BEST: Journal of Recent Trends in Natural Sciences Research & Development (BEST: JRTNSRD)
Vol. 2, Issue 1, Jun 2017, 1-6

GRADUAL REPLACEMENT OF MAIZE WITH KUNNU WASTE IN DIET FOR AFRICAN SHARPTOOTH CATFISH FINGERLINGS CLARIAS GARIEPINUS (SILURIFORMES: CLARIIDAE)

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ABSTRACT

The high cost of imported fish feed has resulted into researches on low cost and locally available indigenous feed resources. Study on the gradual replacement of Maize with Kunnu Waste in diet for African catfish fingerlings (*Clarias gariepinus*) was conducted for eight weeks in the Department of Biological Sciences laboratory, University of Abuja to ascertain the viability of Kunnu waste as fish feed ingredients. A total of 180 fingerlings were purchased from ADP fish farm in Gwagwalada. Kunnu wastes were collected from a local processor of kunnu at Iddo, Airport Road Abuja. The mean values of physico-chemical parameters recorded are within the range for fish culture.The highest mean weight gain of 13.89g was recorded in 100% inclusion followed by 75% (6.52g), while 50% inclusion had the lowest (0.13g). The highest specific growth rate (SGR) of 1.60 was also recorded from diet with 100% inclusion of kunnu waste. The best Feed Conversion Ratio (FCR) of 0.89 was recorded in 100% inclusion followed by the control group (0.97). There was correlation between Specific Growth Rate (SGR) and body weight gain ($P>0.05$). However, weight increases with increased level of Kunnu waste inclusion ($P<0.05$).The result shows that Maize can easily be replace with kunnu waste which is cost effective in the diet of African catfish without any adverse effect on performance.

KEYWORDS: Kunnu Waste, *Clarias gariepinus*, Growth Parameters, Correlation, Gwagwalada

INTRODUCTION

Fish is generally accepted as protein source in diets of average Nigerians (Agbabiaka, 2010). Nutritionally, fish is about the cheapest and direct source of protein and micro nutrients for several millions of Africans (Bene and Heck, 2005). Feed is a major factor that determines the viability as well as profitability of fish farming as an enterprise and accounts for minimum of 60% of the total cost of fish production in Africa (Jamu and Ayinla, 2003).Intensive fish production and high cost of imported feed has resulted in price increases of the conventional fish resources especially the energy sources. Therefore, research on low- cost and locally available indigenous feed resources is fundamental. One such potential alternative is the use of Kunnu waste. Kunnu is a traditional non-alcoholic fermented beverage made from cereals such as sorghum, maize, millet or rice in Northern part of Nigeria (Agarry *et al*.,2010; Odunfa and Adeyele, 1985; Adeyemi and Umar, 1994) and it is usually served as appetizer to entertain visitors mostly as well as in social gatherings (Amusa and Odunbaku, 2009).

Kunnu waste refers to the residue or chaff that remains after wet sieving of the steeped and milled grains to produce the slurry called kunnu. It is often discarded at garbage dump or used to feed livestock such as poultry especially

those on extensive or semi intensive pastoralism (Agbabiaka and Madubuko, 2013). There are documented works on agro-processing waste as feedstuff in fish nutrition in Nigeria (Agbabiaka and Madubuko, 2013, Agbabiaka*et al*., 2013) but there is no documented work on Kunnu waste as Maize replacement in the diets of catfishes in Gwagwalada despite its abundance which is becoming an environmental problem. Also the rise in environmental temperature due to global warming will lead to increase in the demand and consumption of Kunnu which will subsequently results to increase in quantity of the waste to be discarded into the environment. The aim of the present study is to replace maize with Kunnu waste in the diets of African catfish (*C. gariepinus*) fingerlings.

MATERIALS AND METHODS

Study Area

University of Abuja is located along Gwagwalada - Airport road in Gwagwalada the headquarters of Gwagwalada area council, which is one of the six area councils in Abuja the federal capital territory (FCT) of Nigeria. Abuja is located in the centre of Nigeria with a land area of 8 000km^2. It lies between the Latitude of 8°25″ and 9°25″N and Longitude 6°45″ and 7°45″E. It is bounded to the North by Kaduna and Niger States, to the South by Kogi State, East by Nasarawa State and West by Niger State (Figure 1). From its Central location its vegetation combines the savannah grassland type of the North and middle belt with the tropical rain forest type of the South of Nigeria.

Gwagwalada with an area of 1, 043km^2 is one of the largest satellite towns in the FCT with a population of 157, 770 as at 2006 population census. Due to the large influx of people on a daily basis and the presence of River Usuma which is an important tributary of River Gurara in the study area besides numerous tributaries with a lot of fishing activities make Gwagwalada town an important commercial fish market (Dankishiya *et al*., 2013).

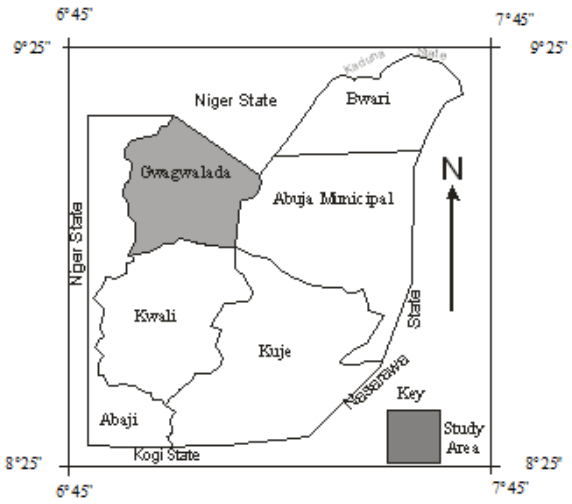

Figure 1: Map of Abuja, Federal Capital Territory of Nigeria Showing the Study Area

Experimental Design and Fish

The study was conducted in the Department of Biological Sciences Laboratory, University of Abuja from April to May, 2015 and the fishes reared in 50 litres bowls arranged behind the laboratory. A total of 180 African catfish fingerlings with mean body weight of between 1.52 to 1.83gwerepurchased from ADP fish farm, Gwagwalada. They were allowed to acclimatize for a week and were fed with the control diet and subsequently, experimental fish were assigned to 50 litres

capacity bowls at the rate of 12 fishes per bowl and replicated thrice. Fish were fed with the experimental diets at 5% body weight shared between mornings (8.00-9.00am) and evening (4.00-5.00pm) daily.

Sampling Collection and Processing

Kunnu waste was collected from a local processor of kunnu at Iddo, Airport Road Abuja. The chaff was sundried for 48 hours, packaged in an air-tight polythene bag and was kept in the refrigerator prior to proximate analysis (AOAC, 2000).

The sundried kunnu waste was milled and mixed with other feed ingredients (Table 1) such that maize was gradually replaced by Kunnu waste at 0, 25, 50, 75 and 100% respectively and were administer to the fishes (Agbabiaka and Madubuko, 2013).

Table 1: Percentage Composition of Experimental Diets Fed African Catfish Fingerlings

Ingredients	Dietary Treatments				
	0%	25%	50%	75%	100%
Maize	26.00	19.50	13.00	6.50	0
Kunnu waste	0	6.50	13.00	19.50	26.00
Fish meal	28.00	28.00	28.00	28.00	28.00
Soya bean	41.00	41.00	41.00	41.00	41.00
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.50	0.50	0.50	0.50	0.50
Lysine	0.50	0.50	0.50	0.50	0.50
Bone meal	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25
Oil	2.00	2.00	2.00	2.00	2.00
Total	100	100	100	100	100

The control diets contain no kunnu waste. Diets produced were pelleted, sundried for 4 days, packaged in water-proof nylon bags and was labelled accordingly prior to storage at room temperature. Samples of the diets were subjected to proximate analysis using standard methods (AOAC, 2000) as shown in Table 2.

Table 2: Proximate Composition of Experimental Diets Fed To African Catfish

Parameters	Dietary Treatments (%)				
	0	25	50	75	100
Moisture content	4.23±0.04	5.22±0.05	5.58±0.08	6.09±0.03	6.19±0.08
Crude protein	50.83±0.04	28.89±0.07	27.24±0.05	37.05±0.07	51.69±0.05
Crude fibre	7.65±0.04	8.02±0.02	8.19±0.02	8.13±0.02	8.34±0.02
Ash	11.22±0.03	9.10±0.02	9.05±0.03	9.16±0.03	9.24±0.03
Crude lipid	8.95±0.03	4.15±0.07	3.95±0.03	3.56±0.07	6.21±0.03
Carbohydrate	17.12±0.06	44.62±0.04	45.99±0.04	26.01±0.04	18.33±0.04

Laboratory Measurement and Analysis

Temperature, pH and dissolved oxygen of each bowl were monitored weekly. The initial weight as well as the final weight of the fish was determined with digital weighing balance. Biweekly weight measurements were taken to monitor weight gain and the specific growth rate (SGR) was calculated as described by Herper (1998). Data on performance such as body weight changes, specific growth rate and feed conversion ratio were subjected to one way analysis of variance (Obi, 1990).Duncan Multiple Range Test (DMRT) was used to rank the means.

RESULTS

Some water quality parameters measured during the period of study is as shown in Table 3. The mean temperature of water measured ranged between 26.67^{o}C to 30.33^{o}C. The ph ranged from 6.00 to 7.53 while 4.70mg/l to 7.8mg/l is the ranged recorded for dissolved oxygen throughout the trial period.

Table 3: Weekly Water Quality Parameters Measured During the Experiment

Week	Temperature	Ph	DO (mg/l)
1	30.33±0.58	6.00±0.01	6.33±0.58
2	30.33±0.58	6.99±0.01	7.8±0.12
3	26.67±0.58	7.53±0.06	4.73±0.37
4	31.33±0.58	6.53±0.06	4.70±0.35
5	29.33±0.58	6.89±0.01	5.84±0.14
6	28.53±0.06	7.49±0.01	7.67±0.29
7	27.67±0.58	7.06±0.12	6.33±0.58
8	29.00±1.00	7.37±0.12	5.68±0.28

Note: Values are Means±SE

The proximate composition of Kunnu waste as shown in Table 4 contained 12.16% crude protein, 1.67% fat, 9.03% Ash, 8.50% moisture and 12.34% crude fibre respectively.

Table 4: Proximate Composition of Kunnu Waste

Nutrients	Percentage Composition
Crude protein	12.16
Fat	1.67
Ash	9.03
Moisture	8.50
Crude fibre	12.34
Nitrogen free extract (NFE)	56.30

The data on growth performance of *C. gariepinus* fingerlings to the experimental diet is shown in Table 5. The highest mean weight gain of 13.89g was recorded in 100% inclusion followed by 75% (6.52g) while the 0%, 25% and 50% had 0.58g, 0.34g and 0.13g respectively. The highest SGR was recorded in 100% inclusion with 1.60 while 50% had the lowest (0.05). The highest FCR of 0.89 was recorded in 100% inclusion while 75% and 50% had 1.14 each. Others are 25% and 0% with recorded values of 1.07 and 0.97 respectively.

Table 5: Growth and Feed Utilization of *C. Garipinus* Fingerlings Fed Different Treatment of Kunnu Waste

Parameters	Dietary treatments (%)				
	0	25	50	75	100
Initial mean weight (g)	1.66	1.52	1.83	1.61	1.71
Final mean weight (g)	2.24	1.86	1.96	8.13	15.6
Mean weight gain (g)	0.58	0.34	0.13	6.52	13.89
Specific growth rate (%/day)	0.20	0.15	0.05	1.17	1.60
FCR	0.97	1.07	1.14	1.14	0.89

DISCUSSIONS

The ranges of some physico-chemical parameters measured in the present study are within the range for fish culture by Boyd (1979) and WHO (1997) and this also agrees with the findings of Auta *et al.* (2013), Dan-kishiya and Chiaha (2012) and Balogun *et al.* (2004).The crude protein content of the experimental diets increased with increased level

of Kunnu waste inclusion couple with the crude fibre which is within the 8% recommended for catfish might have improved the growth response, feed utilization and subsequent increase in weight gain at high level of inclusion. This was also reported by other researchers on the use of agro-processing waste as feedstuff in fish nutrition in Nigeria (Agbabiaka and Madubuko, 2013; Agbabiaka *et al.,* 2013). However, the crude protein concentration of Kunnu waste is higher than the recorded ranges of 9- 10% for both white and yellow maize (Aduku, 1993) as well as 7-9.7% for tigernut (Oladele and Aina, 2007) but similar to the value of 12.20% recorded for Kunnu waste in Owerri, Nigeria (Agbabiaka and Madubuko, 2013). Also, the better performance of fish fed kunnu waste at high level of inclusion over the control may be attributed to fermentation which usually increases the flavor/aroma of the test diets (Agbabiaka and Madubuko, 2013) which increases the feeding rate of the fishes that resulted in weight gain.

CONCLUSIONS

The result of the present study shows that Kunnu waste which is cost effective can replace maize in the diets of African catfish fingerlings without any adverse effect on performance.

REFERENCES

1. Adeyemi, L. A. and Umar, S. (1994). Effect of method of manufacture on quality characteristics of Kunnu-zaki, a millet based beverage. *Nigerian Food Journal*. 12:34-42.
2. Agarry, O. O., Nkama, I. and Akoma, O. (2010). Production of Kunun-Zaki (A Nigerian fermented cereal beverage) using starter culture. *International Research Journal of Microbiology.* 1(2): 18-25.
3. Agbabiaka, L.A. (2010). *Aquaculture and Pond Management in the Tropics*. Owerri, Imo State, Nigeria, Vintage Books Limited. 111.
4. Agbabiaka, L. A. and Madubuko, C. U. (2013). Potentials of Kunnu waste as Dietary Supplement for African Catfish Fingerlings. *Fisheries and Aquaculture Journal.* 68: 1-6.
5. Agbabiaka, L. A., Okorie, K. C. and Ezeafulukwe, C. F. (2013). Plantain peels as dietary supplement in practical diets for African catfish (*Clarias gariepinus* burchell, 1822) fingerlings. *Agriculture and Biology Journal of North America*.4 (2): 155-159.
6. Amusa, N.A. and Odunbaku, O.A. (2009). Microbiological and nutritional quality of hawked kunnu (a sorghum based non-alcoholic beverage) widely consumed in Nigeria. *Pakistan Journal of Nutrition.* 8(1): 20-25.
7. A.O.A.C (2000).Official Methods of Analysis. (Ed. Herrick K), 17th Edition. Washington, DC, USA.
8. Auta, J., Yashim, Y. E., Dambo, A. and Tiamiyu, B. B. (2013).Growth responses of African Catfish, *Clarias gariepinus*, Fingerlings to imported and local feeds. *International Journal of Applied Biological Research.* 5(1): 55-61.
9. Balogun, O. O. and Olupona, J. A. (2004). Nutrient utilization by rabbits fed brewers' dried grains from different proportions of barley, maize and sorghum. *Nigerian J. Anim. Prod*., 31: 189-193.
10. Bene, C. and Heck, S. (2005). Fisheries and the millennium development goals: solutions for Africa. Naga, world fish Centre Quarterly, 28(3-4): 8-13.

11. Boyd, C. E. (1979). Water quality in warm fish ponds. Auburn University Alabama Agric Experimental Station. 359.

12. Dan kishiya, A. S. and Chiaha, Q. N. (2012).Physico-chemical parameters of some selected stations in Lower Usuma Reservoir, Bwari, Nigeria. *Report and Opinion* 4(2):1-6.

13. Dan-kishiya, A. S., Olatunde, A. A. and Balogun, J. K. (2013). Variation in the concentration of Dissolved oxygen (DO) and Hydrogen ion (ph) at the surface of a tropical Reservoir: a case study of Lower Usuma Reservoir in Bwari, Abuja, Nigeria. *American Journal of Research Communication.* **1**(9): 204-214.

14. Jamu, D. M. and Ayinla, A. O. (2003).Potential for the development of agriculture in Africa. NAGA 26:9-13.

15. Odunfa, S. A. and Adeyele, S. (1985). Microbiological changes during the traditional production of Ogibaba, A West African fermented sorghum gruel. *Journal of Cereal Science.* 3: 173-180.

16. Obi, I. U. (1990).Statistical methods of detecting different between treatment means.2nd edition.Snaap Press, Enugu, Nigeria.

17. Oladele, A. K. and Aina, J. O. (2007). Chemical composition and fermentation properties of floor produced from varieties of tigernut. *African Journal of Biotechnology*. 6(12): 2373–2476.