

PERFORMANCE OF LARGEMOUTH BASS (*Micropterus nigricans*) FED ON SOYBEAN MEAL DIETS

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ABSTRACT

This study evaluated soybean meal (SBM) as a partial replacement for fishmeal in juvenile largemouth bass diets, with and without taurine (T) supplementation. A 90-day feeding trial is underway using juvenile fish averaging 6.96 ± 4.21 g in weight and 8.90 ± 0.22 cm in length. Fish were randomly distributed into six dietary treatments, each with three replicate tanks containing 40 fish, and reared in a closed recirculating aquaculture system. All diets were formulated to be isonitrogenous (45% crude protein) and isolipidic (11% crude lipid) and included a control fishmeal diet, 30% and 60% SBM diets with or without taurine, and a commercial reference diet. Fish were fed to apparent satiation, while water quality and growth performance were monitored regularly. Preliminary results after 60 days indicated significant dietary effects on final weight (FW), final length (FL), weight gain (WG), feed intake (FI), specific growth rate (SGR), and feed conversion efficiency (FCE) ($P < 0.05$). Fish fed diets containing 60% SBM, with or without taurine, showed the best growth performance, followed by those receiving 30% SBM diets, whereas the commercial diet resulted in the poorest performance. Feed intake per fish increased with higher SBM inclusion, and feed conversion efficiency was significantly improved in all SBM-based diets ($P < 0.05$). Feed conversion ratio (FCR) was not impacted by the experimental diets and was lowest in the group fed diet SBM50. Taurine supplementation did not result in additional benefits. These findings suggest that soybean meal can effectively replace fishmeal up to 60% without adverse effects on growth, feed efficiency, and survival of juvenile largemouth bass.

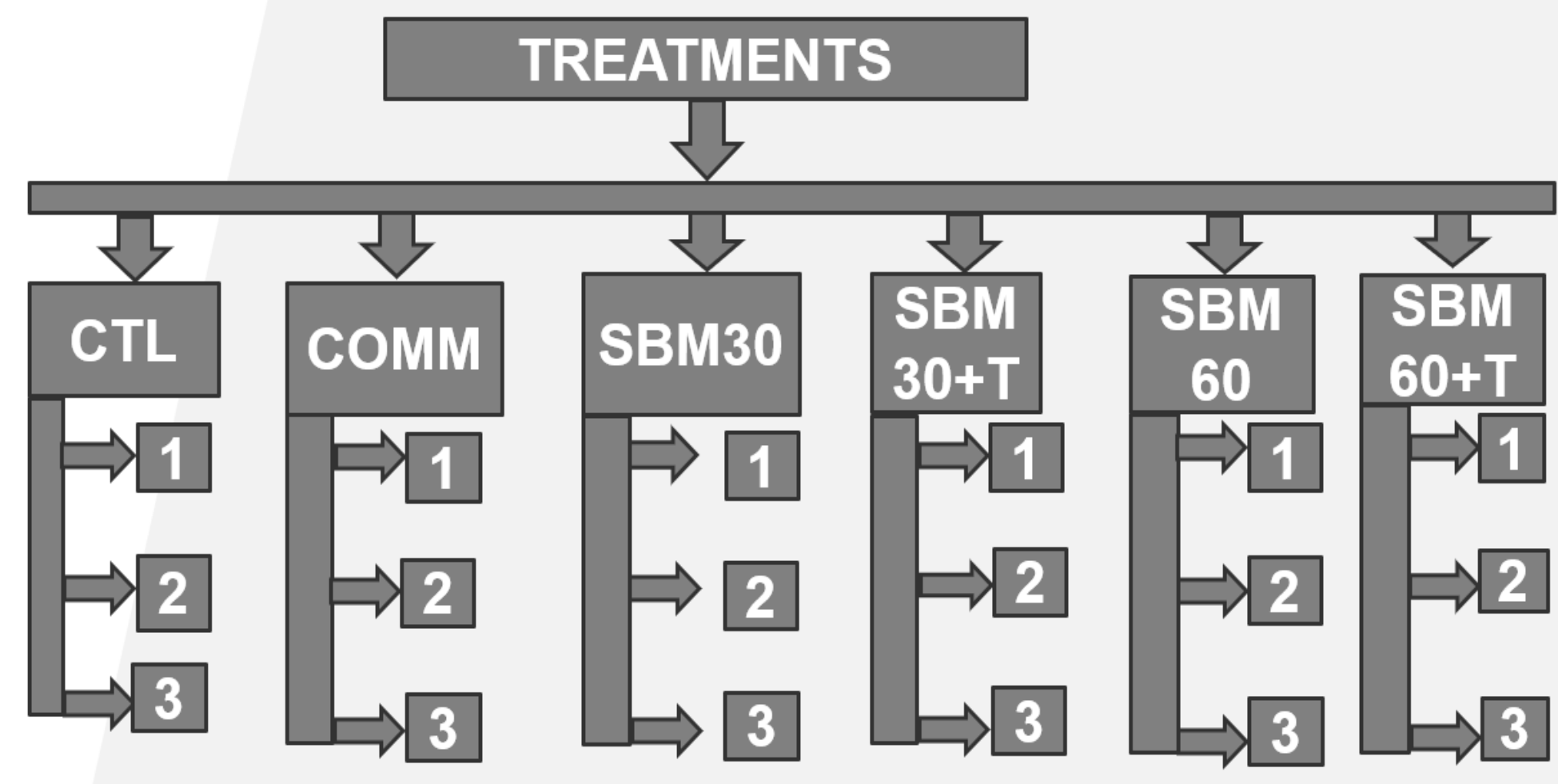
INTRODUCTION

In the United States, largemouth bass (*Micropterus nigricans*) ranks fifth among the most farmed food fish and represents an important species for freshwater aquaculture. However, high feed cost remains one of the major challenges facing the industry, largely due to the high price and declining availability of fishmeal. These constraints highlight the need to identify cost-effective and nutritionally adequate alternative protein sources. Plant-based ingredients such as soybean meal (SBM) are widely available and economically attractive, making them promising protein ingredients for partial replacement of fishmeal in largemouth bass diets. Developing affordable and efficient SBM-based feeds can enhance producer profitability while supporting the long-term viability of largemouth bass aquaculture.

Research Objectives: This study aimed to assess the effects of replacing fishmeal with graded levels of soybean meal, with or without taurine supplementation, on growth performance, feed utilization, and body composition indices, product quality, intestinal tissue histology, and gene expression of juvenile largemouth bass.

MATERIALS AND METHODS

Experimental Design



Feeding trial

Stage: Juveniles
Fish: 720 fish at 6.96g and 8.98cm
18 tanks, 40 fish/ tank
Feeding: to satiation, twice daily
Growth assessment: Every 30 days
Trial Duration: 90 days



RESULTS AND DISCUSSION

Table 1: Growth performance parameters of juvenile largemouth bass fed the experimental diets for 60 days

Growth metrics	Treatments ¹						p-value
	COMM	CTL	SBM30	SBM30+T	SBM60	SBM60+T	
IW(g)	9.67 ± 0.22 ^a	9.5 ± 0.10 ^a	9.37 ± 0.08 ^a	9.49 ± 0.16 ^a	9.1 ± 0.12 ^a	9.33 ± 0.17 ^a	0.209
FW (g)	35.59 ± 1.67 ^b	45.97 ± 4.02 ^{ab}	48.46 ± 2.51 ^a	48.9 ± 1.41 ^a	52.53 ± 1.13 ^a	51.62 ± 1.1 ^a	0.002
IL (cm)	10.11±0.80 ^a	10.18 ± 0.38 ^a	9.55 ± 0.37 ^a	9.79 ± 0.56 ^a	8.89 ± 0.45 ^a	9.53 ± 0.63 ^a	0.391
FL (cm)	13.65 ± 0.11 ^b	15.28 ± 0.08 ^a	15.32 ± 0.2 ^a	15.4 ± 0.19 ^a	15.71 ± 0.07 ^a	15.73 ± 0.07 ^a	<0.001
WG (g)	25.92 ± 1.65 ^b	36.47 ± 3.99 ^a	39.09 ± 2.46 ^a	39.41 ± 1.45 ^a	43.43 ± 1.09 ^a	42.29 ± 1.24 ^a	0.002
FI (g/fish)	32.78 ± 1.56 ^b	39.2 ± 0.21 ^a	37.26 ± 1.51 ^{ab}	38.54 ± 1.44 ^a	41.45 ± 0.87 ^a	40.85 ± 0.92 ^a	0.003
FI (g/body weight)	1.45 ± 0.02 ^a	1.43 ± 0.10 ^a	1.29 ± 0.03 ^a	1.32 ± 0.02 ^a	1.35 ± 0.01 ^a	1.34 ± 0.01 ^a	0.165
SGR (%/day)	5.21 ± 0.20 ^b	6.27 ± 0.35 ^a	6.56 ± 0.19 ^a	6.56 ± 0.14 ^a	7.01 ± 0.08 ^a	6.84 ± 0.15 ^a	0.001
Survival (%)	90.83 ± 3.63 ^a	97.5 ± 0.00 ^a	98.33 ± 1.67 ^a	98.33 ± 1.67 ^a	97.5 ± 1.44 ^a	100 ± 0.00 ^a	0.058

Data are presented as mean ± S.E.M. (n=3). Values with the same superscript showed no significant differences ($P > 0.05$). ¹Six different experimental diets: COMM, CTL, SBM30, SBM30+T, SBM60, and SBM60+T.

RESULTS AND DISCUSSION

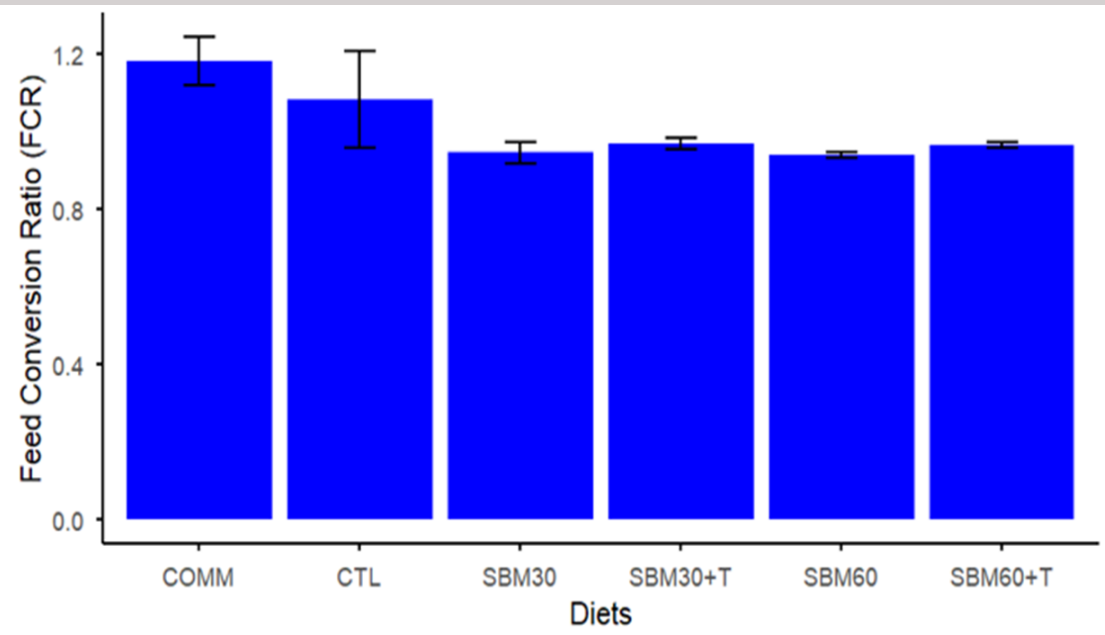


Figure 1: Feed conversion ratio of juvenile largemouth bass fed the experimental diets for 60 days.

Feed conversion ratio (FCR) varied among dietary treatments, with fish fed the commercial and control diets showing significantly higher FCR values than fish fed soy-based diets (SBM30, SBM30+T, SBM60, and SBM60+T) (Figure 1).

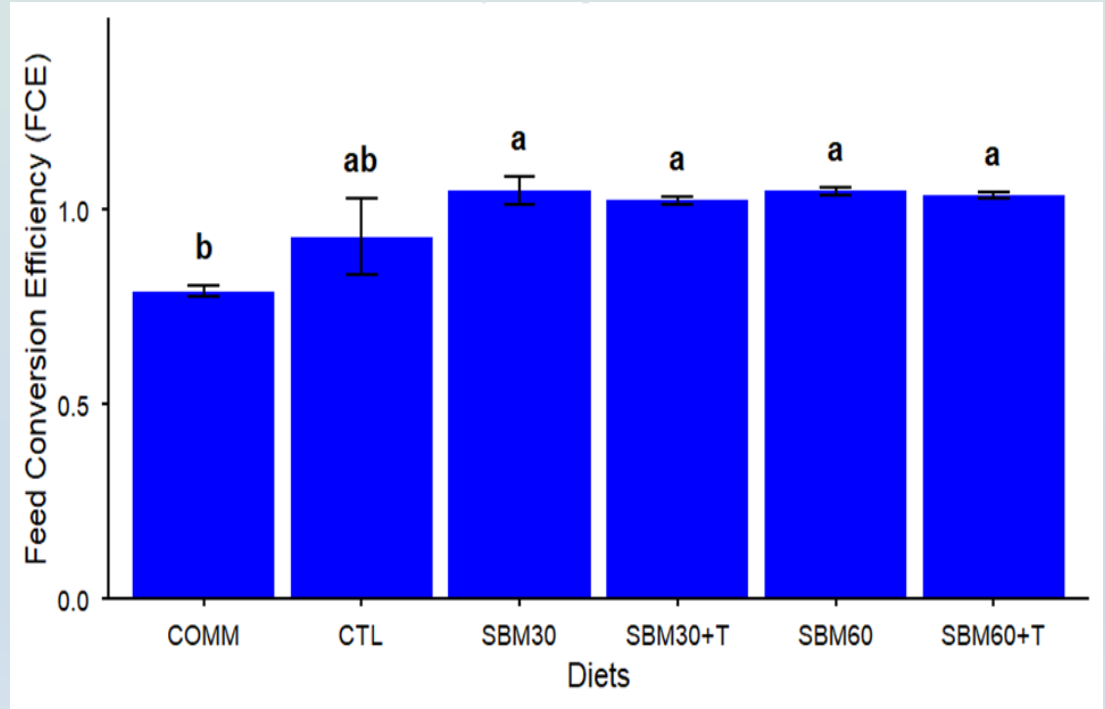
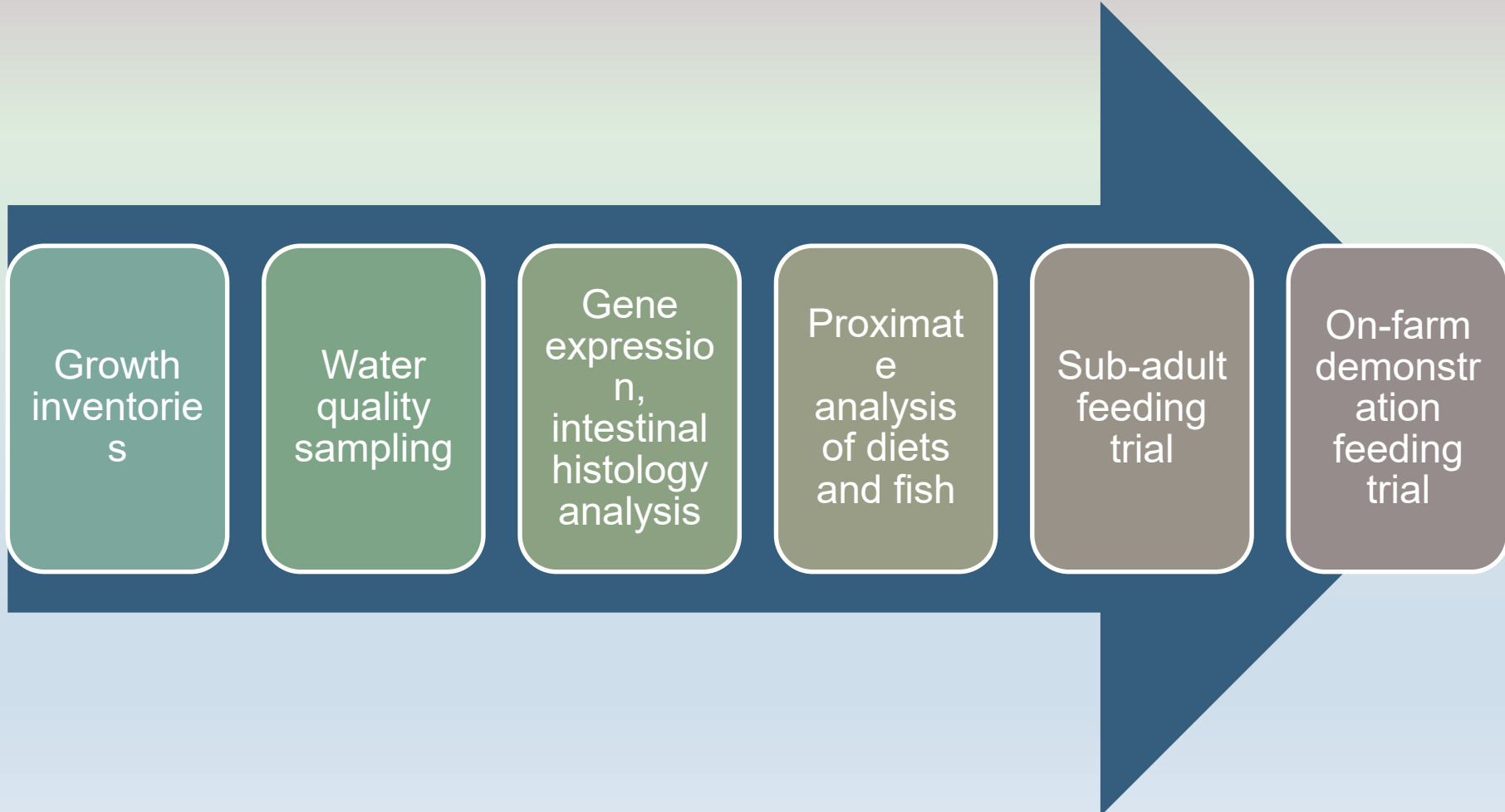


Figure 2: Feed conversion efficiency of juvenile largemouth bass fed the experimental diets for 60 days.

Feed conversion efficiency differed significantly among dietary treatments ($p < 0.05$). Fish fed soy-based diets (SBM30, SBM30+T, SBM60, and SBM60+T) exhibited significantly higher and comparable FCE values than the control diet, while the commercial diet resulted in the lowest and significantly different FCE value (Figure 2).

ONGOING AND FUTURE ACTIVITIES



CONCLUSION

Preliminary results demonstrate that replacing fishmeal with soybean meal at levels up to 60% significantly enhanced growth performance and feed efficiency of rainbow trout without compromising survival. Diets containing 60% soybean meal, with or without supplementation, produced the best overall growth responses, including higher final weight, weight gain, and specific growth rate. Taurine supplementation did not result in additional benefits. Overall, these findings suggest that soybean meal can effectively replace fishmeal up to 60% without adverse effects on largemouth bass growth performance, feed conversion ratio, feed conversion efficiency, and survival. Ongoing analyses through day 90, including body composition, fish quality, enzyme activity, gene expression, and production costs, will provide a more comprehensive evaluation of long-term dietary effects.

ACKNOWLEDGEMENTS



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KEY REFERENCES

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