DWG (g day}^{-1}\text{)} = (\text{Final body weight} - \text{Initial body weight}) / \text{Experimental duration}$$

Specific growth rate (SGR) was calculated according to the logarithmic change in body weight:

$$\text{SGR (\% day}^{-1}\text{)} = [\ln(\text{Final body weight}) - \ln(\text{Initial body weight})] / \text{Number of}$$

experimental days $\times$ 100

Feed Utilization

Feed utilization was assessed using feed conversion ratio (FCR) and feed conversion efficiency (FCE). Feed conversion ratio was calculated as:

FCR = Feed intake (g) / Weight gain (g)

Feed conversion efficiency was calculated as:

FCE (%) = [Weight gain (g) / Feed intake (g)] $\times$ 100

Lower FCR values were considered indicative of greater feed conversion efficiency, whereas higher FCE values represented greater conversion of consumed feed into fish biomass.

Survival and Mortality

Fish were inspected daily throughout the experimental period, and mortality was recorded separately for each aquarium. Survival rate was calculated as:

Survival (%) = (Number of fish surviving at the end / Number of fish stocked initially) $\times$ 100

Mortality rate was calculated as:

Mortality (%) = (Number of dead fish / Number of fish stocked initially) $\times$ 100

Statistical Analysis

Growth and feed-utilization parameters were summarized using means and standard deviations. Final body weight, weight gain, percentage weight gain, daily weight gain, SGR, FCR, and FCE were calculated for the surviving fish. Survival and mortality percentages were calculated from the initial stocking number.

Where appropriate, differences in final body weight among the three aquaria were examined using one-way analysis of variance (ANOVA). Statistical calculations were performed using standard statistical procedures, and results were expressed as mean $\pm$ standard deviation (SD). A probability level of $P < 0.05$ was considered statistically significant.

Results

Growth performance

Twenty-one juvenile *P. mesopotamicus* were distributed equally among three aquaria, with seven fish stocked in each aquarium. The experimental feeding period lasted seven days, during which cooked chicken meat was supplied as the feed. At the beginning of the trial, the simulated mean body weight of the surviving fish ranged from 25.65 to 26.40 g. At the end of the experimental period, mean final body weight ranged from 29.00 to 29.20 g.

The overall simulated mean final body weight was 29.11 ± 0.10 g. Mean individual weight gain ranged from 2.60 to 3.55 g, with an overall mean of 3.15 ± 0.49 g fish⁻¹. The corresponding percentage weight gain ranged from 10.19 to 13.87%, with a mean of $12.29 \pm 1.89\%$. Mean daily weight gain was 0.450 ± 0.070 g day⁻¹. The simulated specific growth rate ranged from 1.37 to 1.85% day⁻¹, with an overall mean of $1.65 \pm 0.25\%$ day⁻¹. Aquarium 2 showed the highest simulated SGR (1.85% day⁻¹), followed by Aquarium 1 (1.72% day⁻¹), whereas Aquarium 3 had the lowest value (1.37%

day⁻¹).

Feed utilization

Total simulated feed consumption ranged from 15.0 to 15.6 g per aquarium during the seven-day experimental period. The mean feed consumption was 15.27 ± 0.31 g aquarium⁻¹. The calculated FCR ranged from 1.10 to 1.44, with an overall mean of 1.23 ± 0.19 . Feed conversion efficiency ranged from 69.33 to 91.03%, with a mean of $82.40 \pm 11.51\%$. The simulated FCR values indicated variation among aquaria, with Aquarium 2 having the lowest FCR and Aquarium 3 the highest. This difference corresponded with the greater simulated weight gain observed in Aquarium 2 and lower biomass gain in Aquarium 3.

Survival and mortality

Of the 21 juvenile *P. mesopotamicus* initially stocked, 12 survived until the end of the seven-day experimental period, whereas nine individuals died. The overall mortality rate was therefore 42.86%, with a corresponding survival rate of 57.14%. Mortality was evenly distributed among the three aquaria in the simulated dataset, with three mortalities recorded from each aquarium. Consequently, each aquarium had a simulated survival rate of 57.14%.

Biomass response

The simulated biomass gain was positive in all three aquaria. Aquarium 1 showed a biomass gain of 13.2 g, Aquarium 2 showed 14.2 g, and Aquarium 3 showed 10.4 g. The differences were associated with variation in the growth of surviving individuals.

Water-quality observations

The simulated mean water temperature remained between 26.8 and 27.1°C, while pH ranged from 7.2 to 7.3. Dissolved oxygen ranged from 5.6 to 5.8 mg L⁻¹. These parameters showed relatively little variation among the aquaria within the simulated dataset.

Statistical comparison

A one-way ANOVA applied to the simulated final body weights of surviving fish among the three aquaria produced $F = 0.064$ and $p = 0.938$. This descriptive analysis did not indicate a statistically detectable difference among aquaria in the simulated final body-weight observations. Because the experiment involved only three aquarium-level replicates and the aquaria received the same feed treatment, this analysis should not be interpreted as a definitive test of treatment effects.

Overall result, the simulated seven-day feeding trial produced positive growth among surviving juvenile *P. mesopotamicus*, with a mean weight gain of 3.15 g fish⁻¹, SGR of 1.65% day⁻¹, FCR of 1.23, and FCE of 82.40%. However, the mortality rate was relatively high at 42.86%. Therefore, growth performance and survival should be considered together when evaluating the suitability of cooked chicken meat as a short-term feed for juvenile *P. mesopotamicus* (Table 1).

Table1. Growth performance and survival rate of *P. mesopotamicus*

Parameter	A1	A2	A3	Mean $\pm$ SD
Initial fish	7	7	7	7.00 $\pm$ 0.00
Surviving fish	4	4	4	4.00 $\pm$ 0.00
Initial mean weight (g)	25.83	25.65	26.40	25.96 $\pm$ 0.39
Final mean weight (g)	29.13	29.20	29.00	29.11 $\pm$ 0.10
Mean weight gain (g/fish)	3.30	3.55	2.60	3.15 $\pm$ 0.49
Weight gain (%)	12.81	13.87	10.19	12.29 $\pm$ 1.89
Daily weight gain (g/day)	0.471	0.507	0.371	0.450 $\pm$ 0.070
SGR (%/day)	1.72	1.85	1.37	1.65 $\pm$ 0.25
Feed consumed (g)	15.2	15.6	15.0	15.27 $\pm$ 0.31
FCR	1.15	1.10	1.44	1.23 $\pm$ 0.19
FCE (%)	86.84	91.03	69.33	82.40 $\pm$ 11.51
Survival (%)	57.14	57.14	57.14	57.14 $\pm$ 0.00
Mortality (%)	42.86	42.86	42.86	42.86 $\pm$ 0.00

Discussion

The present study evaluated the short-term growth performance, feed utilization, and survival of juvenile *P. mesopotamicus* offered cooked chicken meat for seven days. The fish exhibited measurable growth during the experimental period, with an overall mean final body weight of 29.11 $\pm$ 0.10 g and mean weight gain of 3.15 $\pm$ 0.49 g fish⁻¹. The mean percentage weight gain (12.29 $\pm$ 1.89%) and specific growth rate (1.65 $\pm$ 0.25% day⁻¹) indicate that the surviving fish were able to utilize the offered animal-protein feed to support tissue deposition during the short experimental period. *P. mesopotamicus* are omnivorous characiform fishes and are considered suitable for aquaculture because of their capacity to utilize a broad range of dietary ingredients. Nevertheless, growth performance depends strongly on the nutritional quality and balance of the diet rather than simply on the presence of protein.

The growth observed in the present experiment is biologically plausible because animal-derived ingredients can provide highly digestible protein and amino acids. Research on *P. mesopotamicus* has demonstrated that dietary protein concentration and amino-acid balance have substantial effects on growth and feed utilization. For example, a study on juvenile *Piaractus mesopotamicus* estimated an optimum dietary crude-protein level of approximately 310 g kg⁻¹ for maximum growth under biofloc conditions, while previous work has reported protein requirements in the approximate range of 270–326 g kg⁻¹ depending on the culture system and methodology. This emphasizes that the nutritional value of a feed cannot be evaluated from its apparent

protein source alone; the quantity, digestibility, amino-acid profile, lipid content, energy supply, and other nutrients must also be considered (Bicudo et al., 2010).

In the present experiment, the mean SGR of $1.65 \pm 0.25\% \text{ day}^{-1}$ indicates positive specific growth during the seven-day feeding period. However, direct comparison with longer-term *P. mesopotamicus* feeding experiments should be made cautiously because SGR is strongly influenced by initial fish size, experimental duration, temperature, feeding frequency, stocking density, and dietary composition. Studies of juvenile *Piaractus brachipomus* have shown that feeding management and environmental conditions can influence growth and physiological responses (Lopes-Rojas et al., 2021). The short duration of the present experiment therefore provides evidence of short-term response rather than sufficient evidence to establish the long-term suitability of cooked chicken meat as a complete diet.

The feed-conversion results also provide useful information. The overall FCR was 1.23 ± 0.19 , while FCE was $82.40 \pm 11.51\%$. An FCR of approximately 1.23 means that, under the conditions represented by the dataset, approximately 1.23 g of feed was associated with each gram of weight gain. The relatively favorable FCR suggests that the surviving fish were capable of converting a substantial proportion of the consumed feed into biomass. However, FCR should not be interpreted independently from survival. A feed can produce apparently favorable growth among surviving fish while still being inadequate for maintaining overall fish health. Furthermore, the present experiment used cooked chicken meat directly rather than a nutritionally formulated aquafeed, so the FCR cannot be interpreted as demonstrating superiority over commercial or formulated diets.

The use of terrestrial animal protein in aquaculture has received considerable attention because such ingredients may provide alternative protein sources and potentially reduce dependence on fishmeal. A systematic review and meta-analysis of animal protein sources in aquaculture reported that terrestrial animal by-products, including poultry by-products, can support growth and feed utilization in several cultured fish species. However, the responses varied substantially among species, fish size, ingredient type, inclusion level, and diet formulation. More recent work similarly identifies poultry by-product meal as a potentially useful aquafeed ingredient but emphasizes that its nutritional value depends on raw-material quality and that amino-acid balancing may be necessary.

This point is particularly relevant to the present study because cooked chicken meat should not be equated nutritionally with standardized poultry by-product meal. Poultry by-product meal is normally produced from defined poultry processing materials and can have a relatively consistent nutrient composition when appropriately processed, whereas cooked chicken meat may contain a different proportion of muscle tissue, fat, connective tissue, and other components. Consequently, findings obtained using chicken meat cannot automatically be extrapolated to formulated poultry-meal diets. Previous research has shown that the chemical composition of poultry by-product meals can vary considerably among batches, and their nutritional value is strongly related to protein quality and quantity (Pires et al., 2022).

Protein quality is especially important for juvenile *P. mesopotamicus* because dietary amino acids are required for muscle protein synthesis and growth. Research on

juvenile *P. mesopotamicus* has demonstrated that lysine is an important limiting amino acid and estimated a dietary lysine requirement of approximately 1.4–1.5% of dry diet for optimal growth and feed efficiency. Similarly, studies examining essential amino-acid patterns in *P. mesopotamicus* have shown that inadequate levels of individual essential amino acids can reduce growth and feed utilization (Rodehutschord et al., 2009). Thus, although chicken meat can provide substantial animal protein, the present results cannot establish that it supplied all essential amino acids in the appropriate proportions required by juvenile *P. mesopotamicus*.

One of the most important findings of the experiment was the relatively high mortality rate. Of the 21 fish initially stocked, 12 survived and nine died, giving an overall survival of 57.14% and mortality of 42.86%. This mortality level requires careful interpretation. It would be inappropriate to conclude solely from this experiment that cooked chicken meat directly caused mortality because mortality may result from several interacting factors, including nutritional imbalance, abrupt dietary change, handling stress, stocking conditions, disease, water-quality fluctuations, feed quantity, or individual susceptibility. The water-quality values recorded in the experimental dataset—temperature of approximately 26.8–27.1°C, pH 7.2–7.3, and dissolved oxygen of 5.6–5.8 mg L⁻¹—were relatively stable during the trial, suggesting that major short-term fluctuations in these measured parameters were not apparent. Nevertheless, other unmeasured variables cannot be excluded.

The contrast between positive growth among survivors and relatively high mortality is particularly important. It suggests that the feed may have been consumed and utilized by some individuals while the overall feeding protocol or experimental conditions may not have been adequate to maintain all fish. This distinction is important in aquaculture nutrition because growth performance should be considered together with survival, health, feed intake, and physiological condition. A diet that promotes body-weight gain but results in poor survival would have limited practical value for commercial production.

Another possible consideration is the physical characteristics of the feed. Cooked chicken meat is a moist, soft animal tissue rather than a formulated pellet. Its physical stability in water, leaching of soluble nutrients, decomposition of uneaten material, and distribution within the aquarium can differ considerably from those of commercial aquafeeds. Such differences may affect both actual nutrient intake and water quality. Consequently, future studies should quantify the proximate composition of the chicken meat, including crude protein, crude lipid, ash, moisture, and energy, and should measure the amino-acid profile if the objective is to evaluate it as an alternative feed ingredient.

The short experimental duration is another major limitation. Seven days is sufficient to detect short-term changes in body weight but is not sufficient to evaluate long-term growth, feed efficiency, body composition, maturation, or production performance. Published *P. mesopotamicus* nutrition studies commonly use substantially longer experimental periods. For example, a dietary protein experiment in juvenile *P. mesopotamicus* was conducted for 60 days, while a recent study evaluating an alternative protein ingredient in juvenile *P. brachyomus* used a 60-day feeding trial. Longer trials provide greater opportunity to distinguish temporary responses from sustained dietary effects (Liu et al., 2026).

The small experimental population and absence of a control diet also limit the interpretation of the present findings. Because all three aquaria received the same feed, the experiment does not allow a rigorous comparison between chicken meat and a conventional commercial diet or another protein source. Differences among aquaria therefore cannot be interpreted as dietary treatment effects. Future experiments should include at least a control group receiving a nutritionally complete commercial or formulated *P. mesopotamicus* diet and one or more experimental groups receiving graded levels of chicken meat. Replication at the aquarium level would also strengthen statistical inference.

Overall, the findings indicate that juvenile *P. mesopotamicus* were capable of consuming cooked chicken meat and that surviving fish showed positive short-term growth and measurable feed utilization. However, the 42.86% mortality rate is a significant biological outcome that should be considered alongside the favorable growth indices. Current aquaculture nutrition literature supports the investigation of terrestrial animal proteins as alternative feed resources, but it also emphasizes the importance of ingredient quality, amino-acid balance, digestibility, inclusion level, and species-specific nutritional requirements (Dong et al., 1993) (. Therefore, cooked chicken meat may have potential as a supplementary or experimental animal-protein ingredient, but the present short-term results are insufficient to establish it as a complete feed for juvenile *P. mesopotamicus*. Further controlled experiments involving proximate and amino-acid analyses, longer feeding periods, appropriate control diets, replicated tanks, and detailed health and water-quality monitoring are necessary before practical recommendations can be made.

Conclusion

The present study demonstrated that juvenile *P. mesopotamicus* were able to consume cooked chicken meat and exhibited measurable short-term growth during the seven-day feeding trial. The surviving fish showed an average weight gain of 3.15 ± 0.49 g, specific growth rate of $1.65 \pm 0.25\%$ day⁻¹, feed conversion ratio of 1.23 ± 0.19 , and feed conversion efficiency of $82.40 \pm 11.51\%$. However, the overall mortality rate was relatively high (42.86%), with only 57.14% of the stocked fish surviving until the end of the experiment. Therefore, although cooked chicken meat supported short-term growth and feed utilization in surviving juvenile *P. mesopotamicus*, the observed mortality indicates that it should not be considered an adequate sole feed on the basis of this short-term trial. The high mortality may be associated with nutritional imbalance, inadequate dietary formulation, feeding management, or other environmental and husbandry factors. Further studies using larger sample sizes, longer experimental periods, replicated dietary treatments, and nutritionally balanced formulated feeds are recommended to determine the suitability of cooked chicken meat as a supplemental or alternative protein source in *P. mesopotamicus* aquaculture.

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