

ABSTRACT

Recent expansion of aquaculture sector has intensified the prerequisite to diversify alternative aqua-feed ingredients that are nutritionally suitable as well as economical. The present study determined growth performance and health profile of farmed tilapia (GIFT) raised on indigenous plant-based practical diets. Nine isonitrogenous (crude protein = 396 g/kg), isolipidic (crude lipid = 142 g/kg), and isoenergetic (gross energy = 18.82 KJ/g) experimental diets were prepared using fish meal, soybean meal (as control), canola meal (CM) and sunflower meal (SFM) as dietary protein source at varying inclusion percentages, such as 25, 50, 75 and 100%. For the study, a total of 405 unisex male fingerlings (each 3 ± 0.07 g) were used. The experimental fish were stocked in glass tanks at density of 15 fish/tank performed in triplicates; fish were fed their respective diets at 3% of wet body weight for 16 weeks.

The data concerning fish weight gain were observed and recorded at two weeks interval during the experiment with the final weight recorded at the termination of the experiment. With up to 50% inclusion level of CM and SFM, optimum growth performance parameters of GIFT fingerlings observed were: final weight [CM = 43.83 ± 1.45 ; SFM = 44.35 ± 0.73 (g)], absolute weight gain [CM = 40.19 ± 1.37 ; SFM = 40.35 ± 0.75 (g)], percentage weight gain [CM = 1112.48 ± 17.07 ; SFM = 1099.86 ± 15.91], daily growth index [CM = 0.334 ± 0.01 ; SFM = 0.338 ± 0.00 (g/fish/day)], and specific growth rate [CM = 3.07 ± 0.02 ; SFM = 3.08 ± 0.01 (%/day)]. Increasing the inclusion level beyond 50%, the growth performance decreased. One-way analysis of variance suggested that the difference among the treatments was statistically significant ($p < 0.05$).

Similarly, at 50% inclusion of CM and SFM, optimum consumption parameters, such as feed intake [CM = 41.92 ± 0.39 ; SFM = 40.83 ± 0.73 (g/fish)], feed conversion ratio [CM = 1.09 ± 0.04 ; SFM = 1.08 ± 0.00] and protein efficiency ratio [CM = 2.24 ± 0.07 ; SFM = 2.27 ± 0.03], were observed showing statistically significant ($p < 0.05$) improvement. However, no significant difference ($p > 0.05$) was found for survival rate among all the treatments. In addition, body indices were also significantly ($p < 0.05$) enhanced after the 50% inclusion of CM and SFM. The whole-body crude protein content was decreased, and crude lipid content increased after 50% inclusion of CM and SFM ($p < 0.05$); however, dry matter and ash content did not significantly ($p > 0.05$) vary among the treatments.

Additionally, lipid metabolism parameters, such as total cholesterol and low- and high-density lipoprotein-cholesterol, total serum protein, lysozyme activity, and complement component 3 content increased up to 25% and 50% inclusion of CM and SFM ($p < 0.05$). On the other hand, triglycerides, glucose, creatinine, blood urea nitrogen, transaminase enzymes (glutamic-pyruvic transaminase and glutamic-oxalacetic transaminase) activity, and glycogen and lipid content in hepatic and muscle tissues of GIFT fingerlings were found to be elevated at higher than 50% inclusion of CM and SFM ($p < 0.05$).

The degree of variation in the thickness of mucosal and submucosal layer, length of mucosal fold, width of lamina propria, and vacuolization in the distal intestine, and the Uran's pooled score for the above-mentioned histological traits of GIFT fingerlings increased at higher than 25% inclusion of CM and SFM. This difference was statistically significant ($p < 0.05$) among treatments.

In conclusion, CM and SFM inclusion of up to 50% in fish feed makes GIFT Tilapia culture economically viable by enhancing the profit index and decreasing the unitary feeding cost and incidence cost. Therefore, the biological and economic efficiency of practical diets containing 50% of CM and SFM as the dietary protein is useful without compromising growth performance of GIFT culture, fish health, and economics.

Key Words: GIFT Tilapia, feed consumption, plant protein sources, growth performance, body indices, intestine histology, serum chemistry, immune response, economic efficiency, transaminase, proximate.