PATIN FISH REARING IN CANVAS TANK: A COMMUNITY EMPOWERMENT PROJECT FOR B40

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ABSTRACT

Patin is a fish from the family *Pangasiidae*, living in rivers and lakes. The attempt to rear Patin in tanks is limited due to the cost and unfamiliar technique. This project investigates the possibility of a Below 40 (B40) group adopting a frugal technique to rear Patin to improve their livelihood. A total of 10 families were selected to rear Patin in canvas tanks at their homes. Each house received one set of a canvas tank (10’ x 3’ x 2’) with accessories including the submersible pump (40 watts), piping, filter box, 200 Patin fries, and formulated fish pellet. The length and weight of the fries were measured to monitor growth. The pH, and oxygen levels in the tank were measured regularly. The one-way ANOVA revealed a significant difference in DO ($F(7,232) = 7.315$, $p < 0.001$) and in pH levels ($F(7,232) = 12.9$, $p < 0.001$) throughout the study period. The fish weight and length also showed a significant difference across the tanks ($F(9, 230) = 5.939$, $p < 0.001$ and $F(9, 230) = 5.637$, $p < 0.001$ respectively). Nonetheless, there was no interaction effect of pH level and DO concentrations on fish weight and length (Two-way ANOVA, $p>0.05$). Other factors such as diet and routine of cultural activities could cause the above results. There is an urgent need for the participants to get continued consultation and training to improve their aquaculture skills, particularly on the critical points for a Halalan Tayyiban practice.

Keywords: *canvas tank, patin fish, B40, halalan tayyiban*

1. Introduction

The Mid-Term Review of the Ninth Malaysia Plan, Eleventh Malaysia Plan, and 2016 Financial Report defines the low-income group, known as the Below-40 group (B40), as having a monthly income not exceeding RM3,900. Aquaculture is thought to have a positive impact on the food security agenda for the poor. However, when aquaculture involves farming of large-sized commercial species, the problem of food insecurity resurfaces as these commercial large fish species do not bring the same quantity of nutrition as compared to small fishes (Olaganathan & Tang, 2017). Fish farms with small fish have improved their livelihoods by increasing household income, although some constraints continue to hamper fish production, such as low-quality fish fry, lack of credit, and low prices of fish produced, among others (Al Mahadi et al., 2022).

Patin is commonly cultured in cages in rivers or lakes or in earthen ponds on land. Different aquaculture techniques may experience different types of difficulties in maintaining water quality (Yunus et al., 2023). The source of water and management practices were reported to link to the parameters of the pond water. On the other hand, the parameters of the pond were associated with fish yield and the likelihood of disease occurrence (Mramba & Kahindi, 2023). Kassim et al. (2023) suggested the adoption of a strict culture protocol to maintain the clean condition of the culture facilities and healthy fish as ultimately necessary. As emphasized by Kartika et al. (2022), understanding the importance of adopting halal aquaculture practices is a prerequisite towards quality fish production in the aspect of nutrients and cleanliness.

The initiatives to date are hindered by some issues related to the lack of knowledge and skill. Furthermore, income, education, and occupation pressure their socioeconomic status

(Shahar et al., 2019). These underpin decision-making in a range of settings definitely affect them, and focus on a certain activity should be introduced to them (Sheehy-Skeffington & Rea, 2017). As emphasized by Jaafar et al. (2023), training in the agricultural sector will be able to minimize the impact of internal and external factors on the success of the bottom 40 groups in Malaysia in their activities. Additionally, the full adoption of a standard operation of aquaculture practice and the *tayyiban* concept will ensure the production of high-quality fish from the aquaculture activity (Kartika et al., 2020).

The goal of this project is to use a cost-effective strategy to empower the low-income population in aquaculture production. Additionally, it is anticipated that they will be able to uphold the *halalan tayyiban* principle of protecting water quality.

2. Materials and methods

2.1 Target Community

The target community was from the B40 group at Kampung Tersusun, Batu 20, Titi Tinggi Perlis. Early communication with the local authority and the community leader's office helped us to invite participants from low-income groups for the project. A total of ten volunteered participants were gathered for registration and attended an introductory workshop for fish farming. They stayed in the same neighbourhood, so monitoring is expected to go smoothly. Each house was given a tank, and to avoid disclosure of their name, the data reported in this study will use numbers 1, 2, 3, 4,5, 6, 7, 8, 9, 10.

2.2 Tank Preparation

All participants were exposed to a knowledge transfer activity in the classroom to give an early understanding of fish culture preparation, water quality, and production cycle. They were then exposed to a hands-on activity to learn the technique to prepare a fish tank made from a metal frame and high-density canvas with the standard size of 10’ x 3’ x 2’. The source of water was obtained from rainwater collected and stored in their rain harvesting container. Alternatively, tap water was used after adding an anti-chlorine liquid. The tank was filled with water until 50% of the volume. A submersible pump of 60 watts was installed at the bottom of the tank to circulate water. The tank was set with water circulation for 24 hours before introducing fish fry.

Water circulated by the submersible pump will be filtered through a filter box attached to the corner of the tank. The filter box contained artificial sponges and coral rubble and acted as a physical filter.

2.3 Introducing Fish Fries and Rearing Monitoring

The dedicated nearby farm operators supplied Patin fish fry, which was booked a few months before the project started. Because of the high demand for the fish fry, booking must be done earlier. Upon arriving, the fish fries in the plastic containers must be kept for about one hour in the tank before release.

After being set free, they were inspected to check for any abnormalities, such as poor swimmers, scars, scratches, and blisters on the abdomen or reddish-coloured scales or fins. Fry exhibiting symptoms of illness were segregated and given individual care. Every participant received 200 healthy fries, each measuring 4 inches. They were given pellets in the morning and evening that were the right size based on their age, with a diet proportion of 5% of their body weight.

The field researcher measured two parameters, pH and DO, from each tank *in situ* using a YSI multiprobe meter monthly. The size of the fish (length, from the tip of the mouth to the tip of the tail, weight, total fresh weight) was measured monthly by randomly taking 5 samples from each tank. Participants were also given technical advice during each visit.

2.4 Growth Measurement

The measurement of weight was used to measure the Relative Growth Rate.

Absolute growth rate = W_t - W_i / t, where
Final weight, weight at time = W_t
Initial weight = W_i
Time = t
Relative Growth Rate = [W_t - W_i / W_i] x 100

The measurement was adopted from Hopkins (1992) with the understanding of the limitations of the application.

2.5 Statistical Analysis

A one-way ANOVA was performed to analyse if there was a significant difference in the values of pH and DO between the tanks. The same analysis was carried out to investigate if there were any significant differences in the length and weight of fish in the tanks. A two-way ANOVA was used to investigate if there is a correlation between pH and DO with the growth.

3. Results and Discussion

3.1 Water parameters

3.1.1. Dissolved Oxygen concentrations

The mean dissolved oxygen (DO) concentrations across the tanks varied from low to moderate values over the study period (Table 1). The monthly average DO levels ranged from 0.68 mg/L in May 2024 to 7.76 mg/L in March 2024, with Tank 6 exhibiting the lowest and Tank 8 recording the highest average DO levels. The one-way ANOVA revealed a statistically significant difference in DO levels throughout the study period, $F(7,232) = 7.315$, $p < 0.001$.

Table 1: Mean of DO concentrations during the study period.

Tank	DO (mg/L)							
	Jan-24	Feb-24	March-24	Apr-24	May-24	June-24	July-24	Aug-24
1	1.93	5.20	1.02	5.57	3.19	2.32	0.91	5.61
2	4.20	3.60	1.45	1.84	4.17	4.09	3.92	5.94
3	1.22	0.69	2.03	2.11	1.42	1.50	2.01	1.81
4	1.38	0.90	3.10	0.80	2.04	4.10	2.30	6.37
5	4.40	1.06	3.87	3.63	0.90	2.27	2.11	1.02
6	6.40	4.39	3.48	0.95	0.68	0.75	0.82	0.79
7	5.99	4.22	2.71	1.41	0.78	2.03	0.78	0.88
8	3.39	2.38	7.76	7.40	2.06	2.03	3.50	0.91
9	5.19	3.77	1.63	1.52	0.74	3.22	6.81	0.73
10	6.88	6.38	4.80	5.79	0.76	1.09	1.21	5.74

3.1.2 pH

The mean of pH values across the tanks over the rearing period is shown in Table 2. The monthly average of pH values recorded optimal range of pH levels ranged from 5.79 in June 2024 (Tank 10) to 7.76 in April 2024 (Tank 1). The one-way ANOVA showed a significant difference in pH levels throughout the study period, $F(7,232) = 12.9$**,** $p < 0.001$**.**

Table 2: Mean of pH values during the study period.

Tank	pH							
	Jan-24	Feb-24	Mac-24	Apr-24	May-24	June-24	July-24	Aug-24
1	7.17	7.52	7.43	7.76	6.79	6.57	7.04	7.07
2	6.20	7.43	7.16	7.24	6.89	6.59	6.50	7.00
3	6.87	6.90	6.81	6.99	6.88	7.12	6.79	6.58
4	6.93	7.28	7.16	7.28	6.58	6.29	6.72	6.56
5	7.25	6.97	7.28	7.40	7.00	7.09	6.90	6.79
6	7.55	7.37	7.65	7.33	6.87	6.62	6.89	6.75
7	7.67	7.40	7.18	7.33	6.68	6.42	6.49	6.87
8	7.16	7.17	7.42	7.41	6.90	6.19	6.30	6.69
9	6.89	7.44	7.34	7.37	6.88	6.54	6.67	6.89
10	7.53	7.48	7.60	7.66	6.73	5.79	6.59	6.89

The water quality parameters, such as the DO, are one of the critical points to be maintained. The ideal values for Patin were reported between 7.4 mg/L and 8.4 mg/L (Hor et al., 2017). As reported by Bagherzadeh et al. (2013), dissolved oxygen had a significant effect on growth. A low level of oxygen accompanied by a reduction in feed intake resulted in lower growth and changes in stress response. The low DO condition obviously does not align with the concept of Tayyiban as it affects animal welfare. Fluctuations in pH levels could be another reason for the slow growth (Marium et al., 2023). Bolner et al. (2014) reported how exposure to acidic and alkaline pH changes affected the metabolic parameters as well as gill Na^+/K^+-ATPase activity. Darmawan et al. (2021) found that the sudden difference in the pH value had a significant effect (P<0.05) on survival, blood glucose levels, and the level of damage to the gill tissue of the *Pangasius* sp. fry. Nonetheless, the fries could adapt to a slow change in pH and build resistance to the pressure.

3.2 Growth

3.2.1 Weight and Length Gain

The mean weight gain across the 10 tanks ranged from 2.67±1.15 grams in Tank 6 to 158.33±4.55 grams in Tank 3 (Figure 1). A one-way ANOVA was performed to determine whether there were significant differences in weight gain across the tanks. The results showed a significant difference in fish weight among the tanks, **F** (9, 230) = 5.939, **p** < 0.001. The mean length gain across the 10 tanks ranged from 2.67±0.29 cm in Tank 9 to 24.83±0.76 cm in Tank 5 (Figure 2). The results of one-way ANOVA indicated a statistically significant difference in fish length across the tanks, **F** (9, 230) = 5.637, **p** < 0.001. However, there was no interaction effect of pH level and DO concentrations on fish weight and length (two-way ANOVA, p > 0.05).

Weight and length actually increase in the non-linear stage; nonetheless, an absolute measure or relative growth could at least indicate if the fish is growing in the given system. The slow increase is possibly associated with the tank's condition, including the amount of waste and cleanliness, which is indirectly shown by the pH and DO. Water treatment in aquaculture is definitely necessary to meet the *Halalan Tayyiban* requirement (Chowdhury et al., 2023).

3.2.2 Growth rate

The absolute and relative growth rate was calculated for fish in each tank from January to August 2024 to represent the daily increase in fish weight over the study period (Table 3). The absolute growth rate ranged from 0.11 to 0.71 g/day. The values were low if compared to other studies (Ali et al., 2003; Basuki et al., 2018). From the absolute growth, the relative growth rate was calculated to show the daily rate of growth during the study period. The rate was much higher in tanks 1 to 6 (8.12-15.17% daily) than in tanks 7, 8, 9, and 10 (2.20-5.93% daily). Apart from the influence of the amount of pellets given, temperature could also affect the growth rate (Odinga et al., 2018). The tanks were not exposed to a consistent environment since they were located and managed by the participants in their own space.

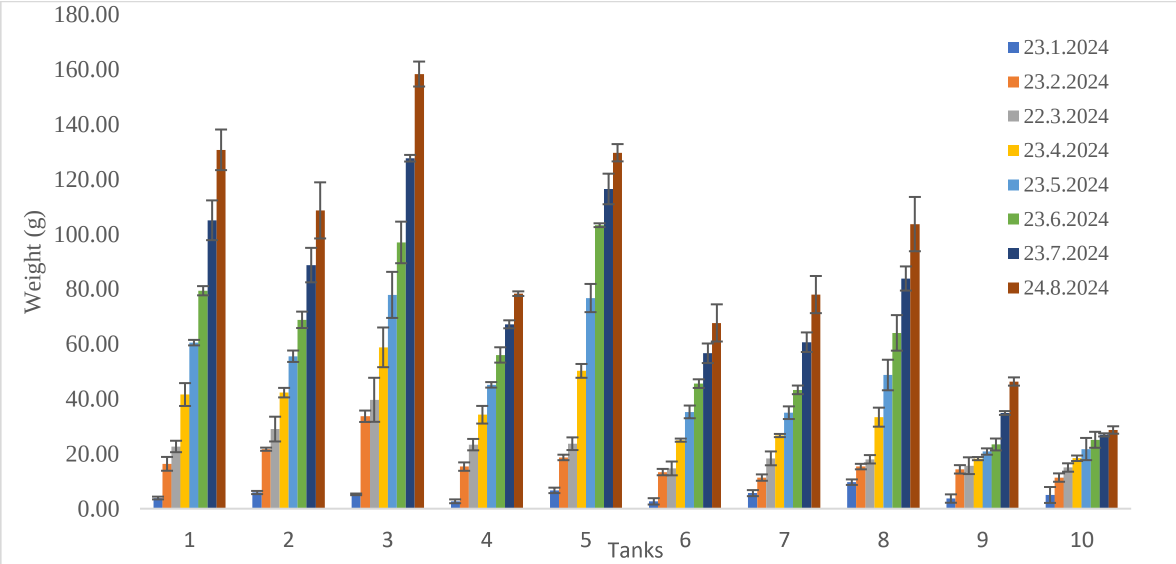

Figure 1: The mean fish weight gain across the 10 tanks during the study period.

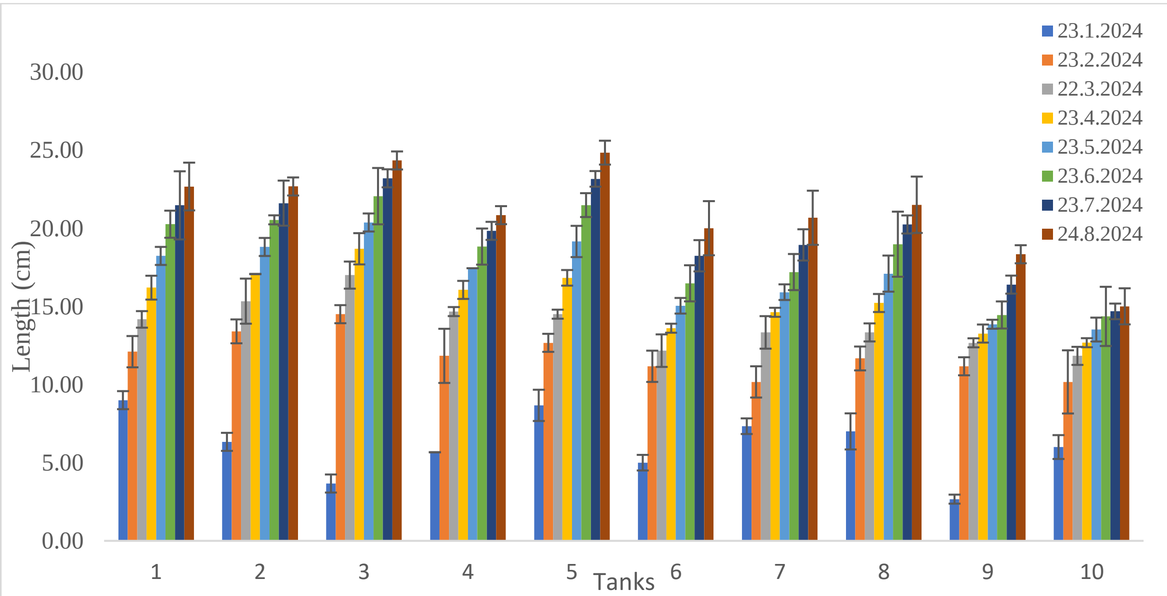

Figure 2: The mean fish length gain across the 10 tanks during the study period.

Table 3: Absolute Growth and Absolute Growth Rate

Participant	Initial Weight, (gm) Jan-24	Final Weight (gm) Aug-24	Absolute Growth (gm) 215 days	Absolute Growth Rate (gm/day)	Relative Growth Rate (%) /day
1	3.89	130.73	126.84	0.59	15.17
2	5.89	108.67	102.78	0.48	8.12
3	5.22	158.33	153.11	0.71	13.64
4	2.69	78.33	75.64	0.35	13.07
5	6.67	129.67	123.00	0.57	8.58
6	2.67	67.67	65.00	0.30	11.32
7	5.67	78.00	72.33	0.33	5.93
8	9.67	103.67	94.00	0.44	4.52
9	3.69	46.33	42.64	0.19	5.37
10	5.00	28.67	23.67	0.11	2.20

A report from Jamaludin & Yong (2021) confirmed a slower growth of Patin when cultured in tanks. This is related to their feeding habit as bottom feeders. The pellets used in this project were of the floating type. The feeding frequency should be increased based on the feeding behavior of the fries, an observation that needs skills and training. The feeding regime, which includes how to feed and the portion that will be given to the fish being cultured, also affects growth performance (Haetami & Pratiwy 2023).

Every participant in this initiative demonstrated patience and dedication by attending all scheduled meetings and training sessions in full. They made every effort to adhere to the protocols in order to protect the fish's wellbeing. The fundamentals of animal welfare were presented; nevertheless, greater awareness should be raised, and government agency support could increase the project's effectiveness (Din et al., 2017; Aziz et al., 2022). To strengthen their comprehension of water quality and protect animal welfare, a thorough education in the adoption of the *Halalan Taiyyiban* concept is necessary. At the same time, the most important factors for a successful production should be the cultural environment's cleanliness and purity (Kartika et al., 2020; Kassim et al., 2023).

4. Conclusion

Patin fish has the potential to be produced using a frugal technique using a canvas fish tank, which is more affordable to the low-income group. Nonetheless, a more comprehensive training and knowledge transfer program should be introduced to the participants. The main parameters that are easy to measure, such as pH and DO, are suggested to be used to monitor the tank's water condition. Knowledge transfer on the *Halalan Tayyiban* concept would be significant to empower the target group to be more successful in this type of project.

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