African Journal of Biotechnology Vol. 3 (8), pp. 418-420, August 2004
Available online at http://www.academicjournals.org/AJB
ISSN 1684–5315 © 2004 Academic Journals

Short Communication

Use of palm oil in the diet of the African mudfish, *Clarias gariepinus*

K.B. OLURIN*, Y. AKINYEMI, O.Y. OBE and E.A.A. OLOJO

Department of Biological Sciences, Olabisi Onabanjo University, P.M.B. 2002, Ago-Iwoye, Ogun State, Nigeria.

Accepted 14 July, 2004.

This study was conducted to investigate the effect of the substitution of fish oil with palm oil in the diet of *Clarias gariepinus* fingerlings over a 49 day period. Four diets were prepared with fish oil substituted with palm oil at 0% (control Diet 1), 25% (Diet 2), 50% (Diet 3) and 100% (Diet-4), using a completely randomised block design. Mortality was observed in all the treatments, while fish fed with 100% palm oil were most sluggish in accepting their feeds. Average weight gained, specific growth rate and feed conversion efficiency were not significantly affected by diet. It was concluded that palm oil can be substituted for fish oil in the diet of *C. gariepinus*.

Key words: African mudfish, diet, palm oil, growth.

INTRODUCTION

A major component of fish feeds is fish oil, which serves as a veritable source of essential fatty acids (EFAs) and energy. A dietary deficiency in those EFA's result in slow growth, and various pathologies (Karapanaglottidis, 2002; Sargent et al. (1999).

Fish oil which is mostly obtained from marine fish is however, becoming limited and expensive, and there is need to find alternative sources of EFA's.

Attempts have been made at partially substituting or replacing fish oils with vegetable oils (Bell et al. (1991, 1996), Bransden et al., 2003.)

Fish oil substitution must however be done such that the product quality in terms of long chain n-3 poly unsaturated fatty and (PUFA) content as well as the eating quality are not diminished.

Palm oil which has a low n-6 PUFA is currently the second most abundant vegetable oil world wide (Bell et al., 2002) after soyabean oil. This study was aimed at substituting fish oil with palm oil in the diet of the African mudfish, *Clarias gariepinus.*

* Corresponding author. E-mail address: kbolurin@yahoo.com.

MATERIALS AND METHODS

C. gariepinus fingerlings (3.29 g) obtained from a commercial fish farm were transported in oxygenated polythene bags to the laboratory where they were acclimated to experimental conditions for seven days. Fingerlings were subsequently randomly distributed into eight tanks at a stocking rate of eight fish per tank.

Fish were fed with four compounded diets, with different levels of inclusion of palm oil as a substitute for fish oil (Table 1). Each treatment had two replicates.

Fish were fed 3% body weight, twice daily.

Fish were batch-weighed every week and the amount of diet given adjusted appropriately. The physiochemical parameters of the water in the tanks were maintained within acceptable limits. The experiment lasted forty-nine days.

A completely randomised block design was utilised, and the data was subjected to a one way analysis of variance.

RESULTS

Mortality was observed in all the experimental tanks. Fish fed with 100% palm oil were most sluggish in accepting their feeds. There were no significant differences in mean weight gained ($F=0.33$, df 3, 3; $P>0.05$); in specific growth rate ($F=6.73$, df 3,3; $P>0.05$) and feed conversion efficiency ($F=5.25$, df 3,3 $P>0.05$) for the different diets (Table 2).

Table 1. Formulation and proximate composition of experimental diets.

Ingredients (g/100 g)	Diets (level of palm oil inclusion)			
	1 Control 100% sardine oil	2 75% sardine oil + 25% palm oil	3 50% sardine oil + 50% palm oil	4 100% palm oil
Fish meal	0.5	0.5	0.5	0.5
Bone meal	0.1	0.1	0.1	0.1
Blood meal	0.05	0.05	0.05	0.05
Wheat offal	0.2	0.2	0.2	0.2
Corn meal	0.05	0.05	0.05	0.05
Sardine oil	0.05	0.0375	0.025	-
Palm oil	-	0.0125	0.025	0.05
Vitamin premix	0.05	0.05	0.05	0.05
Proximate analysis				
Metabolisable energy (kcal/100g)	355	338	329	316
Fat	9%	15%	7%	15%
Protein	37.63%	39.91%	39.38%	37.70%

Table 2. Effect of different levels of inclusion of palm oil on growth and feed utilisation by *C. gariepinu* fingerlings.

Parameter	Diet 1	Diet 2	Diet 3	Diet 4
[a] Mean wt gained (g)	0.95	1.45	1.65	1.75 ns
[b]Feed conversion efficiency	20	25	23	17 ns
[c] Specific growth rate	0.9	0.85	0.9	1.1 ns

ns- not significant at $p > 0.05$.
[a] mean weight gain = mean final weight-mean initial weight.
[b] feed conversion efficiency = (fish weight gain x 100)/feed intake.
[c] specific growth rate = 100 x In (final weight-initial weight) / day.

DISCUSSION

Observed mortalities in this study could have been as a result of stocking relatively small fish Bransden et al. (2003) observed similar mortalities in their investigations on the replacement of fish oil (FO) with sunflower oil (SFO) in the feeds for Atlantic salmon (*Salmo salar L*.).

No apparent EFA deficient signs such as fin erosion and bacterial disease (Castell et al. 1972) were observed during the feeding trial. The replacement of fish oil with palm oil in the diet of *Clarias gariepinus* did not significantly affect growth. Bransden et al (2003) similarly observed no significant differences in weight gain, total feed consumption, feed efficiency ratio for Atlantic salmon fed with SFO as partial replacement for FO.

Similar other trials with Atlantic salmon have shown that substitution of FO with SFO does not significantly affect growth (Bell et al*.,* 1991, 1996). However, Thompson et al. (1966) found in two similar trials with Atlantic salmon that when SFO was used as the primary oil source, the experimental fish either grew significantly less or the same as those fed diet containing FO.

Feed conversion efficiency, although generally low did not differ significantly among diets. This pattern was also observed in Atlantic salmon (Bell et al*.,* 1996). Based on the results of this study, it is concluded that palm oil can be substituted for fish oil in the diet of *C. gariepinus.* Fish oil can be replaced with vegetable oil if the essential fatty acid requirements are satisfied (Watanabe, 1982; Steffens, 1997; Sargent et al*.,* 1999).

ACKNOWLEDGMENT

I wish to acknowledge the contribution of Engineer Idowu Adekola to this paper for producing the pelleting machine used in the production of the feeds.

REFERENCES

Bell JG, Ashton I, Secombes CJ, Weitzel BR, Dick JR, Sargent JR (1996). Dietary lipid affects phospholipid fatty acid compositions, eicosanoid production and immune function in Atlantic salmon (*Salmo salar*). Prostaglandins Leukot. Essential Fatty Acids 54: 173 - 182.

Bell JG, Henderson RJ, Torcher DR, McGheef F, Dick JR, Porter A, et al. (2002). Substituting fish oil with crude palm oil in the diet of Atlantic salmon (*Salmon salar*) affects muscle fatty acid composition and hepatic fatty acid metabolism. J. Nutr. 132: 222-230.

Bell JG, McVicar AH, Park M, Sargent JR (1991). High dietary linoleic acid affects fatty acid compositions of individual phospholipids from tissues of Atlantic salmon (*Salmon salar*): association with stress susceptibility and cardiac lesion. J. Nutr. 121: 163 - 172.

Bransden MP, Carter CG, Nichols PD (2003). Replacement of fish oil with sunflower oil in feeds for Atlantic salmon (*Salmo salar* L.): effect on growth performance, tissue fatty acid composition and disease resistance. Comparative Biochem. Physiol. (B) 135: 611 - 625.

Castell JD, Sinnhuber RO, Wales JH, Lee JD (1972). Essential fatty acids in the diet of rainbow trout (*Salmo gairdneri):* growth, feed conversion and some gross deficiency symptoms. J. Nutr. 102: 87 - 92.

Karapanaglotides I (2002). Studies to optimise poly unsaturated fatty acid composition of tilapias for human consumption in S.E. Asia. Aquaculture News, 28: 6 - 7.

Sang-Min Lee, Jong Ha Lee, Kyoung-Duck Kim (2003). Effect of dietary essential fatty acids on growth, body composition and blood chemistry of juvenile starry flounder (*Platichthys stellatus*). Aquaculture 225: 269 - 281.

Sargent J, Bell G, McEvoy LA, Tocher D, Estevev A (1999). Recent development in the essential fatty acid nutrition of fish. Aquaculture 177: 191 - 199.

Steffens W (1997). Effects of variations in essential fatty acids in fish feeds on nutritive value of freshwater fish for humans. Aquaculture 151: 97 - 119.

Thompson KD, Tatner MF, Henderson RJ (1996). Effects of dietary (n - 3) and (n - 6) poly unsaturated fatty acid ratio on the immune response of Atlantic salmon, *Salmon salar* L. Aquaculture Nutr. 2: 21 -31.

Watanabe T (1982). Lipid nutrition in fish. Comp. Biochem. Physiol. 73B: 3 - 15.