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Research Paper

Assessment of the condition factor of guppy fish (*poecilia reticulata*) cultured under controlled laboratory conditions

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Abstract: The present study was undertaken to evaluate the condition factor and growth performance of guppy fish (*Poecilia reticulata*) under controlled laboratory conditions over a period of 103 days. Ten guppy fry were reared in a plastic tank with monitored water quality parameters including temperature, pH, dissolved oxygen, ammonia, and hardness. Fish were fed Artemia and Spirulina flex twice daily. Growth increased from 0.7 cm to 2.1 cm in length and from 0.001 g to 0.3 g in weight. The condition factor (K) ranged from 0.291 to 3.242, indicating improved health and nutritional status. Morphological changes such as fin development, pigmentation, and reproductive signs were also observed. The study concludes that guppy fish can be successfully cultured under laboratory conditions with good growth performance and condition factor, making them suitable for ornamental aquaculture.

Keywords: Guppy, *Poecilia reticulata*, Condition Factor, Growth Performance, Ornamental Fish, Laboratory Culture

Introduction:

Guppy (*Poecilia reticulata*) is one of the most popular ornamental fish due to its vibrant coloration, adaptability, and rapid reproduction (Raghavan et al., 2013). The condition factor (K) is widely used to evaluate fish health and reflects the relationship between length and weight (Le Cren, 1951; Froese, 2006). Water quality parameters such as temperature, pH, dissolved oxygen, and ammonia significantly influence fish growth and survival (Boyd & Tucker, 2012). Controlled laboratory conditions allow accurate monitoring of these parameters. This study aims to evaluate the condition factor and growth performance of guppy fish under controlled laboratory conditions.

Materials and Methods:

Experimental Setup

The experiment was conducted using a plastic tank of 20 L capacity, in which the water level was maintained between 8–10 L to ensure optimal rearing conditions for guppy (Poecilia reticulata) fry. A total of 10

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guppy fry were stocked in the tank. Aquatic plants and small stones were added to simulate a natural environment and to provide shelter and support for normal behavioural activities.

Feeding

The fish were fed a combination of Artemia and Spirulina flakes (flex) twice daily to meet their nutritional requirements and promote healthy growth. A fasting day was observed once a week (Sunday) to help maintain water quality and reduce the accumulation of waste in the tank.

Water Quality

Water quality parameters were regularly monitored and maintained within optimal ranges to ensure healthy growth of guppy (Poecilia reticulata). Key physicochemical parameters such as temperature, pH, dissolved oxygen (DO), ammonia, and total hardness were recorded throughout the experimental period.

Water temperature was maintained between 24–28°C, while pH ranged from 6.5 to 7.5. Dissolved oxygen levels were kept above 5 mg/L to support proper metabolic activities. Ammonia concentration was maintained below 0.02 mg/L to prevent toxicity, and total hardness was regulated within acceptable limits for freshwater ornamental fish culture. Regular partial water exchange and proper aeration were carried out to maintain water quality.

All parameters were measured using standard methods as described by American Public Health Association (2017). The recommended water quality ranges were followed based on guidelines for ornamental fish culture (Boyd Water Quality in Aquaculture, 1998; Aquaculture Engineering, 2013).

Parameter	Observed Range	Recommended Range
Temperature	24–25°C	22–25°C
pH	7.5–8.5	6.5–7.5
DO	4.9–6.5 mg/L	5–7 mg/L
Ammonia	0.2–0.4 mg/L	<0.5 mg/L
Hardness	400–450 mg/L	50–300 mg/L

Growth Data

Day	Average Length (cm)	Average Weight (g)
1	0.7	0.001
7	0.8	0.002
14	1.0	0.015
28	1.4	0.05
70	1.8	0.1
103	2.1	0.3

Condition Factor

The Fulton's Condition Factor (K) is calculated using the following formula:

$K=W/L3\times100$

Where:

K = Condition factor

W = Weight of the fish (in grams)

L = Total length of the fish (in centimeters)

Result and Discussion:

Growth Performance

The fish showed steady growth throughout the study period. The increase in length and weight confirms favorable environmental and feeding conditions (Kibria et al., 2017).

Figure 1: - The line graph is showing the growth of guppy fish over time in terms of both length and weight.

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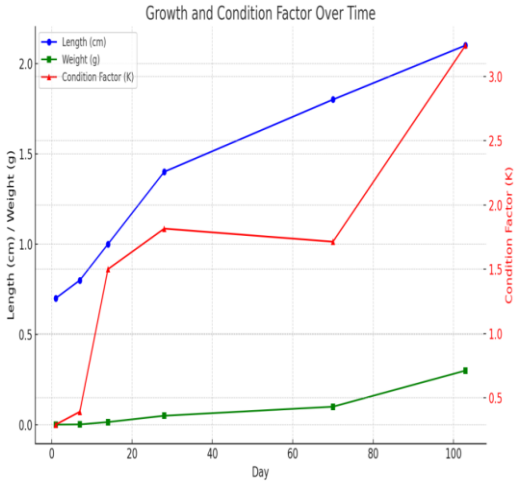
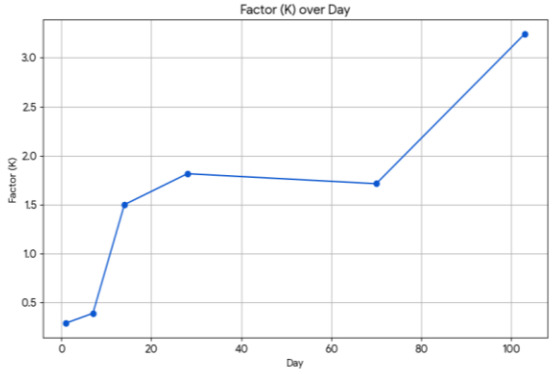


Condition Factor

Day	Length (cm)	Weight (g)	K
1	0.7	0.001	0.291
7	0.8	0.002	0.391
14	1.0	0.015	1.500
28	1.4	0.05	1.816
70	1.8	0.1	1.714
103	2.1	0.3	3.242

Figure 2: Condition Factor Trend



Increasing K values indicate good health and nutritional status (Froese, 2006).

Water Quality Impact

Water parameters remained within acceptable limits. Slight deviations in pH and hardness did not affect growth, confirming the adaptability of guppies (Boyd, 2019).

Morphological Development

The morphological development of guppy fish (*Poecilia reticulata*) was observed systematically throughout the experimental period, revealing progressive and well-defined changes in body structure, fin formation, and pigmentation. During the early stages, the fry exhibited a transparent body with underdeveloped fins; however, as the culture period advanced, significant structural differentiation became evident. By the later stages of the experiment, particularly around Day 103, all fins including dorsal, caudal, and pelvic fins were fully developed and functionally active. Pigmentation also showed a marked increase over time, with distinct black and yellow coloration appearing prominently, especially in the caudal region, thereby enhancing the ornamental value of the fish. Furthermore, the appearance of gravid spots in female guppies indicated the onset of sexual maturity and reproductive readiness. These morphological transformations confirm that the controlled laboratory conditions were conducive to normal growth, development, and maturation of the fish.

Behavioural Observations

Behavioural patterns of the guppy fish were closely monitored during the study period, and significant changes were observed as the fish progressed through different growth stages. Initially, the fry displayed limited movement and remained close to shelter areas such as aquatic plants and stones. However, with increasing age and development, the fish exhibited enhanced swimming activity and greater exploration of the tank environment. Improved fin coordination contributed to smoother and more efficient movement patterns. Feeding behaviour also became more active and competitive over time, indicating better adaptation to the rearing conditions.

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Notably, early signs of reproductive behaviour were observed, particularly among female fish, which corresponded with the development of gravid spots and physiological maturity. These behavioural changes reflect healthy growth, adaptability, and a stress-free environment within the controlled laboratory system.

Conclusion:

The present study clearly demonstrates that guppy fish (*Poecilia reticulata*) can be successfully reared under controlled laboratory conditions with consistent growth and development. The steady increase in both length and weight throughout the experimental period indicates that the feeding regime and environmental conditions were appropriate and effective. The significant improvement in the condition factor values further confirms that the fish maintained excellent physiological health and nutritional status during the study. Additionally, the observed morphological and behavioural developments, including fin formation, pigmentation, and reproductive indicators, highlight the suitability of laboratory conditions for the normal maturation of guppies. The ability of the fish to adapt to slight variations in water quality parameters further reinforces their robustness and resilience. Overall, the findings suggest that guppy fish are highly suitable for ornamental aquaculture and can be effectively cultured under controlled conditions for both research and commercial purposes.

Recommendations:

Based on the outcomes of the present study, several recommendations can be made to enhance guppy culture practices under laboratory and small-scale aquaculture systems. It is essential to maintain optimal water quality parameters, particularly temperature, pH, dissolved oxygen, and ammonia levels, to ensure sustained fish health and growth. Although guppies demonstrated adaptability to slightly elevated pH and hardness levels, maintaining these parameters within recommended ranges would further improve culture efficiency. The feeding regime adopted in this study, consisting of Artemia and Spirulina flex, proved effective in promoting growth and should be continued or optimized with the inclusion of cost-effective alternative feeds. Regular monitoring of the condition factor (K) is strongly recommended, as it serves as a reliable indicator of fish health, nutritional status, and environmental suitability. Additionally, proper management of stocking density is necessary to prevent stress, competition, and growth suppression. Future studies should focus on long-term culture performance, reproductive output, and the effects of different dietary and environmental treatments to further refine guppy aquaculture practices.

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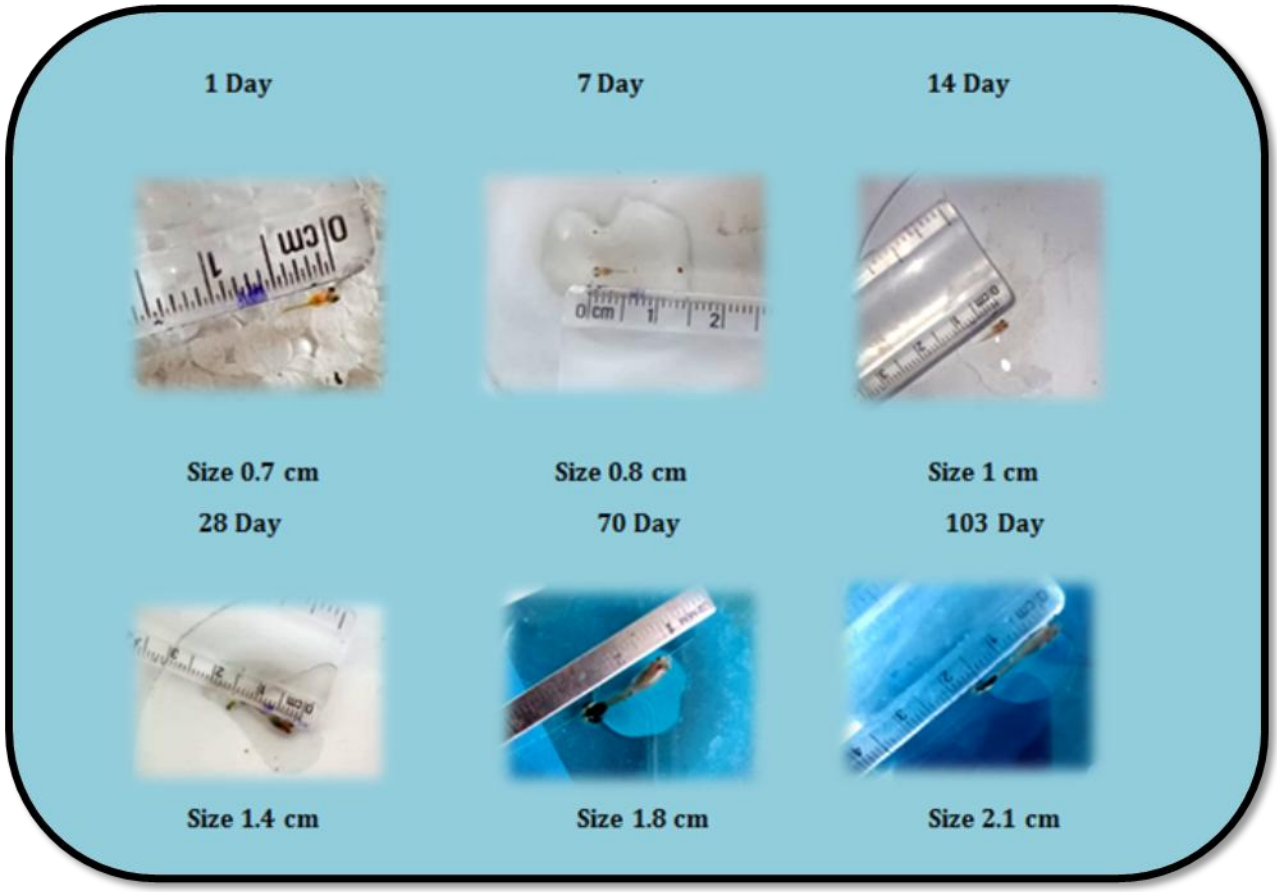

Image showing different life stages and growth of experimental fish