

Effect of Nutmeg (*Myristica Fragrans*) as an Additive on the Growth Performance of Juvenile Catfish (*Clarias Gariepinus*)

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Abstract:

Three hundred and eighty (380) juvenile fish (*Clarias gariepinus*) were used to examine the effect of nutmeg (*Myristica Fragrans*) on weight gain and carcass evaluation of juvenile catfish. The catfish were allocated into six (6) treatments with three (3) replicate each containing twenty (20) catfishes. Treatment A contained 0% of nutmeg while treatment B contained 0.5% of nutmeg, treatment C contained 1% of nutmeg, treatment D contained 1.5% of nutmeg, also, treatment E contained 2.0% of nutmeg and treatment F contained 2.5% of nutmeg inclusions. The feeding trial lasted for eight (8) weeks. Parameters measured include weight gain, feed intake and mortality rate. The result showed that there were significant differences ($P < 0.05$) in weight gain with the catfish on treatment F having the highest value (5.2 g), followed by treatment E (4.6 g) while treatment D (3.8 g) and treatment C (3.8 g) while treatment B (3.4 g) and treatment A (2.9 g). There was significant difference ($P < 0.05$) in the feed intake with the catfish on treatment F having the highest feed intake (6.9 g) compared to treatment A (control) which had the least feed intake (5.5 g). Therefore, it can be concluded that nutmeg at 2.5% inclusion in the diet of juvenile fish improved the weight gain of the fish and also reduced the mortality rate.

Keywords: Catfish; Nutmeg; Mortality rate; Weight gain

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Introduction

Fish production from both captured, cultured and importation has not yet met the increasing demand for fish which is an excellent source of protein that is highly needed in the diet. Although the demand for fish is high while the rate of supply is however low (Adedeji *et al.*, 2000).

Fish nutrition is critical in fish farming it represents 40-50% of the production cost (Craig and Helfrish, 2002). Growth performance and nutrient utilization of fish is determined by gross composition of the feed ingredients which include the processing and storage of the feed products. Globally, there is a great decline in aquaculture production, due to fish feed manufacturers substituting vital feed ingredients with alternative feed stuffs that cannot achieve fish nutritional requirements. Quality fish feed enhances optimum growth and resistance to diseases when it contains proper proportion of proteins, carbohydrate, lipids, vitamins and minerals. Nevertheless, nutrients in fish feeds are optimally utilized when the feed stuffs are acceptable and palatable to the fish (Dada and Wanah, 2003).

Feed additive is a food supplement for farm animal that cannot get enough nutrients from regular meals that the farmer provides. In some cases if farm animal does not have some specific nutrition in its diet may not grow properly. The nutritional value of any feeds is influenced not only by their nutrient content, but also by many other factors. These include feed presentation, hygiene, digestibility and effect on the intestinal health.

Nutmeg (*Myristica fragrans*) seed is widely used as a spice, is a tropical, dioeciously evergreen tree native to the Moluccas or Spice Island of Indonesia. Nutmeg has a characteristic pleasant fragrance and warm taste. It is used to flavour many kinds of baked goods, confections, puddings, meats, sausages, saucers, vegetables, and beverages (Panayotopoulos and Chisholm, 1990).

The extracts of the nutmeg and clove were found to stimulate the mounting behavior of male mice, and also to significantly increase their mating performance. The hypnotic, analgesic and hypotensive activities of *M. fragrans* have also been reported. The medicinal use of nutmeg and its use as a spice suggest that it contains some constituents which are responsible for the reported biological activities. Some of these active principles may at the same time possess some adverse effects. No studies have been conducted to evaluate its effects on the growth performance of catfish, however, this study was designed to determine the effects of nutmeg powder on growth performance of catfish.

Materials and Methods

Experimental site

The experiment was carried out at the fishery unit of Federal College of Agriculture, Moor Plantation, Ibadan.

Experimental materials

The materials used for the experiment includes; weighing

scale, plastic container, gloves, net, fish pellet, grounded nutmeg seed and juvenile fish.

Experimental design

Three hundred and eighty (380) juvenile cat fish (*Clarias gariepinus*) were purchased from Aquatech Institute of Fisheries Management, Ibadan. After two weeks of acclimatization, the fish were weighed and allotted into treatments. Each treatment was replicated three times and each replicate having 20 pieces of fish. Treatment A which serves as a control was fed with no inclusion of nutmeg, Treatment B had 0.5% of nutmeg inclusion. Treatment C had 1.0% of nutmeg inclusion, Treatment D had 1.5% of nutmeg inclusion while Treatment E had 2.0% of nutmeg and Treatment F had 2.5% of nutmeg.

Sources of Nutmeg

The Nutmeg use for the experiment was purchased from Ogunpa market and processed by milling into powdered form with milling machine and sieved to separate shaft from it.

Experimental procedure

At the end of acclimatization, juvenile fish were weighed and the initial mean weight was recorded. Thereafter, the fishes were randomly assigned to the experimental diet with three (3) replicate per treatment of 20 fishes per replicate. Calculation of their feeding trial was based on 4% of their body weight gained. The experimental diets were administered to them both in the morning and evening (i.e. 8.00 hr and 6.00 hr). Weighing of the fishes were done on a weekly basis.

Routine operation

Water in the tank were changed on every three (3) days, the weighing were done on a weekly basis in the morning to avoid stress on fish in each of the treatment were weighed and average weight in each replicate was also obtained by dividing the total weight of the fish by the number of fish in each replicate. Live weight and carcass weight were done with the aid of sensitive scale. The data collected for this experiment include:

Initial weight, final weight and feed conversion ratio.

FCR=Feed consumed/weight gain.

Statistical Analysis

The data obtained were subjected to statistical analysis of variance (ANOVA) according to SAS (1999), significant difference of means were separated using one way range test.

Experimental diet

The experimental diet was meal at the college feed mill. The nutmeg powder was used to formulate the experimental diet designated as T_A, T_B, T_C, T_D, T_E and T_F while T_A serves as the control and the fish premix was substituted with whole nutmeg powder at graded level into; T_B, T_C, T_D, T_E and T_F respectively. **Tables 1-3** show the gross composition of experimental diets and the proximate analysis of the nutmeg (*Myristica fragrans*).

Table 1: Gross composition (g/100 dry matter) of experimented diet containing varying level of nutmeg replacing fish premix in the diet of *Clarias gariepinus*.

Ingredient	T _A (0%)	T _B (0.5%)	T _C (1.0%)	T _D (1.5%)	T _E (2.0%)	T _F (2.5%)
Fish Meal	28	28	28	28	28	28
Soy Bean	21	21	21	21	21	21
Groundnut Cake	22	22	22	22	22	22
Maize	10	10	10	10	10	10
Fish oil	2.5	2.5	2.5	2.5	2.5	2.5
Fish premix	2.5	2.0	1.5	1.0	0.5	-
Nutmeg	-	0.5	1	1.5	2	2.5
Starch	14	14	14	14	14	14
Total	100	100	100	100	100	100

Table 2: Calculated Analysis of feeds (%).

Crude protein	46.65	37.75	42.32	43.69	42.24	43.89
Fat	3.1	3.97	3.37	3.2	3.65	3.44
Crude Fibre	2	2.75	2.26	2.34	2.38	2.2
Ash	6.2	8.71	9.85	5.05	7.21	7.08
Moisture	3.8	6.6	4.1	5.65	6.1	4.9

Table 3: Proximate composition of nutmeg powder.

Nutrient (%)	FWB	DWB
Moisture content	40	-
Ash content	1.54	2.57
Crude fibre	7	11.7
Crude protein	4.3	7.16
Carbohydrate	18.1	30.2

FWB-Fresh weight basis; DWB-Dry weight basis

Results

The cat fish (*clarias gariepinus*) fed with experimental diet and the carcass analysis of experimental fish shown in **Tables 4** and **5**.

Discussion

Table 4 showed that there were significant differences ($P < 0.05$) in weight gain with the catfish on treatment F (2.5% nutmeg inclusion) having the highest value (5.2 g), followed by treatment E (4.6 g) while treatment D (3.8 g) and treatment C (3.8 g) while treatment B (3.4 g) and treatment A (2.9 g). The result of the weight gain is in line with the result reported by (Lawhavinit *et al.*, 2011) who reported that ethanolic turmeric extracts could improve weight gain when supplemented in white shrimp diet

at 15 g/kg. There was significant difference ($P < 0.05$) in the feed intake with the catfish on treatment F (2.5% nutmeg inclusion) having the highest feed intake (6.9 g) compared to treatment A (control) which had the least feed intake (5.5 g).

The feed intake also enhanced the carcass performance in which treatment F fed with 2.5% of nutmeg had the highest feed intake which help to bring about the performance in carcass characteristics such as LW, HG, HG⁰ and B with the value of 13.6 g, 5.3 g, 4.3 g and 2.2 g respectively while treatments A fed with 0% of nutmeg had the lowest performance in LW and I with the value of 8.4 g and 0.8 g respectively, the weight gain of fish in treatment F fed with 2.5% of feed additive is beneficial and has no adverse effect on fish and this was in agreement with the result

Table 4: Performance characteristics of Catfish (*Clarias Gariepinus*) fed with experimental diet.

Parameters	T _A	T _B	T _C	T _D	T _E	T _F
Initial weight (g)	4.6	4.6	4.6	4.6	4.6	4.6
Final weight (g)	7.5 ^c	8.0 ^{bc}	8.4 ^{bc}	8.4 ^{bc}	9.2 ^{ab}	9.8 ^a
Weight gain (g)	2.9 ^c	3.4 ^{bc}	3.8 ^{bc}	3.8 ^{bc}	4.6 ^{ab}	5.2 ^a
Survival rate (%)	63	66.6	75	78.3	83.3	86.3
Feed intake (g)	5.5 ^c	5.9 ^{bc}	5.7 ^{bc}	5.9 ^{bc}	6.5 ^{ab}	6.9 ^a
Feed conversion ratio	1.8 ^a	1.7 ^{bc}	1.5 ^{bc}	1.5 ^{bc}	1.4 ^{bc}	1.3 ^{bc}

abc: Means with this same superscript are significantly different (p<0.05)

TA=0% of nutmeg

TB=0.5% of nutmeg

TC=1.0% of nutmeg

TD=1.5% of nutmeg

TE=2.0% of nutmeg

TF = 2.5% of nutmeg

Table 5: Carcass analysis of experimental fish.

Parameters	T _A	T _B	T _C	T _D	T _E	T _F
LW (g)	8.46 ^b	10.66 ^{ab}	9.00 ^b	9.00 ^b	12.50 ^a	13.66 ^a
HG (g)	3.33 ^c	4.00 ^{bc}	3.33 ^c	3.66 ^{bc}	5.00 ^{ab}	5.33 ^a
H ⁰ G (g)	2.86 ^{bc}	3.13 ^{bc}	2.33 ^c	2.50 ^c	3.83 ^{ab}	4.36 ^a
G	0.46 ^a	0.88 ^a	1.00 ^a	1.16 ^a	1.16 ^a	1.03 ^a
WB+I+B	5.66 ^c	6.33 ^{bc}	5.33 ^c	5.33 ^c	8.66 ^a	8.33 ^{ab}
WB-I	4.86 ^b	5.96 ^{ab}	4.33 ^b	4.33 ^b	7.36 ^a	7.33 ^a
B	1.50 ^a	1.70 ^a	2.00 ^a	1.50 ^a	2.16 ^a	2.23 ^a
I	0.80 ^a	0.36 ^a	1.00 ^a	1.00 ^a	1.20 ^a	1.00 ^a
M	3.80 ^{ab}	4.26 ^{ab}	2.33 ^b	2.83 ^b	5.30 ^a	5.10 ^a

LW (g)=Live weight; HG (g)=Head with gill; H⁰G (g)=Head without gill; G=Gill;

WB+I+B=Whole body with intestine and bone; WB-I=Whole body without intestine;

B=Bone; I=Intestine; M=Muscles

of (Organic fact. Net, 2009) who reported that nutmeg feed will support proper growth of animals.

Conclusion

The results suggest that dietary feed additive will promote the growth of *C. gariepinus* juveniles. These results showed that feed additive enhance nutrient utilization, which is reflected in improved weight and the feed conversion ratio. The result of the study showed that 2.5% of nutmeg (*Myristica fragans*) gave the highest feed intake, weight gain and final weight. This study therefore recommended 2.5% nutmeg inclusion for commercial production of catfish.

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