

## **MONTMORILLONITE CLAY AS MINERAL SUPPLEMENT IN THE DIET OF CATFISH (*Clarias gariepinus*)**

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### **ABSTRACT**

*In a 3-week experiment, the value of Montmorillonite clay as mineral supplement for catfish was investigated. Eighty four fingerlings aged 6 weeks were randomly assigned to 6 groups of 14 fingerlings with each group weighing 14g average. Two diets containing 30% crude protein were formulated. Diet 1(control) was based on commercial premix as mineral supplement which was replaced with Montmorillonite clay in diet 2. Each three groups of fingerlings received one of the diets for three weeks of experimentation. Result showed no significant difference in daily gain and final body weight between the two groups. The cost of the feed was reduced on the Montmorillonite-clay-based diet and the skin quality of the fish improved on this diet compared to the control. There was no mortality during the experiment. It was concluded that Montmorillonite clay can completely replace mineral/vitamin premix in catfish diets with no adverse effect on growth. The substitution reduced the cost of fish feed and improved the skin quality thus, the market value of the fish.*

*Keywords: Montmorillonite, Mineral Supplement, Catfish, Performance*

### **INTRODUCTION**

Fish is an excellent source of protein, fatty acids, B vitamins (especially nicotinic acid), and vitamin A and D (John, Douglas and Karen, 2003). The proteins, vitamins and minerals from fish are valuable parts of our diets and are especially good for human health (Bijayalaxmi and Ajit Kumar, 2009). The raw fish flesh supplies about half of the total proteins and fat requirement and one fourth of the calories needed in a balanced daily diet for adult human beings (Gupta S. and Gupta P., 2006). An average theoretical fish weight of 0.66g at 24 weeks indicates a good feeding practice (Israel, 2009). However, one of the major problems in supplying fish in sufficient quantity for the growing human population is the high cost of fish feed.

Fish feed ingredients represents 50 to 70% of fish farmers production cost, and the average prices of the ingredient commonly used in fish feed increased from 20 to 92% between June 2007 and June 2008 (Lindsay, 2010). One of the most

expensive ingredients in fish diets is the mineral/vitamins premix. In order to minimize cost of fish feed production there is the need for research into alternative cheaper and valuable sources of fish feed ingredients. Montmorillonite clay is among the highest and richest natural form of essential mineral elements on earth. It is in a form that is highly absorbable by plants, animals and human (Ray Kong, 2007). There are reports to indicate that Montmorillonite clay contains an outstanding 73 essential minerals all in a balanced ratio (Al sears, Haydel, Remenily, and Williams, 2008). Recently it has been recognized and utilized by the cosmetic industry and by soil experts, who value it as an exceptional good agricultural enhancements, as crops grow faster, taste better and are more resistance to diseases (Chris Neaves 2008). The aim of this study is to report the effects of feeding Montmorillonite clay as a replacement for mineral premix on the growth and cost of production of catfish.

## **MATERIALS AND METHODS**

This study is an experimentation of Montmorillonite clay as dietary supplement for catfish. The clay was obtained in a lagoon within Yobe State College of Agriculture Gujba. The area lies on latitude 11°N and longitude 12°E. The clay was sun-dried for 72 hours and cleaned to remove stones and other unwanted materials; and then ground in a hammer mill to pass through a 40 mesh sieve. Two diets were formulated to contain 30% crude protein as recommended by Olokar, Ihuahi, Omojowo, Falayi and Adalowo (2007) for feeding catfish. Diet 1 which served as the control contained commercial minerals premix which was replaced completely with Montmorillonite clay in diet 2.

Eighty four 6-weeks old fingerlings weighing 900g were used for the study. They were weighed and randomly divided into 6 groups of 14 fingerlings with each group weighing 150g. Each group of 14 fingerlings was stocked into 6m<sup>3</sup> concrete tanks. Each 3 groups of fish received one of the diets above for a period of 3 weeks (duration of the experiment). Feeding was done 2 times a day (6-7am and 6-7pm). All other management practices were the same in the ponds. At the end of the 3rd weeks the fish in each pond were weighed and the gain in weight calculated by subtracting the initial weight from the final weight. The cost of each diet (^/kg) was determined using the market price of the ingredients at the time of the experiment and the feed cost of fish production calculated on the assumption that all the feed fed was consumed. Data collected were analyzed for variance and significant means separated using the least significant difference (Steel and Torrie, 1980).

## **RESULTS AND DISCUSSION**

The results of the growth of the fish are presented on Table 2. Final body weight and daily weight gains were numerically improved on diet 2 (containing Montmorillonite clay) compared to the control diet based on mineral premix, but the differences were not significant. It has been reported that Montmorillonite clay

improves the growth performance of fish (Ma et al; 2008 and Long et al; 2008). These findings were not observed in this study possibly due to differences in experimental procedure. The cost of feed/kg was reduced on the Montmorillonite based diet compared to the diet based on mineral premix. This trend in feed cost was attributable to the cost of the premix compared to the clay which was not purchased. The reduction of the cost of the clay based diet translated into a significant reduction in the cost of fish production on the diet compared to the control. The final body weights of fish on both diets were comparable to values reported in literature (Israel, 2009) indicating nutritional adequacy of the diets. There was no mortality during the period of the experiment. Fish fed the Montmorillonite diet were lighter in coloration than those fed the diet based on premix. This observation is in agreement with the report of Chris Neaves (2008) that feeding small quantities of Montmorillonite clay to Koi fish and occasionally bathing them in it or adding regulated dosage to the pond resulted in wonderful and significant effects on their color luster.

**Table 1:** Ingredients composition of the experimental diets.

Ingredients	Diets (%)	
	1 (Control)	2 experimental diets
Wheat offal	38	38
Yellow Maize	7.5	7.5
Fish meal	39	39
Groundnut cake	7.5	7.5
Vegetable oil	1.5	1.5
Mineral premix	2.0	0.0
Montmorillonite	0.0	2.0
Methonine	1.0	1.0
Lysine	1.0	1.0
Salt	0.5	0.5
Total	100	100

*Source:* Experimentation, 2010

**Table 2:** Growth performance of catfish fed Montmorillonite clay as a substitute for commercial mineral premix.

Parameters	DIETS		
	1	2	SEM
Initial weight (g/fish)	10.71	10.71	0.000NS
Final weight (g/fish)	13.81	15.00	0.60NS
Daily gain(g/fish)	0.15	0.21	0.03NS
Cost of feed (N/kg)	1.90	130	NA
Feed cost of production (Ng gain)	514.80	372.0	51.61*
Mortality (%)	0	0	NA

*NS = Not Significant ((P>0.05), \*= significant (P>0.05)*

*NA= Not Analysed*

*Market price (N/kg of feed ingredients at the time of experiment) wheat bran 35.0, maize 60.0, fish meal 100.0, g/nut 60.0, veg. oil 200.0/L, premix 1500.0, Methonine 1200, lysine 1000/salt 30.0*

## CONCLUDING REMARK

This study aimed at reporting the effects of feeding Montmorillonite clay as a replacement for mineral premix on the growth and cost of production of catfish. The results of the growth of the fish are presented on Table 2. Final body weight and daily weight gains were numerically improved on diet 2 (containing Montmorillonite clay) compared to the control diet based on mineral premix, but the differences were not significant. It was observed that fish fed the Montmorillonite diet were lighter in coloration than those fed the diet based on premix. Therefore, it was concluded that Montmorillonite clay can replace commercial premix in fish diet without adverse effect on the growth. The substitution is beneficial as it reduces the cost of production and improves the skin quality and thus, market value.

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