Effects of Grasshopper Meal in the Diet of *Clarias Gariepinus* Fingerlings

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Abstract

A study was conducted to assess the effects of grasshopper meal in the diet of *Clarias gariepinus* fingerlings. The aim was to substitute fishmeal with grasshopper meal in the formulation of *Clarias gariepinus* fingerlings feed. Feeds were formulated using different quantities of fishmeal and grasshopper meal and were used in feeding *Clarias gariepinus* fingerlings. Result shows that the best growth and feed utilization indices were recorded in the fingerlings fed 20% fishmeal and 10% grasshopper meal followed by those fed 15% fishmeal and 15% grasshopper meal. The least growth rate was recorded in fingerlings fed only 30% grasshopper meal. It could be concluded that *Clarias* fed with diet containing 10% grasshopper meal combined with 20% fishmeal produced the best growth rate.

Keywords: Growth; Grasshopper meal; *Clarias gariepinus*; Fingerling

Introduction

Fish is the major source of protein for most Nigerians. The increasing human population and the desire to obtain a nutritionally balanced level of protein intake is a major cause of the high fish demand in Nigeria. Aquaculture which is expected to bridge the gap between fish supply and demand is constrained generally by inappropriate technologies [1].

Fish feed is presently very expensive; both imported and locally produced ones. This is among the problems facing successful aquaculture in Nigeria coupled with good quality fish Falaye [2,3]. This is as a result of the competing need of the agricultural produce and by-products between man and livestock Salami et al. [4] and between livestock and fish in the formulation and production of the animal feed. Various protein sources have different amino acids, both essential and non-essential. A deficiency of one or more of these essential nutrients results in reduced growth rate, depressed diet, disease or even death NRC [5].

In the last decade, much effort has been made with the use of soybean meal as a good alternative to fishmeal in the diet of *Clarias gariepinus* [6-12]. Many researchers have attempted to use varied substitutes to fishmeal in *Clarias gariepinus* production with varying results. Faturoti and Oyelese [13] found yellow maize and sweet potato as a good energy source in the diet of *Clarias gariepinus* while, Eyo [14] obtained poor growth rate while feeding *Clarias anguillaris* with soybean diet. Ufodike and Ekokotu [15] confirmed that excess levels of dietary protein might retard fish growth due to energy expenditure in deamination and excretion of excess protein. Ofoekwu and Ejike [16] also obtained poor results with cottonseed meal in Clarias food.

Edible Grasshoppers and locusts which include Nomadacris septemfasciata, Kraussarida sp., Katantop sp., Anacridium sp., Catalepsus sp., Heterolophus sp., Gelestorhinus sp., and Locusta sp. are found to invade most of the North-eastern and Central States of Nigeria at a particular season of the year causing great consequences on crops Sharah [17]. These grasshoppers also serve as a delicacy to nation of North Eastern Nigeria during these invasions. These grasshoppers are as rich as the fishmeal in terms of its amino acid profile (Table 1). Encouraged by the similarity in the quality of the amino acid profile of fish and grasshopper meal, this research decided to replace fishmeal with grasshopper meal to ascertain if these qualities of the grasshopper can compare favorably in growth production of *Clarias gariepinus* as that obtained or fishmeal in the same species.

Materials and Methods

Preparation of grasshopper meal

Samples of edible grasshoppers and locusts were collected from the market located in Maiduguri irrespective of their sizes and species. The samples were dewinged, all appendages removed, sunried and crushed into powder with milling machine. Proximate analysis of the powdered samples was performed using standard methods AOAC [18]. Fibre content was assessed according to Cullison. The protein was measured by calorimetric method (Vanadomolybdale yellow method) (Table 2) with a varian 634 UV-visible spectrometer. Crude protein was calculated as total Kjeldahl N x 6.25.

Experimental diet

The feedstuffs used were obtained locally within Maiduguri town. The soybean was toasted for 15 minutes according to Eyo [14]. Other ingredients such as groundnut cake, fishmeal, yellow maize, maize bran were obtained and ground into powder with the toasted soybean and grasshopper. A 45% CP feed was obtained from the combination of the feed ingredient in the diet and mixed with the premix.

Different diets (those containing only fishmeal and those containing grasshopper meal at various inclusion levels) were formulated using different treatments which include feed containing only fishmeal, feed containing only grasshopper meal and feed containing both fishmeal and grasshopper meal. The feed was pelleted using kitchen hand cranker. The pelleted feed was crushed into crumbles before administering them to the fish.

Experimental design and treatments

Fingerlings weighing between 15-20 g were obtained from the hatchery and conditioned in net hapa (1 m x 1 m x 1.2 m) installed in a pond and provided with the formulated feeds according to the treatments formulated. Different treatments which include feed containing only fishmeal, feed containing only grasshopper meal, feed containing both fishmeal and grasshopper meal and feed containing only grasshopper meal and fishmeal. The fish were fed twice daily at 08:00 and 16:00 hours with the formulated feeds. The experiment was conducted for a period of 6 weeks from November to December 2012. The stocking density was 50 fingerlings/ha. The fish were hand fed of pellets at a ration of 3% body weight at morning and afternoon.

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and protein efficiency ratio (PER) were calculated.

Feeding rate was adjusted weekly based on body weight. Water quality parameters such as temperature and pH were monitored. Feeding rate was adjusted weekly based on body weight. Water quality parameters such as temperature and pH were monitored.

Results

Discussion

Table 1: Comparative Amino acid profile of the proteins of fishmeal and grasshopper meal

| Amino acid | Fish meal | Grasshopper meal |
|------------|-----------|-----------------|
| Lysine     | 7.85      | 5.87            |
| Histidine  | 2.22      | 4.24            |
| Arginine   | 5.82      | 7.62            |
| Aspartic   | 9.35      | 9.32            |
| Threonine  | 4.55      | 4.08            |
| Serine     | 4.55      | 5.22            |
| Glutamic   | 13.3      | 15.21           |
| Proline    | 4.35      | 5.02            |
| Glycine    | 5.90      | 4.78            |
| Alanine    | 6.34      | 5.29            |
| Cysteine   | 0.70      | 1.79            |
| Valine     | 5.65      | 3.47            |
| Methionine | 2.84      | 1.96            |
| Isoleucine | 4.85      | 4.21            |
| Leucine    | 7.35      | 5.30            |
| Tyrosine   | 3.45      | 2.88            |
| Phenylalanine | 4.35  | 4.50          |

Table 2: Product file for formulating 45% crude protein for Clarias gariepinus

| FEEDSTUFFS       | % INCLUSION LEVEL |
|------------------|-------------------|
| Yellow maize     | 10.11             |
| Groundnut cake   | 25.80             |
| Soybean meal     | 25.80             |
| Fishmeal/grasshopper meal | 30 | |
| Cassava tuber starch | 5 | |
| Premix (vitamin) | 2                 |
| Salt             | 0.29              |
| Bone             | 1                 |
| Total            | 100.00            |

Table 3: Experimental Design with Grasshopper/ Fishmeal inclusion in the diets

| Treatments | Fishmeal inclusion (%) | Grasshoppermeel Inclusion (%) |
|------------|------------------------|-------------------------------|
| 1          | 30                     | -                             |
| 2          | 20                     | 10                            |
| 3          | 15                     | 15                            |
| 4          | 10                     | 20                            |
| 5          | -                      | 30                            |
result of good quality essential amino acid present in both feedstuffs when combined.

Little mortality was recorded in all the treatments as a result of improper acclimatization and low temperature during the first 2 weeks (which was between 21-23°C) of the study. This is in line with Falayi [2,3] who say that warm water fish grows best at temperatures between 25-32°C.

Conclusion

A lot of research had been carried out on suitable substitutes for fishmeal in fish diet. Grasshopper meal has been shown to contain most of the essential amino acids in higher proportions than other protein feedstuff like bloodmeal, groundnut cake and soybean meal.

The growth performance of Clarias gariepinus fed with five different diets containing grasshopper meal at varying inclusion level was monitored for 56 days in net hapas installed in concrete tank. The overall best performance was obtained in treatment 2 and 3 respectively. This is an indication of the potentials of grasshopper meal to substitute fishmeal for Clarias gariepinus to achieve optimal growth.

Based on the result obtained, more studies should be carried out on other conventional feedstuffs of least cost for growth performance of Clarias gariepinus and possibly other aquacultural fish.

References

1. Ajana AM (2002) Over view highlight and protein of fisheries in Nigerian aquaculture.
2. Falaye BA (2009a) Feed nutrients chemistry and importance in fish and livestock production.
3. Falaye BA (2009b) Tropical feedstuffs composition tables and biological catalogues in fish and livestock production.
4. Salami AA, Balogun OB, Fagbenro, Edible L (1992) Utilization of non-pulitont extract in breeding of Clarias gariepinus.
5. NRC (1993) Nutritional requirements of warm water fish and shellfishes. National Academy Press. Washington DC, USA.
6. Balogun AM, Ologbobo AD (1989) Growth performance and nutrient utilization of fingerlings of Clarias gariepinus (Burchell) fed raw and cooked soybean diets. Aquaculture 76: 119-126.
7. Sadiku SOE, Jauney K (1998a) Utilization of enriched soybean flour by Clarias gariepinus. J Aqua Tropics 13: 1-10.
8. Sadiku SOE, Jauney K (1998b) Digestibility, apparent amino acid availability and waste generation potential of soybean flour-poultry meat meal blend diets for the sharp-toothed catfish fingerlings. J Applied Aquaculture 6: 69-75.
9. Fagbenro OA, Davies SJ (2002) Use of soybean flour (dehulled solvent extracted soybean) as fishmeal substitute in practical diet for African catfish, Clariasgariepinus (Burchell 1822) growth, feed utilization and digestibility. Journal of Applied Ichthyology 17: 64-69.
10. Fagbenro OA, Davies SJ (2003) Use of high percentages of soy protein concentrate as fishmeal substitute in practical diets for African catfish growth, feed utilization and digestibility. Journal of Aquaculture 16: (1).
11. Eyo AA (1994) Fish feed production techniques in agro products.
12. Davies SJ, Fagbenro OA, Abdel-Waritho, Diller I (1999) Use of soybean products as fishmeal substitute in African Catfish Clariasgariepinus, diets. Applied Tropical Agriculture 4: 10-19.
13. Faturoli EO, Oyelese I (1989) Digestibility and utilization of yellow maize and sweet potato based diets by Clariasgariepinus.
14. Eyo AA (1999) The effect of different method of soybean processing on the growth and food utilization of African mudfish Clariasanguillaris(L) fingerlings. J Biotech 10: 9-10.
15. Ufodike EBC, Ekotolu PA (1986) Protein digestibility and growth of African catfish fed blood meal and algae diets. Acta hydrobiologica 28: 237-243.
16. Ofojekwu PC, Eije C (1984) Growth response and feed utilization in tropical Cichlid Oreochromisniloticus (Lin) fed on cottonseed based artificial diets. Aquaculture 42: 27-37.
17. Sharah HA (2012) The driving force behind increasing grasshopper frying business in Maddugun: Profitability or Joblessness? Int J Eco Dev Res Invest 3: 110-117.
18. Association of Official Analytical Chemists (A.O.A.C) (1995) Official methods of analysis of A.O.A.C. Washington DC, USA.
19. Njidda AA, Isidahomen CE (2010) Haematology, blood chemistry and carcass characteristics of growing rabbits fed grasshopper meal as a substitute for fishmeal. Pak Vet J 30: 7-12.
20. Okoye FC, Nnaji JC (2004) Effect of substituting fishmeal with grasshopper meal on the growth and food utilization of the Nile Tilapia, Oreochromisniloticus fingerlings.
21. Lopez-Alverado L, Langdon CJ, Teshima S, Kana- Sawawa A (1994) Effect of coating and encapsulating of crystalline amino acids on leaching in larva feeds. Aquaculture 122: 335-345.
22. Eyo AA (2001b) Chemical composition and amino acid content of the commonly available feedstuffs used in fish feed in Nigeria.
23. Haruna BA (2003) Aquaculture in the tropics. Theory and practice. Al-Hassana Publishers Abuja, Kaduna, Kano- Nigeria.
24. Gbadamosi OK, Daramola JA, Osungbemiro (2007) Growth performance and nutritional utilization of vitamin c in diet of African catfish fingerlings. Acta Zoological science 58: 763-766.