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ARTICLE

Performance and Fatty Acids Composition of Oreochromis Niloticus Fed on Maggots

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ABSTRACT

This study was conducted to assess **improved performance and fatty acids composition of *Oreochromis niloticus***. Different substrate was used to culture and analyze the effect. Growth performance of *O. niloticus* fed on HFM meal and enhancement of fatty acids in the produced *O. niloticus* was conducted. Results showed that fish fed on HFMEuch achieved high performance with higher amount of ω-3FAs levels accumulation. *Eucheuma* species can be used to culture HFM as alternative non-competitive feed ingredient to improve performance and composition of ω-3FAs in cultured *O. niloticus.*

1. Introduction

Tanzania faces high demand of quality protein for human consumption and also for animal feeds. Approximately 85% of fish production is used for consumption while the rest is for non-human uses [2].

High costs of important ingredients such as fish meal which are used in making fish feeds is a limiting factor in growth of aquaculture industry [3], [4]. However, due to high demand for human consumption, this leads to requiring alternative non-competitive protein source.

Fish are good source of fatty acids which is important for different body physiological activities. However, freshwater fish, including tilapias which are highly depended fish in Tanzania. Previous studies show that supplementation of tilapia with feed having high concentration of ω-3 fatty acids can increase the amount of these fatty acids in the muscle tissues of fish [8].

Lemna has high composition of fatty acids and can

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enhance fatty acids in fish dietary [11]. *Eucheuma* provides provide good lipid and quality protein however of its un-palatability nature [12]. Housefly maggots accumulates nutrients from substrate and transfer to fish when used as feed ingredient [15].

This study evaluated improvement of performance and fatty acids composition of *Oreochromis niloticus*.

2. Materials and Methods

Two species of aquatic macrophyte *Lemna* and *Eucheuma spp* were collected from Lake Victoria and from Indian Ocean, respectively. *Lemna* sp was sorted to remove unwanted materials and debris, and then were fermented for three days to acquire offal odor to attract housefly and make them useful for maggot's culture. *Eucheuma sp* was cleaned then were fermented for three days ready for maggot's culture at experimental site.

Culturing was done indoors for each of the substrates as described by [16] Devic (2014) and [17]. The mature maggots were harvested according to [18]. The samples for formulate feed including maggot meal were taken to Laboratory for proximate analysis as shown in table 1 below.

2.1 Determination of fish growth and feed utilization

The body weights of fish from each replicate were recorded in bulky and finally mean weights was calculated.

2.2 Lipid extraction and fatty acids analysis

Frozen fish sample were taken to the Zoology laboratory for lipid extraction and fatty acids analysis

2.3 Lipid extraction

Extraction of lipid was done by using Folch Methods

3. RESULTS

There was no significant difference from all substrates ($P>0.05$) as shown in table 2 below.

There was no feed related mortality observed during the entire period of the experiment.

Table 1: Diet formulation and grouping

	SBM	**FM,**	**HFMChick**	**HFMLemn**	**HFMEuch**
SBM	51.49	43.90	12.72	10.80	7.50
FM	0.00	5.00	0.00	0.00	0.00
MM	37.70	40.33	40.15	43.33	44.75
HMM	0.00	0.00	35.00	35.00	35.00
CRM	2.49	2.48	3.90	2.53	4.33
CGM	0.00	0.00	0.00	0.00	0.00
SFO	4.32	4.29	0.46	0.47	0.65
Premix	1.00	1.00	1.00	1.00	1.00
Meth	1.00	1.00	1.00	1.00	1.00
Lysine	1.00	1.00	1.00	1.00	1.00
MCP	1.00	1.00	1.00	1.00	1.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 2: Chemical composition of formulated diets

Ingredient (%)	**Diets**				
	SBM	**FM**	**HFMChick**	**HFMLemn**	**HFMEuch**
Dry matter	90.75	90.89	88.42	91.86	91.40
Crude protein	41.73	46.01	40.66	46.03	50.00
Ether extract	18.98	19.20	20.00	19.07	20.40
Crude fibre	1.45	1.90	1.22	0.86	1.08
Ash	7.57	7.66	7.31	7.69	7.73

Table 3: Growth performance and nutrient utilization of Nile tilapia fed different diets (mean±SE)

	Diets					
Parameter	**SBM**	**FM**	**HFMChick**	**HFMLemn**	**HFMEuch**	**P-value**
INBWT (g)	2.41 ± 0.17[a]	2.48 ± 0.11[a]	2.54 ± 0.12[a]	2.32 ± 0.08[a]	2.52 ± 0.04[a]	0.344
FBWT (g)	7.71. ± 0.07[a]	8.19 ± 0.19[a]	8.07 ± 0.19[a]	7.81 ± 0.37[a]	8.33 ± 0.20[a]	0.048
BWTG (g)	5.01 ± 0.27[a]	5.65 ± 0.20[a]	5.29 ± 0.34[a]	5.01 ± 0.27[a]	5.59 ± 0.08[a]	0.161
ADG(g/day)	0.100±0.005[a]	0.101±0.001[a]	0.091±0.006[b]	0.100±0.005[a]	0.100±0.041[a]	0.161
SGR (%day)	2.00 ± 0.15[b]	2.16 ± 0.09[a]	2.11 ± 0.049[a]	1.88 ± 0.06[b]	2.18 ± 0.06[b]	0.711
FI (g/fish/day)	0.22±0.01[b]	0.28 ±0.01[a]	0.26±0.01[ab]	0.24±0.01[b]	0.30±0.01[ab]	0.045
FCR	2.24± 0.07[abc]	2.05 ± 0.01[b]	2.66 ± 0.16[dc]	2.47 ± 0.01[c]	1.85 ± 0.04[a]	0.073
PER	1.35 ± 0.01[b]	1.64 ± 0.09[ad]	1.49 ± 0.05[b]	1.26 ± 0.08[c]	1.81 ± 0.03[a]	0.511
SR (%)	88.1 ± 8.6[b]	97.6 ± 2.4[a]	95.2 ± 4.8[a]	97.6 ± 2.4[a]	95.2 ± 2.1[a]	0.559

Table 4:

Diets						
Parameters	**(D1)**	**(D2)**	**(D3)**	**(D4)**	**(D5)**	***P* value**
ΣPUFAS	1.99 ± 0.01[a]	2.84 ±0.10[b]	0.88 ± 0.12[a]	4.81 ± 0.05[c]	9.52 ± 0.82[c]	0.0001
Σω-3 PUFAs	1.54 ± 0.06[a]	2.83 ±0.16[b]	0.69 ± 0.29[a]	2.73 ± 0.38[b]	4.07 ± 0.91[c]	0.0003
Σω-6 PUFAs	0.43 ± 0.05[a]	0.33 ± 0.0[a]	0.13 ± 0.04[a]	1.09 ± 0.0286[a]	4.54 ± 0.37[c]	<0.0001

4. Discussion

The findings from this study showed that fish fed on HFMEuch diet the performance were superior compared to fish fed on other diets. Higher growth performance of *O. niloticus* fed on HFMEuch diets reflects palatability and high protein content of maggots cultured in *Eucheuma* species of the marine macrophyte.

FCR obtained from fish fed HFMEuch was the lowest compared to other HFM which implies higher weight gain obtained from the feed. [35]. Similar findings were reported previously [14], [31] and [36] whose values ranged from 3.13 to 5.07.

To conclude, housefly maggots cultured in aquatic macrophyte (seaweed and duckweed) are cheap and non-competitive, and fish fed this maggot diet grow fast compared to other diet.

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