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Enhancing aquaculture resilience with baobab and tamarind-based micronutrient premixes for catfish fingerlings

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Abstract

This study assessed the potential of locally available baobab (*Adansonia digitata*) and tamarind (*Tamarindus indica*) pulp powders as sustainable alternatives to synthetic vitamin-mineral premixes (SVMPs) in *Clarias gariepinus* fingerling diets. High costs and reliance on imported feed additives remain barriers to sustainable aquaculture, especially for smallholder systems in resource-limited regions. The goal was to enhance nutrient use efficiency and support climate-resilient, low-input aquaculture.

A 12-week feeding trial was conducted using 300 fingerlings, allocated across five dietary treatments: 3 % SVMP (control), 5 % and 7 % baobab pulp powder, and 5 % and 7 % tamarind pulp powder (w/w). Growth performance, hematological parameters, and water quality were evaluated. All diets were formulated to be isonitrogenous and isoenergetic.

Fingerlings fed baobab-based diets achieved similar weight gain (99.72 ± 0.09 g, 99.33 ± 0.27 g), and feed conversion ratios (FCR: 1.17 ± 0.53, 1.12 ± 0.14) to those fed SVMP, with survival rates above 98 %. Tamarind-based diets resulted in significantly lower growth (mean 71.5 ± 0.85) and higher FCRs (>3.24), suggesting reduced digestibility due to anti-nutritional factors. Health indicators such as red blood cell count, hemoglobin levels, and packed cell volume were maintained in baobab-fed fish, indicating effective oxygen transport and immune function. In contrast, tamarind diets led to significant reductions in these parameters, indicating possible anemia and physiological stress.

Water quality also varied. Baobab and SVMP diets maintained optimal pH (7.2–7.8), high dissolved oxygen (>5.5 mg/L), and low ammonia (<0.4 mg/L). Tamarind-based diets increased total dissolved solids and lowered DO levels, reflecting poor water stability likely due to higher microbial oxygen demand.

This research supports the use of baobab pulp as a climate-smart, nutrient-efficient feed ingredient that can reduce reliance on imported inputs. It contributes to SDGs 2, 12, and 13 by promoting local innovation, food system resilience, and sustainable aquaculture practices. Future work should focus on reducing tamarind's anti-nutritional content via fermentation or enzymatic treatment to improve its usability.

Keywords: Aquaculture resilience, baobab pulp, catfish, climate-smart nutrition, hematology , tamarind pulp

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