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Growth performance of *clarias gariepinus* fingerlings fed defatted *Moringa oleifera* seed meal as partial replacement for fishmeal

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Abstract

The limiting nature cum the ever rising cost of feed ingredients of protein origin have orchestrated the need seek alternative source. Hence, the effect of defatted *Moringa Oleifera* seed meal *(DMOSM)* on growth performance of *Clarias gariepinus* fingerlings was conducted for a period of 7 weeks. The *DMOSM* was substituted from fish meal at 0% (control), 10%, 20% and 30% inclusion rate in different diets. *Clarias gariepinus* fingerlings of 2.4g mean weight were randomly distributed into plastic tanks at 10 fish/tank in four replicate treatments and were fed twice daily at 5% body weight. The growth parameters and nutrient utilization shows that fish fed with 10% *DMOSM* diet had the highest weight gained (3.05 ± 0.04g) while least (2.98 ± 0.04g) was recorded in the control. The other treatments 20%, and 30% gained 2.88 ± 0.04g and 2.86 ± 0.04g respectively. Similar trend was observed for other parameters such as feed conversion ratio, protein efficiency ratio and condition factors, where the best for each case (1.57 ± 0.08, 1.82 ± 0.06 and 1.46 ± 0.07) recorded at 10% inclusion respectively. The highest survival rate 85 ± 0.45 was however obtained at 30% inclusion level while the least 73 ± 0.45 was obtained at 30% was obtained in 0% (control). Finding of this report proves the *DMOSM* to enhance growth and survival of fish with any deleterious effect, with the best inclusion ratio however at 10%.

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Introduction

The vegetative parts of plants such as seeds, leaves, stem, flowers bulbs roots and botanical fruits are in great demand by animal and human for food (Egwui, *et al.,* 2013 Aja *et al.,* 2013, Ramachandra *et al*., 1980). Usually the vegetable of choice is based on palatability and nutrient content which often includes carbohydrate, protein, fat, vitamin, fibre and mineral content. The immature green Moringa pods called drum stick are the most valved and widely used part of the tree especially in Asia (Bosch, 2004). The young pods are prepared and taste like asparagus. Older pods can be added to sauces and curries in which their bitterness is appreciated (FAO, 2006; Radovich, 2013; Orewa *et al.,* 2009; Bosch, 2004).

Fish is a vital source of high quality protein, providing approximately 16% of the animal protein consumed by the world population (Bello and Nzeh, 2013; FAO, 1997). The FAO (1997), also reported that fish culture is one of the fastest growing sectors of the world's animal production with about 10% animal increase. Consequently, in order to sustain or further improve on this, it is imperative that there should be a corresponding increase in management especially in feeding regime. And feed alone accounts for over 60% of the entire fish productions cost while protein is the single most expensive feed ingredient (Falaye, 1989). However the exorbitant cost of fish feed/ingredients on one had coupled with their fluctuating quality on the other had made ready room for seeking alternative feed ingredients of protein origin for fish feed formulation (Bello and Nzeh, 2013; Dienye and Olumuji, 2014). The paucity of fish feed ingredients especially of protein source remain a bane to the sustenance of fish culture in today's competitive global food production continuum (Ogbunji *et al*., 2005 FAO, 206). This study determined the use of defatted *Moringa Oleifera* seed meal in partial replacement for fish meal in formulation of diet for *Clarias gariepinus* fingerlings.

Materials and methods

The study was conducted in the hatchery building of the Department of Fisheries and Aquatic Studies, Niger Delta University, Wilberforce Island Bayelsa Nigeria.

Processing (defatted) of the Moringa oleifera Seed

Moringa seeds were collected, de-husked, dried and grounded to powder form. They were later boiled in water to extract the oil.

The residues after oil extraction were dried and sieve through 595mm sieve tube to separate stones and dirt's and also to ensure homogeneity. The proximate analysis of defatted *Moringa Oleifera* was carried out according to method of Puran *et al*., (2014).

All other feed ingredients (Table 1) were milled using locally fabricated hammer mill and sieved to remove impurities and to ensure homogenous size. Four diets were made using the defatted *Moringa Oleifera* meal as partial replacement for fish meal at 0% (A) 10%(B) 20% (C) 30%(D) treatment levels (Akegbejo, 1999) at 40% crude protein level.

Experimental design/feeding trial

The feeding trial was conducted in plastic aquaria tanks of twenty litres capacity. They were washed and rinsed and filled with water to $^2/_3$ of the tank. The fish fingerlings were procured from a reputable farm. They were allowed to starve for 24 hours prior to commencement of the experiment. This was done to enable them empty their stomach content, and acclimatize and adapt to the new diet billed to be fed to them.

Experimental procedure

The fingerlings were randomly distributed at stocking rate of 10 fingerlings/plastic (aquarium) in four replicates. They were fed 5% of this body weight twice daily. Weekly sampling of body weight and length were determined with the aid of sensitive weighting balance and metre rule respectively. The study was conducted for 49 days. The water temperature was monitored daily, using standard mercury in glass thermometer, while dissolved oxygen (DO) was monitored using digital DO meter, pH meter was used to measure pH.

Results

Data generated for the proximate analysis of the defatted *Moringa oleifera* seed meal *(DMOSM)* are shown in the Table 1 below. It had crude protein level of 34.15%, crude fat 1.13%, crude fibre 13.15% total ash 6.81%, moisture content 5.55% and 32.74% nitrogen free extract.

Table 1. Proximate composition of defatted *Moringa oleifera* seed meal *(DMOSM)*.

Nutrients	Percentage
Crude protein	34.64
Crude fibre	13.14
Crude fat	1.13
Moisture content	5.55
Total ash	12.28
Nitrogen free extract	32.76

The result obtained for parameters such as growth responses, nutrient utilization and survival rate of *Clarias garispinus* fed defatted *Moringa oleifera seed meal (DMOSM)* based diet are presented in the Table 2 below. In terms of weight gained, those fed treatment A (10%) *DMOSM* had the highest (3.05 ± 0.04g) while D (30%) recorded the least (2.86 ± 0.04g). There was no significant difference (P> 0.05) between values obtained among the treatments with respect to weight gained. The values computed for length increase, in fish fed *DMOSM* showed that was significant difference (P< 0.05) between treatments. Length increase values were in the order 10% (4.83 ± 0.09cm) > (4.69 ± 0.09cm) > 20% (4.53 ± 0.09cm) > (4.11 ± 0.09cm). The best and least condition factors were derived in B (1.46 ± 0.07) and D (1.92 ± 0.07) respectively. Similar trend was observed in food conversion ratio as the better conditioned fish were obtained in treatment B (1.46 ± 0.07) while the least was in D (1.92 ± 0.07). The treatment D however recorded the highest survival rate (85%) while the corresponding lowest survival rate (73%) was marked in A (the control).

Table 2. Growth response, nutrient utilization and survival parameters of *Clarias gariepinus* fingerlings fed different levels of defatted *DMOSM*.

PARAMETERS	(A) 0%	(B) 10%	(C) 20%	(D) 30%
Initial mean weight (g)	2.40	2.41	2.39	2.35
Mean weight gain (g)	2.98±0.04	3.05+0.04	2.88 ±0.04	2.86 ±0.04
Mean total length (cm)	7.02±0.05	7.20±_0.05	6.86±0.05	6.49±0.05
Initial length (cm)	2.33	2.37	2.33	2.38
Mean increase in length (cm)	4.69±0.09	4.83±0.09	4.53±0.09	4.11±0.09
Final weight gain (g)	5.38	5.46	5.27	5.21
Food conversion ratio	1.61±0.08	1.57±0.08	1.67±0.08	1.68±0.08
Condition factor	1.52 ±0.07	1.46±0.07	1.63±0.07	1.92±0.07
Percentage survival	73±0.45	75±0.45	80±0.45	85±0.45
Protein efficiency ratio	1.77±0.06	1.82±0.06	1.71±0.06	1.70±0.06

Discussion

It is imperative to evaluate the potential of feed stuff to ascertain the proximate chemical composition prior it is incorporation in diet of animals. The values recorded in this study are at variance with those reported by Puran *et al.*, (2014). The values are CD 34.64/45.0%, CF 13.14/3%, CF 1.13/25%, TA 12.78/4%.

This study congruent those of Alegbeleye *et al.*, 2001;

Nwanna *et al*., 2008; Richter *et al*., 2003, in that the incremental substitution of *DMOSM* of with fish meal led to a corresponding decrease in the growth rate. The presence of anti-nutritional factors such as tannins, phenol saponins and phylate may be responsible for this. Thus the relevance of feed diet fed to fish as growth determiner has been reported by several workers (Faturoti, 1989; Anderson *et al*., 1994; Ali and Jauncey, 2004). While the likes of Akegbejo – Samson, 1994; Richter *et al*., 2003; Salem and Makka, 2009; Puran *et al*., 2014) emphasized the utilization of protein sparing effects by other nutrients in a feed. The study showed that fish fed with 0% and 10% *DMOSM* had better condition, and feed conversion ratio *(FCR)*. This might however be linked the high fibre content of seed meal – a fact earlier buttressed by Alegbeleye *et al*., 2001, Nwana *et al*., 2008). Subsequent increment in the rate (20%, 30%) led to a corresponding decline in FCR, condition factor. This compares favourably with the works of Ramachadra and Ray, 2004; Ramachadra *et al*., 2005) which suggest a decreasing trend growth parameters at higher inclusion ratio. The survival ratio was however on the increase at increasing inclusion level. This fact suggests the inclusion of *DMOSM*, served as not only a protein source but also as a probiotic.

Conclusion

This study examined the best inclusion level of defatted Moringa oil meal seed *(DMOMS)* to replace fish meal (the most expensive single feed stuff) in fish diet. It revealed that, 10% replacement level of *DMOSM* produced the best result in all growth, parameters measured without posing any adverse/deterious effect on the fish.

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