Sci-Afric Journal of Scientific Issues, Research and Essays Vol. 2 (5), Pp. 218-221, May, 2014. ***(ISSN 2311-6188)***
http://www.sci-afric.org

Research Paper

Nutrient quality of African catfish (*Clarias Gariepinus*, burchell 1822) fed *Cissus Populnea* root meal based diet as soybean meal replacer.

*[1]**Adelakun** KM, [2]**Mustapha** MK, [3]**Maradun** HF and [4]**Amali** RP

[1]Federal College of Wildlife Management, Forestry Research Institute of Nigeria, P.M.B.268, New Bussa, Nigeria.
[2]Department of Zoology, University of Ilorin, Ilorin, Nigeria.
[3]Aquaculture and Biotechnology Program, National Institute of Freshwater Fisheries Research, New Bussa, Nigeria.
[4]Department of Biological Sciences, Federal University of Lokoja, Kogi state, Nigeria.

* Corresponding Author E-mail: adelakunkehinde@gmail.com

Accepted April 14th, 2014

ABSTRACT

Wild plants offer a convenient but cheap means of providing adequate supplies of nutrients to man and animals living within the tropics but the availability of these nutrients after ingestion depends on nutritional quality of the plant even when tested within one fish species. Considering the significance of quality data needed for the development of useful models across ingredients and species, the effect of *Cissus populnea* root meal fed as soybean meal replacer in the diet of catfish (*Clarias gariepinus*) was evaluated through proximate analysis of the experimental plants and animal. The proximate composition of crude protein level in the *Cissus populnea* root were 32.45% while that of soyabean is 46.22%. The ash content of *cissus populnea* (5.34%) which indicate presence of mineral elements is close to that of soyabean seed (6.89%) while fat (1.45%), Fibre (3.30%), Moisture (6.50%) and carbohydrate (50.93%) contents were recorded for *Cissus populnea* and 46.22%, 3.01%, 5.89%, 6.89%, 19.91% and 21.09% were recorded for Soyabean in the same order. The proximate composition of the experimental fish carcass revealed the diets to be isonitrogenous as there was no significant difference ($P > 0.05$) in the nutrient contents of the carcass except for the % crude fibre in the total replacement of soyabean meal (100% CpRM inclusion) despite the varying % crude protein content in the diets. Therefore, inclusions of Cissus populnea root meal as replacer for Soyabean meal in diets of *Clarias gariepinus* does not have effect on the nutritional composition of the animal.

Key words: Carcass, composition, inclusion, Nutrients, Wild plant.

INTRODUCTION

There can be a wide variation in the quality of diet received by farmed fish. Factors include the poor availability of suitable constituents, poor formulation and processing, lack of knowledge and understanding of dietary requirement or in appropriate storage (Southgate, 1993). The fish feeds industry has recognized for many years that increased utilization of plant protein in formulated diets is essential, but many limits to increasing the use of plant-based ingredients have been identified. These alternative ingredients must be cost effective, support optimal fish performance, have minimal environmental impact, and result in a product that is appealing and nutritious (Barrows, *et al.*, 2008).
Soybean meal (SBM) is currently the most commonly used plant protein source in fish feed (El-Sayyed, 1999). However, other plant protein sources which are less expensive would be beneficial in reducing feed cost when made to replace soybean meal (Barros *et al.*, 2002).
Although grains and grain products are the main nutrients sources in the diets of cultivated fishes and other livestocks (Darunna, 2000), an attempt at fulfilling the energy requirement of these animals through the use of root and tubers could probably ameliorate the stiff competition with cereals and grains (Agbede *et al.*, 2002). Also, to meet up with annual increase of fish production, research should be targeted towards the use of alternative or unconventional feed ingredients such as root and tubers which could probably improve the feed water stability and nutrient retention, increase efficiency of digestibility and reduce cost of fish feed production (Falayi, *et al.*, 2003 and 2004). Wild plant then offer a convenient but cheap means of providing adequate supplies of carbohydrate, fat, mineral and protein required in tropical animal diet (Eromosele *et al.*, 1991). One of these plants is *Cissus populnea* which is comparable to those

common plants that has potential for exploitation as food and feed (Alaye *et al*., 2012). *Cissus populnea,* a wild plant, is also called Food Gum (Chukwu and Okpalalzima, 1989) and Okoho (Idoma) or Ager (Tiv) which are some local dialects spoken in Nigeria. According to Steffe *et al*., 1983, *Cissus populnea* contains 79% carbohydrate, 11% moisture, 3% crude protein, 3% crude fibre, 2% ether extract and 2% ash. There are wide ranges of possible application of *Cissus populnea*. The root meal with its high content of crude protein can be incorporated into man and animal diets (Alaye *et al*., 2012); the gum is used for soup and as soup thickener; it can be used to treat diarrhoea, headache and whitlow. It is also widely used as medicine for the treatment of venereal diseases and indigestion and as drug binder (Iwe and Atta, 1993).

It is apparent in published results that variability is great concerning the nutritional quality of a given feedstuff, even when tested within one fish species. The reasons for these apparently contradictory results are often difficult to interpret as ingredient sources, physiological stage of the fish, and other experimental conditions differ greatly between experiments. If more standardized protocols were used, the quality of the data would improve, and limited human and funding resources would be saved. In addition, higher quality data are needed for the development of useful models across ingredients and species (Barrows, *et al*., 2008). The proximate composition of intensively farmed fish is an integral part of evaluating their nutritional status. However, the diet composition, metabolic adaptation and variation in fish activity are the main factors responsible for the change in nutritional composition of fish (Rehulka, 2003). Thus, analysis of nutrients is an important factors that could be considered in fish feed assessment. This study then evaluates proximate composition of African catfish (*Clarias gariepinus*) fed *cissus populnea* root meal based diets fed as soybean meal replacer

MATERIAL AND METHOD

Cissus populnea root meal (CpRM) to be use in the experiment was locally source from Federal College of Wildlife Management Estate. The root was clean, dry and hammer mill to pass through 1mm sieve while the soyabean was sourced from a local market, roasted and dehulled. The resulting meals were then analyzed for proximate composition using standard methods of A.O.A.C (1990).

Other ingredients namely: fishmeal, corn meal, starch, vitamin and mineral premix were purchased from Kofo Fish Farm Nigeria Ltd, New Bussa. Three (3) dietary treatments were formulated such that diet 1 serves as control diet (0% CpRM), while diets 2 and 3 were formulated from *Cissus populnea* root meal substituting soyabean meal at 50% and total replacement at 100% respectively. The percentage composition of ingredients in each diet is shown in Table 1. The dry ingredients were compounded at the feedmill of National Institute for Freshwater Fisheries Research (NIFFR), New Bussa, Niger State. The feeds were immediately labeled and stored in airtight polythene bags in a cool dry place in the experimental laboratory of the Federal College of Wildlife Management, New Bussa.

Sixty three (63) juvenile of *Clarias gariepinus* were used for the experiment. The fish were sourced from Kofo Fish Farm Nigeria Ltd, New Bussa with no history of disease infection. The experimental fish were allowed to acclimatize for a period of 10 days and thereafter starve for 24 hours to empty their gastro intestinal tract before the commencement of the experiment. Fish were then randomly allocated into three (3) dietary treatments of 21 fish each with three (3) replicates of 7 fish per replicate in a 30 litre plastic aquaria filled with 15 litre of water. The water was changed every 3 days throughout the period of the experiment. Fish ration of 5% of fish biomass were administered twice daily. Fish were then bulk weighed with sensitive scale to the nearest gram and subsequently every 5 days until the end of the 70 days study period. Daily records of mortality were recorded and expressed as percentage at the termination of the experiment.

At the end of the experimental period, 2 fish were randomly selected from each replicate of experimental diet. The sample fish were put in a clean plastic container labeled accordingly and immediately taken to the laboratory of National Institute for Freshwater Fisheries Research (NIFFR), New Bussa, Niger State, Nigeria for proximate analysis according to the procedure of A.O.A.C, 1990.

The data collected were in triplicate and subjected to analysis of variance (ANOVA). Significant means were separated using Duncan multiple range test (Duncan, 1955).

TABLE 1: GROSS COMPOSITION OF EXPERIMENTAL DIETS

INGREDIENTS	DIET 1 (CONTROL)	DIET 2 (50% CPRM)	DIET 2 (100% CPRM)
Fish meal	22.63	21.16	21.17
Soybean meal	45.27	21.16	--
Cissus populnea root meal	--	21.16	42.33
Maize	28.30	32.73	32.70
Bone meal	2.50	2.50	2.50
*Fish premix	0.50	0.50	0.50
Vitamin C	0.10	0.10	0.10
Salt	0.25	0.25	0.25
Vegetable Oil	0.45	0.45	0.45
TOTAL	**100.00**	**100.00**	**100.00**
%CRUDE PROTEIN	**40**	**35**	**32.5**

*Fish premix composition: Vitamins, Minerals, Amino acid antioxidant

RESULTS AND DISCUSSION

The proximate composition of *Cissus Populnea* root and Soyabean seed

Nutritional composition of *Cissus populnea* root and soyabean seed were evaluated in this study. The result shows that both plants contain many essential nutrients which are useful ingredient in fish diets. These nutrients also help in body building and prevention of diseases. Among the nutrients composition contained in the plants are: protein, fat, fibre, moisture, carbohydrate (Nitrogen Free Extra), minerals (ash) and vitamins.

The crude protein level in the *Cissus populnea* root (32.45%) is lesser than that of soyabean (46.22%) but higher to that of *Canavalia ensiformis* (Jack bean) of 28.25% which has been used successful to replaced soyabean in the diet of hybrid catfish hybrid catfish for 56days without apparent deleterious effects on the fish (Osuigwe *et al*., 2005). Ash content of *Cissus populnea* (5.34%) which indicate presence of mineral elements is close to that of soyabean seed (6.89%) and even closer to that of Sunflower meal (5.89) which was reported to be isonitrogenous to Soyabean (Fagbenro *et al*., 2000). The low fat content (1.45%) of *Cissus populnea* is considered good for fish as Tacon (1985) reported that feeding fish with a high lipid diet exposes them to a risk of fat deposition in the organs. Moisture content of 6.50% in *Cissus populnea* better than that of 19.19% of soyabean as the former will discourage microbial growth, decreases the rate of enzymatic reaction and hence delay deterioration of the ingredient. The implication of this is that the *Cissus populnea* can be stored for more time than soyabean before it starts to deteriorate. Fibre (3.30%) and carbohydrate (50.93%) contents were evaluated for *Cissus populnea* while (5.89% and 21.09%) were recorded for Soyabean in the same order. Table 2 below shows the result of proximate analysis of *Cissus populnea* root and soyabean seed. The result showed the mean value of each nutrient contained in the plants.

Table 2: The result of proximate analysis on *Cissus populnea* root and Soyabean seed.

Nutrients	Cissus populnea root (%)	Soyabean (%)
Moisture content	6.50	19.91
Ash content	5.37	6.89
Crude fibre	3.30	5.89
Crude protein	32.45	46.22
Crude fat	1.45	3.01
Carbohydrate	50.93	21.09

SOURCE: LABORATORY ANALYSIS, 2012.

Carcass composition of experimental Fish

Table 3 shows the proximate composition of carcass samples of fish fed control and test diets. The % mean moisture of 75.56±0.36, 74.98±1.65, 76.01±0.24 and % mean protein 19.03±0.60, 20.29±2.22, and 18.70±0.36 were analysed for T1, T2 and T3 respectively. This result is in consonance with the report of Afolabi *et al.,* 1984 which reported the proximate composition of moisture (78.13%) and protein (18.63) for *Clarias gariepinus* (Catfish). The proximate composition of the experimental fish carcass revealed the diets to be isonitrogenous as there was no significant difference (P > 0.05) in the nutrient contents of the carcass except for the % crude fibre in the total replacement of soyabean meal (100% CpRM inclusion) despite the varying % crude protein content in the diets.

Table 3: Carcass composition of experimental fish

Parameters	Fish fed control diet (T1)	Fish fed 50% CpRM (T2)	Fish fed 100% CpRM (T3)
% Moisture	75.56±0.36[a]	74.98±1.65 [a]	76.01±0.24 [a]
% Crude protein	19.03±0.60[a]	20.29±2.22 [a]	18.70±0.36 [a]
% Ash	1.76±0.09 [a]	1.88±0.08 [a]	1.95±0.06 [a]
% Lipids	1.67±0.10 [a]	1.57±0.15 [a]	1.57±0.04 [a]
% NFE	1.88±0.28 [a]	1.21±0.62 [a]	1.67±0.15 [a]
% Crude Fibre	0.10±0.01 [a]	0.12±0.01 [a]	0.10±0.01[b]

*Mean values in a row followed by similar superscripts are not significantly different (P>0.05), **CpRM is *Cissus populnea* Root Meal.

CONCLUSION

The result of this study as revealed that *Cissus populnea* root contains essential nutrients. The high content of crude protein makes it a very good source of plant protein for its inclusion in fish diets as the nutrients contents are comparable to soyabean meal; best protein quality among plant protein feedstuffs used in fish feeds (Davies *et al*., 1999). *Cissus populnea* root is also discovered to be a good source of carbohydrate. The high ash content is an indication of presence of minerals which are needed in fish ration.

The proximate composition of the experimental carcass revealed the diets to be isonitrogenous as there was no significant difference (P > 0.05) in the nutrient composition of the experimental fish despite the varying % crude protein of the experimental diets at 40%, 35% and 32.5% for T1, T2 and T3 respectively. It is then concluded that inclusion of *Cissus populnea* root meal as replacer for Soyabean meal in diets of *Clarias gariepinus* does not have effect on its nutritional composition.

References

Afolabi, JO., Arawomo, OA., and Oke, OL. (1984). Quality Changes of Nigerian Traditionally Processed Freshwater Species. Nutritive an Organoleptic Changes. *Food technology*. 333-340

Agbede, JO., K. Ajaja and VA Aletor, 2002. Influence of Roxazyme G. supplementation on the utilization of sorghum dust-based diets for broiler-chicks *Proc. 27th Ann. Conf. NSAP,* Akure, 2002 105-108.

Alaye, S.A., Ajagbe, SO., Adelakun, KM and Adeola, AJ. (2012). Nutrient Composition of Processed root of *Cissus populnea*. Association of Official Analytical Chemists (A.O.A.C.). (2005). *Official methods of analysis of A.O.A.C. International*, Gatithersburg, MD., U.S.A.

Barros MM., Lime. Klesius PH (2002). Effect of soybean replacement by cottonseed meal and iron supplementation on growth, immune response and resistance of channel catfish (*Ictalurus punctatus*) to *Edwarsiella ictaluri* challenge. *Aquaculture 207,* 263 – 279.

Barrows, Frederic T., Bellis, Diane, Krogdahl, Åshild, Silverstein, Jeffrey T., Herman, Eliot M., Sealey, Wendy M., Rust, Michael B. and Gatlin III, Delbert M. (2008). Report of the Plant Products in Aquafeed Strategic Planning Workshop: An Integrated, Interdisciplinary Research Roadmap for Increasing Utilization of Plant Feedstuffs in Diets for Carnivorous Fish',*Reviews in Fisheries Science*,16:4,449 — 455.

Chukwu A and Okpalalzima C (1989). Primary evaluation of *C. populnea* gum as a binder in Sodium Sachy late tablet formulation. *Drug Dev. Ind. Pharm. 15(2)*: 325-330.

Davies, SJ., Thomas, N. and Bateson, RL. (1989) "The nutritional value of a processed soy protein concentrate in diets for tilapia fry (*Oreochromis mossambicus*, Peters)". *Israeli Journal of Aquaculture-Bamidgeh* 41, 3-11.

Durunma, CS., ABI. Udebibie and GA. Anyanwu, (2000). Combination of maize/sorghum and cassava tuber meal as a substitute for maize in diet of laying hens. In: *Proceedings of the 25th Annual Conference of the Nig. Soc. Anim. Prod*. Umudike.

Duncan, DB. (1955). Multiple range and multiple F tests. *Biometrics 11*:1-42.

El-sayyed DMSD., and Gaber MMA. (2004). Use of cottonseed meal supplemented with iron for detoxication of gossypol as a replacement of fish meal in Nile Tilapia, *Oreochromis niloticus* (L.) diets *Aquac. Res. 35*, 859 – 869.

Eromosele IC, Eromosele CO, Kuzhkuha DM (1991). Evaluation of mineral elements and ascorbic acid contents in fruits of some wild plants. *Plant Foods Hum. Nutr. 41*: 151-154.

Fagbenro OA and Davies, SJ. (2000) use of soybean flour (dehulled solvent entracted soybean) as fish meal substitute in practical diets for African catfish, (*Clarias gariepinus*, Burchell1822); growth, feed utilization and digestibility: journal of applied technology 16 in press

Falayi BA., Balogun AM., Adebayo OT., Madu CT., Eyo A.A., (2004). Comparison of seven locally prepared starches Nigeria with sodium carboxyl methylcellulosefor water stability in African catfish (*Clarias gariepinus*) feeds. *Journal of Sustainable Tropical Agricultural Research*, 9: 104-108.

Falayi BA., Balogun AM., Adebayo OT., Madu CT., Eyo AA., (2003). Leaching of Feed nutrients, economic losses to fish farming. *Journal of Aquatic Sciences,* 18(2): 119-124.

Iwe MO. and Atta C (1993). Functional properties of the active ingredients of *C. populnea.* Crill. Perr. pp. 29-53.

Osuigwe, DI.; Obiekezie, AI. and Onuoha, GC. (2005). Some haematological changes in hybrid catfish (*Heterobranchus longifilis x Clarias gariepinus*) fed different dietary levels of raw and boiled jackbean (*Canavalia ensiformis*) seed meal. *African Journal of Biotechnology Vol. 4 (9)*, pp. 1017-1021.

Rehulka, J. (2003). Haematological and biochemical analysis in rainbow trout, *Oncorhynchus mykiss* affected by *Viral Haemerrhagic Septicaemia* (VHS). *Dis. Aquat. Org.*, 56:186-193.

Southgate P. (1993). Disease in Aquaculture for Veterinarians. *Fish Husbandry and Medicine*. Lydia Brown (Ed.). Pergamon Press. New York pp 91 – 129.

Steffe JF., Mohammed IO, and Food EW. (1983). Rheological properties of fluid foods. *ASAE*. 83: 781-783.

Tacon, AGJ. (1985). Nutritional Fish Pathology. Morphological Signs of nutrient deficiency and toxicity in farmed fish, *Aquaculture Development and Coordination Programme Report No. 85*: 22-23.