EFFECT OF REPLACING MAIZE WITH DIFFERENT INCLUSION LEVELS OF WHEAT BRAN ON GROWTH PERFORMANCE OF *Clarias Gariepinus* (BURCHELL 1822) JUVENILES.

Egesi, O. C and Okiyi, H.
Department of Fisheries and Aquatic Resources Management
Michael Okpara University of Agriculture, Umudike Abia State Nigeria.
chiomaegesi@yahoo.com

Abstract
An evaluation of the effect of replacing maize with different inclusion levels of wheat bran on the growth performance of *Clarias gariepinus* juvenile was investigated. Four experimental diets containing 30% 20%, 10%, and 0%(control) of wheat bran replacement of maize were formulated. The fish were fed 5% of their body weight daily. Analysis of Variance (ANOVA) was used to analyse the variation in growth performance of the experimental fish. Results showed significant difference ($P<0.05$) in the final mean body weight on Treatment 3. The fish in Treatment 3 also consumed more feed ($P<0.05$) attaining better ($P<0.05$) feed conversion ratio value than in Treatments 1, 2 and 4 respectively. The physico-chemical parameters of the water showed 4.0 – 5.7 mg/l for dissolved oxygen, 6.5 – 7.0 for pH range and 25 °C – 26 °C for the temperature. The study showed the 20% replacement level of wheat bran in the diet for catfish juvenile as the most effective in growth performance.
Keywords: *Clarias gariepinus*, performance, wheat bran, juvenile, nutrition.

Introduction

Good nutrition regime is essential to economically produce healthy, high quality fish in turnaround time, as feed represent 50 – 60% of the total production costs (De Silva and Anderson, 1995). The success of fish farming business depends on the availability of good quality fish feed that would bring fish to table size within a short time frame (Egesi and Ogbonna, 2016). Wheat bran is cheap and readily available carbohydrate source containing Nitrogen Free Extract (NFE) values ranging between 52 – 61% (FAO, 1995). Wheat bran is available all year round from flour mills. About 40% of the wheat grain is in the bran which accounts for its high quality protein. Its light bulky nature 16% high quality protein and high phosphorus content gives wheat a unique place in livestock feeding.

A survey of fish farmers showed that most do not make use of standard commercial feeds, but apply supplementary feeds to reduce cost (Eyo, 1995). Since protein is usually the most expensive component of fish feed, an alternative cheaper source of protein will reduce cost of feeds and the pressure on fish meal which is the major raw materials in the fish feed industry. Traditionally, materials for formulation of feeds for monogastric farm animals such as maize, groundnut cake, oil cake, fishmeal oyster shell salt, vitamin premix and some other ingredients are suitable for *Clarias gariepinus* feed. El-Sayed, (2001) in a study of alternative protein source as substitute for fishmeal in the diet of tilapia observed that a proper combination of soya bean meal (Abdelghany, 2003; Akintayo, 2008; Al-Kenawy 2008; Ajayi *et al*, 2016), wheat bran, groundnut cake and blood meal can provide the 42 – 45% protein needed by *O. niloticus* fish. About 40% of the wheat grain is in the bran, which account for its high quality protein. The FAO (1995) reported that wheat bran has been successfully fed at fairly high levels to various species of fish without adverse effect on growth but observed that too much of it in a formulation may results in pellets with poor water stability due to the water absorption characteristic of fibre. Proteins, minerals, oil and fibre are mainly found in the outer layers of the grain and wheat bran is richer in these nutrients than the whole grain. Wheat bran is relatively rich in protein with 14-19 % DM, and minerals (4 -7 % DM), calcium (0.07-0.2 % DM) and phosphorus (0.9-1.3 % DM). Its oil content (3-5 % DM) is higher than that of the whole grain.

Although a promising potential substitute for fish meal, wheat bran contains phytase, an anti-nutritive componds which may result in, depressed nutrient utilization and poor growth (Choct *et al.*,1992) phytase activity may considerably reduce when wheat bran is processed into pellets because heat destroys phytase. Wheat bran also contain a very heat stable lipase which causes hydrolytic rancidity and is all the more active that the bran is finely ground (Allen *et al.*, 2004).

Wheat bran has been tested and used in numerous fish species and higher inclusion rates seem possible. The nutrient digestibility of wheat bran in Nile tilapia was found to be relatively high for protein (75 – 84%) and amino acid (78 – 87%) but very low for energy (37 – 39%) and generally much lower than nutrient digestibility of fishmeal and other protein sources (Maina *et al.,* 2002; Sklan *et al.,* 2004). Common carps fed wheat bran at 3% body weight 3 times daily had better growth, and feed conversion than carp's fed rice (Shalaby *et al.,* 1989). A carp diet containing 10% of wheat bran gave better

performance than when 20% wheat bran was used Hertraupt *et al.,* (2000). At 30 % inclusion in the diets of fingerlings of 3 Indian carp species (*Catlacatla*, *Labeorohita*, *Cirrhinusmrigala*) wheat bran was found to be a suitable ingredient, with relatively high digestibility for protein (93 %) and energy (80 %) (FAO2010) The high fibre content of wheat bran limits its use to herbivorous and omnivorous fish. General recommended rates are 2-5 % and should preferably be extruded (Hertrampt *et al.,* 2000).

Materials and Methods

Clarias gariepinus juvenile were acclimatized for one week before use for the treatments were administered with the experimental diets. Three treatments and one control (T_0 , T_1, T_2, and T_3) were fed diet containing 0, 10, 20, and 30% of wheat bran replacement of maize respectively. Each of the treatments had three replicates. The ingredients used in the diet formulation was purchased from the local market in Umuahia, Abia State. The formulated feeds was sundried to preserve the food.

The following water quality parameters were monitored every week, during the experiment – temperature, pH, dissolve oxygen. Temperature and pH were measured using HM digital 80 while Dissolved oxygen was measured using Hannah dissolved oxygen metre. The fish were fed 5% of their body weight daily and sampling was done every 2 (two) weeks. Increase in weight and length were recorded. Siphoning of debris and uneaten feed was done on daily basis followed by partial water change of about 40%.

Weight Gain, Daily Weight, Growth Rate, Feed Conversion Ratio (CFR) and Relative Growth Rate were calculated**.** Analysis of Variance (ANOVA) was used to analyse the variation in growth performance of the experimental fish.

Results and Discussion

There was significant different ($P<0.05$) in the mean weight gain, Specific growth rate, and feed conversion ratio of fish fed the varying levels of wheat bran. The fish achieved final mean weights of 573.40, 639.67, 657.33 and 581.47 g after 16 weeks trial for treatment 0 – 3 respectively. Treatments 2 had a significantly higher ($P<0.05$) with final mean weight of 657.33, followed by treatment 1. While treatment 0 and 3 are significantly the same.

The same trend occurred for the final total body length of 18.70 for the treatment 2 as against 16.17, 17.57 and 16.20 cm for treatment 0, 1 and 3, respectively. In the final mean weight gain of 468.33, 533.64, 551.6 and 475.8 and final increase in length of 5.4, 6.9, 7.93 and increase in treatment 0-3, respectively. Treatment 2 was significantly higher ($P<0.05$) followed by treatment 1.

Mortality rate was significantly higher ($P<0.05$) in treatment 0 and 3 while treatment 0 had the least mortality rate. The result of feed utilization is shown in Table 4.1. Feed consumption was significantly higher ($P<0.05$) in treatment 2 (2109.26 g) followed by T_1, T_3 and control (2057.02, 1885.47 and 1860.26 g) respectively.

In feed conversion ratio (FCR), treatment 2 (2.9) was significantly better ($P>0.05$) than the rest of other treatments that were significantly the same ($P>0.05$). Specific growth rate value was highest in T_2 and T_1 with 0.70 and 0.68 respectively, while treatment 0 and 3 had the lowest specific growth rate. However, the rate of conversion of feed to flesh (FCR) observed in this study for all the treatments at 3.24, 3.22, 2.9 and 3.24 for treatment 0 – 3 showed greater impact in diet 2 on the growth of *Clarias gariepinus* over the other treatments. All however, fell within the standard range of 2 to 5 reported by (Oluyemi and Robert 2000) and the findings of Egena and Aya (2007). The result of FCR obtained in this study agreed with findings of Faturoti (1999), and Ayoola (2011).

The proximate analysis of the feedstuff used in the experiment is shown in Table 2. This study reveals that the 20% wheat bran level of inclusion yielded the highest weight and length at all ages. This is in agreement with Christopher *et al.,* (2007) that found no significant difference on growth performance and body composition as wheat bran replaced maize up to 20% level of inclusion in the catfish diet *Clarias gariepinus*.

There was a consistent decrease in the value of dissolved oxygen level beyond 20% of wheat bran inclusion. This might be due to formation of pellets with poor stability due to the water absorption characteristics of fibre.

Table 1: Mean values for different inclusion level of wheat bran on the diet for catfish *Clarias gariepinus* (Juvenile)

	T_0	T_1	T_2	T_3
Initial weight	105.7	106.03	105.63	105.67
Final weight	573.40	639.67	657.23	581.47
Initial length	10.77	10.67	10.77	10.67
Final length (cm)	16.77	17.57	18.70	16.20
Mean weight gain	468.33	533.64	551.66	475.80
Feed consumption	1860.26	2057.02	2109.26	18885.47
Feed Conversion Ratio (FCR)	3.24	3.22	2.9	3.24
Specific growth rate	0.65	0.68	0.70	0.65
% survival rate	83.3	93.3	100.0	86.67

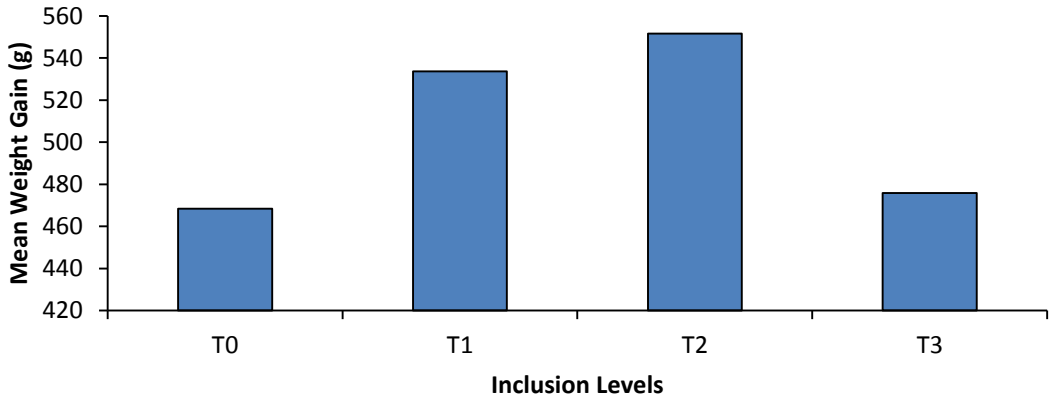

Fig 1: Mean weight gain of different inclusion level of wheat bran in the treatments.

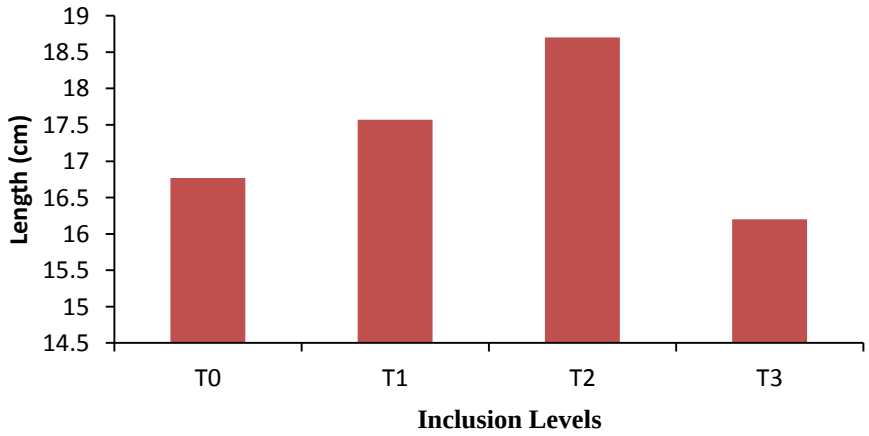

Fig 2: Length increase of different inclusion level of wheat bran in the treatment.

Table 2: Proximate Analysis of the feedstuff used in the experiment.

	Treatments			
	Diet 1	Diet 2	Diet 3	Diet 4
Ingredients	**0%**	**10%**	**20%**	**30%**
Moisture content	11.1%	11.3%	11.0%	11.2%
Nitrogen free extract	43.7	43.5	43.2	43.8
Crude protein	15.9	15.7	15.6	15.6
Ether extract	6.0	6.6	7.0	6.3
Crude fibre	10.9	10.6	11.0	10.7

Table 3: Percentage of ingredients experimental diets

Ingredients	**Diet 1 0%**	**Diet 2 10%**	**Diet 3 20%**	**Diet 4 30%**
Maize bran	31.28	28.15	25.02	21.90
Wheat bran	0	3.13	6.26	9.38
Soyabean cake	26.49	26.49	26.49	26.49
Fishmeal	26.49	26.49	26.49	26.49
Palm oil	5	5	5	5
Garri	8	8	8	8
Premix	0.25	0.25	0.25	0.25
Vitamin c	0.1	0.10	0.10	0.10
Bone meal	2	2	2	2
Salt	0.4	0.4	0.4	0.4

Conclusion

Farmers will benefit economically through the utilization of wheat bran as a cheaper ingredient at 20% inclusion to raise *Clarias gariepinus* species of optimum balanced protein- carbohydrate requirement of the fish. Being is readily available and also cheaper it is recommended at the appropriate inclusion level. Care must be taken in the use of wheat bran as it foul the water easily when feed is not completely eaten by the fish immediately by changing water colour and placing increased bio-oxygen demand on the culture water. There is need for further studies in the use of wheat bran in feeds for *C. gariepinus*.

REFERENCES

Abdelghany, A.E., (2003). Replacement of herring fish meal by soybean flour in practical diets for red tilapia, *Oreochromis niloticus* x *O. mossambicus*, grown in concrete tanks. *J. Applied Aquaculture*., 14: 69-87.

Ajani, E.K., O. Orisasona, B.O. Omitoyin and E.F. Osho, (2016). Total Replacement of Fishmeal by Soybean Meal with or Without Methionine Fortification in the Diets of Nile Tilapia, *Oreochromis niloticus*. *Journal of Fisheries and Aquatic Science, 11: 238-243.*

Ajayi O. T (1999). The Development of Fisheries sub Sector of Nigeria Agriculture in Fish Nutrition and Fish Feed Technology (ed.) A. A. Eyo. Fisheries society of Nigeria FISON Pp. 4 – 1.

Akintayo, I.A., S.O. Obasa, W.O. Alegbeleyo and A.N. Bangbose, (2008). Evaluation of toasted sunflower (*Helianthus annus*) seed meal in the diets of African catfish (*Clarias gariepinus*) fingerling. *Livest. Res. Rural Dev*., 20: 28-46.

Al-Kenawy, D., G. El-Nagar and Y.A.Z. Mohamed, (2008). Total replacement of fishmeal with soybean meal in diets for Nile tilapia in pre-fertilized ponds. Proceedings of the 8th International Symposium on Tilapia in Aquaculture, October 12-14, 2008, The World Fish Centre, pp: 773-785.

Allen J, et al. (2004) Discrimination of modes of action of antifungal substances by use of

metabolic footprinting. *Appl Environ Microbiol* 70(10):6157-65

Ayoola, S.O.,(2011). Utilization of compounded feed and poultry hatchery waste in the diet of *Clarias gariepinus*. *Niger. J. Fish*., 8: 291-299.

Christopher, G. I. S. O. and Idong C. I (2007). Effect of the replacement of maize with wheat bran in broiler finisher diet on growth performance and feed cost.

Choct, M. ; Annison, G., (1992). Soluble wheat pentosans exhibit different anti-nutritive activities in intact and cecectomized broiler chickens. J. Nutr., 122: 2457-2465

De silva, S. S and Anderson T. A (1995). Fish Nutrition in Aquaculture. Chapman and Hall London. 319 Pp.

Egena, S. S. A. and Aya, V. E. (2007). Performance and Cost Implication of Feeding Broilers with Cornflakes Waste Based Diet. AU J.T. 10(4): 232-236 (Apr. 2007).

Egesi, C. O and Ogbonna, R. I. (2016). The Effect of Supplementing Blood Meal with Graded Level of Methionine in Diet of Clarias gariepinus (Burchell 1822) Fingerlings. *International Journal of Agriculture and Earth Science* Vol. 2:4. Pp 1-6.

El-Sayed, A.F.M., 2004. Protein nutrition of farmed Tilapia: Searching for unconventional sources. In: 'New dimensions on farmed tilapia,' *Proc. Of the 6th international symposium on tilapia in aquaculture 12–16 September 2004*, edited by R. B. Bolivar, G. C. Mair, and K. Fitzsimmons. Manila, Philippines: ISTA Publications. pp.364-378.

Eyo, A. A. (1995). Fish feed and feeding practices in Nigeria in report of Nigeria Agha cultural diagnostic survey. May-July 1994 (S. O. Ayeni edition National Institute for fresh water fisheries Research, new bussa, Niger state nig Pp. 41 – 51).

Eyo A. A (1990). The requirement for formulating standard artificial fish feed presrnted at the 11th annual conference of the fisheries society.

FAO (Food and Agriculture Organization of the United Nations) (1995). The state of World Fisheries and aquaculture FAO of the United Nation Rome.

FAO (Food and Agriculture Organization of the United Nations), (2010). The State of World
Fisheries and Aquaculture 2010. Fisheries and Aquaculture Department, FAO, Rome. 197P.

Faturoti, E.O. (1999). Fisheries potential and Investment opportunities in Nigeria *Paper presented at the fisheries Society for Nigeria* (FISON) Investors workshop held at the NIOMR Lagos April, 22, 1999.

Hertrampt. J. W. Piedad- Paschal F. 2000. Hand book in ingredients for Aquaculture feeds Kluver Academic Publisher 624 Pp.

Maina, J. G.; Beames, R. M.; Higgs, D.; Mbugua, P. N.; Iwama, G. and Kisia, S. M. 2002. Digestibility and feeding value of some feed ingredients fed to tilapia Oreochromis niloticus (L.). *Aquaculture Research* 33:853-862.

Oluyemi, J.A. and Roberts, F.A. (2000). Poultry Production in Warm Wet Climates. 1 Edn., MacMillan Press Ltd., London, pp: 147-168.

Shalaby, S. ; Nour, A. M. ; Omar, E. ; Akkada, A. R. A. ; Gunther, K. D., 1989. Utilization of some grains and its by-products in feeding common carp (*Cyprinus carpio* L.) fingerlings. *Landwirtschaftliche Forschung*, 42 (2-3): 196-204

Sklan, D.; Prag, T. and Lupatsch, I. 2004. Apparent digestibility coefficients of feed ingredients and their prediction in diets fortilapia Oreochromis niloticus x Oreochromis aureus (Teleostei, Cichlidae). *Aquaculture Research* 35:358-364.