Research Article

Usage of *Moringa olifera* seed cake as food for *Oreochromis niloticus* fingerlings.

Abdel Raheam H. A. A. El-Bassir

Department of Zoology, Faculty of science and technology, Omdurman Islamic University, P.O. box 382
Omdurman, Sudan.

bassiri786@yahoo.com

Abstract

The study was conducted to determine the suitability of *Moringa olifera* seed cake as a protein source for *Oreochromis niloticus* fry. It is concluded that *Moringa olifera* seed cake can be used as a dietary protein in Nile tilapia fry without significant reduction in growth performance. The body weight gain ranged from 50.91 to 85.17 gm within three weeks. Fry fed a mixture of *Moringa olifera* seed cake and wheat bran (1:1) had better growth performance than those on wheat bran only.

Key words: *Moringa olifera*; *Oreochromis niloticus*; food and feeding.

1. Background

The Nile tilapia *Oreochromis niloticus* was one of the first fish species cultured and is still the most widely cultured species of tilapia in Africa. Positive aquacultural characteristics of tilapia species include their tolerance to poor water quality and the fact that they eat a wide range of natural food (Yashouv and Chervinski 1961, Rappaport *et al.* 1977, Bowen 1982), of the total world production of fish, which amounted to 112.30 million tonnes in 1995, 18.97% came from the aquaculture sector while the rest came from the captured fishery (FAO,1998).

Protein is very important in fish growth and thus crucial ingredient in fish diets. *Moringa*

can be considered as a potential feed component with high nutritive value for Nile tilapia.

Moringa olifera belongs to the family Moringaceae, the tree is native to southern foothills of the Himalayas and possibly Africa and Middle East, today it is widely cultivated in many other places including central and southern America, Mexico and Malaya.

(Adedokun *et al.*, 2010, Odedode *et al.*, 2010, Phiri, 2010).

The products from the *Moringa olifera* tree hold considerable potential for becoming animal and fish feed ingredients because of their high nutritional quality. In the last ten years' extensive studies on the agronomic

aspects of moringa, a quick growing tree that is distributed widely in the tropics have been carried out (Foidl *et al.*, 2001).

The objective of this study was to determine the effect of *Moringa olifera* seed cake supplemented diets on the growth performance of the Nile tilapia (*Oreochromis niloticus*) fingerlings.

2. Materials and Methods

The fish used was *Oreochromis niloticus* supplied from a private farm at Seleit Scheme, 35 km north of Khartoum. The experiments were carried out in the faculty of science and technology, Omdurman Islamic university, where a series of glass aquaria measuring 80cm X40cmX40cm fitted with the necessary aeration facilitates and tubing for siphoning were used, adequate light and room temperature maintained.

The collection and transportation of the fry was done to the experimental aquarium in the early hours of the day to avoid oxygen deficiency. The aquarium was stocked with 30 fry and the length range was 6---10cm, the weight range was 3—18gm.

Prior to introduction to the aquarium the fishes were measured and weighed initially and recorded as pre-requisite to final weighing after the termination of the experiment, this phase is followed by the calculations of the increment in growth rate as the outcome of the experiment designed.

The fish were kept for a period of three weeks, the fish were weighed and measured at the beginning and progressively at weekly intervals in order to access their growth performance.

The supplementary feed which is a mixture of wheat bran and moringa seed cake (1:1), during the experiment the adopted feeding rate was 5% of the fish body weight. The fishes were fed twice daily throughout the experiment. The ration was adjusted every week when new mean weights of fish for the

various experimental units were determined. Leftover feed and faeces in each aquarium were siphoned out each day. The water in the aquaria was also changed every day.

Data on fish growth characteristics were recorded at the end of every week, the weight of individual fish was determined with an electronic scale, the total length was determined with a measuring board.

In another aquarium fishes of the same length were kept but fed only wheat bran without moringa seed cake, this aquarium was kept as control and the same procedure was done at the end of the first, second and third weeks to know if there is any change in length and weight.

As regards calculations, the terms commonly used like average net gain, percentage increment, conversion ratio and percentage conversion efficiency are given below:

- 1- Average net gain (increment)=
average final weight - average initial weight
- 2- Percentage increment= {(Average final weight - average initial weight) / Initial weight} X 100
- 3- Conversion ratio= (Weight of food given/ Net gain) X 100
- 4- Percentage conversion efficiency= (Average net gain/ Weight of food given) X 100 (Becker *et al.*, 1999).

The *Moringa olifera* seed cake was obtained after oil extraction from the seeds by petroleum ether extraction in a Soxhlet apparatus by AOAC (1990) method, crude protein by Kjeldahl method after acid digestion.

3. Results and Discussion

The protein content of *Moringa olifera* seeds was 39.77%.

At the beginning of the experiment the fishes were measured and weighed and the mean total weight was 49 gm, so the diet was adjusted to 5% of the body weight and the

feeding was continued for one week, after one week every fish was measured and weighed and the mean total weight was 50.91 gm, and the new diet was adjusted according to the new weight and feeding was continued for another week, at the end of the second week the fishes were weighed and the mean total weight was 59.79 gm, also the fishes were

measured and weighed and the diet was adjusted for the new weight and continued for another week, at the end of the third week the mean weight was 85.17 gm, as shown in table (1) and that of the control was shown in table (2), the calculations of increment, percentage increment, conversion ratio and percentage conversion efficiency are shown in table (3).

Table 1. Length range and mean weights of *Oreochromis niloticus* fed *Moringa olifera* seed cake and wheat bran (1:1) at different periods of experiment.

Duration	Length (cm)	No of fishes	Mean total weight(gm)
At the beginning	6.5	4	5.5
	7	9	7.1
	7.5	6	6.7
	8	3	9
	8.5	3	9.7
	9	5	11
	Mean total weight		49 (gm)
After one week	6.5	5	5
	7	7	6.43
	7.5	8	7.63
	8	6	9.33
	8.5	2	10.5
	9	2	12
	Mean total weight		50.91
After two weeks	6	1	5
	6.5	4	5.25
	7	5	7
	7.5	4	8.27
	8	5	9.6
	8.5	3	10.67
	9	1	14
	Mean total weight		59.79
After three weeks	5	1	3
	5.5	2	3.5
	6	3	4.33
	6.5	7	5.71
	7	4	6.75
	7.5	5	6
	8	4	9.75
	8.5	3	11.33
	9	1	15
	Mean total weight		85.17

Table 2. Length range and mean weights of *Oreochromis niloticus* (Control) fed wheat bran at different periods of Experiment

Duration	Length (cm)	No of fishes	Mean total weight(gm)
After one week	4.5	1	3
	5	1	4
	5.5	4	3.25
	6	2	5
	6.5	7	4.86
	7	4	6.25
	7.5	3	8
	Mean total weight		34.36
After two weeks	5	1	3
	5.5	2	2.5
	6	6	4.17
	6.5	4	4.25
	7	6	6.17
	7.5	3	8.67
	8	4	8.75
	Mean total weight		37.51
After three weeks	5	1	3
	5.5	2	3.5
	6	3	4.33
	6.5	7	5.71
	7	4	6.75
	7.5	5	6
	8	4	9.75
	Mean total weight		39.04

Table 3. Increment, percentage increment, conversion ratio and percentage conversion efficiency of *Oreochromis niloticus* fed *Moringa olifera* seed cake and wheat bran (1:1) at different periods of experiment.

Percentage conversion efficiency	Conversion ratio	Percentage increment	Increment	Period
0.75	1.34	0.039	1.91	After one week
0.36	2.77	0.22	1.08	After two weeks
8.49	0.12	10.74	36.17	After three weeks

There was no rejection of food until the end of the experiment and the acceptability of the diet was similar, no mortality or any signs of disease were observed during the study period.

Graphs are plotted to illustrate the average net gain for each length group for the first, second and third weeks as shown in figures

(1,2,3) and that of the control in figures (4,5,6). Percentage increment and percentage conversion efficiency was calculated and plotted as shown in figure (7).

Figure 1. Increment of *O. niloticus* fed Moringa seed cake and wheat bran (1:1) for one week.

Figure 2. Increment of *O. niloticus* fed Moringa seed cake and wheat bran (1:1) for two weeks.

Figure 3. Increment of *O. niloticus* fed Moringa seed cake and wheat bran (1:1) for three weeks.

Figure 4. Increment of *O. niloticus* fed wheat bran for one week. (Control).

Figure 5. Increment of *O. niloticus* fed wheat bran for two weeks (Control).

Figure 6. Increment of *O. niloticus* fed wheat bran for three weeks. (Control).

Figure 7. percentage increment and percentage conversion efficiency of *O. niloticus* fed Moringa seed cake and wheat bran (1:1) for three weeks.

When alternative food sources such as plant protein are used in fish diets, one of the common problems encountered is the acceptability of the food by fish, and this frequently relates to the palatability of the diet (Rodriguez *et al.* (1996). In this present investigation all the experimental diets were accepted by the fish indicating that there were increments in growth rates, no mortalities occurred throughout the experimental period and therefore the meal did not have any deleterious effects on the fish.

Shortage in world production of fish meal, the conventional protein feed source, coupled with increased demand for fish meal in feeds for livestock is likely to reduce the dependence on fish meal as a single protein source in aqua-feeds. Throughout the world the efficiency of various alternative protein source as partial or complete dietary replacements for fish meal has been evaluated in fish diets (Wee and Wang 1987, Abdel-fatah and El-Sayed 1999 and Ali *et al.* 2003). The use of leaf and seed cake meal as a possible fish meal substitute to reduce the cost of fish feed is receiving increasing attention by fish nutritionists around the world. There was a progressive increase in growth with increasing dietary protein and this was in agreement with that of Hafedh (1999).

Conclusion

The *Moringa Olifera* seed cake have the potential to make considerable contributions to growth of *Oreochromis niloticus*. It has also the potential to partially replace fish meal in a feeding regime and, thereby, reduce feed cost to the fish farmer, whose most important production cost comes from feed. This study has demonstrated that, in general, *Moringa olifera* seed cake could be included in *Oreochromis niloticus* diets without any negative effects on the growth. *Moringa*

olifera seeds are locally available and can be obtained throughout the year. Experiments with the same feed formulations under natural earthen pond conditions are recommended for future study to elucidate growth performances under natural conditions.

References

- Abdel Fatah**, M. and El-Sayed ,M. (1999). alternative dietary protein sources for farmed tilapia, *Oreochromis* sp. *Aquaculture* 179:106-149.
- Adedokun**,M.O., Oladoye,A.O., Olawumi,A.T. and Laminon,K.I. (2010). Economic contribution of *Moringa olifera* (Lam) plantation of rural livelihoods in Monoidi Local Government Area of Niger Republic, Obeche. *Journal* 28(2):142-146.
- Ali**,A. Al-Asgah,N.A. Al-Ogaily SM. And Ali,S.(2003). Effect of feeding different levels of Alfafa meal on the growth performance and body composition of Nile Tilapia (*Oreochromis niloticus*).*Asian Fisheries Science* 16:59-67. Asian Fisheries Society, Manila, Philippines.
- AOAC (1990). Association of Agricultural chemists official methods of Analysis,15th edition, Arlington, Virginia,USA,PP 807-809.
- Becker**, K. Schreiber,S. Angoni,C. and Blum,R. (1999). Growth performance and feed utilization response *Oreochromis niloticus* X*Oreochromis aureus* hybrid to 1- carnitine measured over a full fattening cycle under commercial conditions. *Aquaculture* 174:313-322.
- Bowen**,S.H. (1982). Feeding, digestion and growth qualitative consideration P.141-456. The biology and culture of tilapias. ICLARM conference proceedings international centre for living Aquatic Resources Management, Manila, Philippines.
- FAO (1998). Code of conduct for responsible fisheries. Food and Agricultural Organization of the United Nations, Rome,41P.
- Foidl**, N.,Nakkar,H.P,S. and Becker,K. (2001). The potential of *Moringa olifera* for agricultural and industrial uses.In the Miracle Tree. The Multiple attribute of *Moringa* feed. By I.J. Fuglie PP.45-76 CWS.Dakar,Senegal.
- Hafedh**, Y.S.A (1999). Effects of dietary protein on growth and body composition of Nile tilapia *Oreochromis niloticus* L. *Aquaculture Research*,30:385-393.

- Odehode**,A.V.,Woes,T.O.,Oyedeggi,O.F, Amadi,J.O., and Sowami, I.I. (2010). *Moringa olifera*: a multipurpose tree for restragetising agriculture for sustainable livelihood In: Akinlade, J.A., Ogunwale, A.B.,Absalom, V.O., Aderinola, O.A.,Ojeiyi,O.O., Rafin, T.A., Ojayeni,T.B. and Helene, D.O. (eds.). Proceedings of the 44th Annual Conference of the Agricultural Society of Nigeria (ASN) PP:444-445.
- Phiri**,C.(2010). Influence of *Moringa olifera* leaf extracts on germination and early seedling development of major cereals. Agriculture and Biology Journal of North America 1(5):774-777.
- Rappaport**,A.,Sarig,S. and Marck,M. (1977). Results of tests of various aeration systems on the oxygen regime in the Genosar experimental ponds and growth of fish there in 1975. *Bamidgeh* 28(3):35-49.
- Rodriguez** ,SM. Olvera,NMA. And Carmona.O.C. (1996). Nutritional value of animal by product meal in practical diets for Nile Tilapia *Oreochromis niloticus* (L) fry. *Aquaculture Res.* 27:67-73.
- Wee** ,K.L. and Shun-Sen Wang (1987). Nutritive value *Leucaena* leaf meal in pelleted feed for Nile tilapia. Division of Agricultural and Food Engineering. Asian Institute of Technology,Bangkok,Thailand, *Aquaculture* 62:97-108.
- Yashouv**,A. and Chervinski,J.(1961). Evaluation of various food items in the diet of *Tilapia nilotica*. *Bamidgeh* 12(3):71-78