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# Proximate Composition of Some Commercial Fish Feeds Sold in Nigeria

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## ABSTRACT

A study was undertaken to analyse and compare with manufacturers' declaration the nutrient content of some feeds available in Nigeria through proximate analysis. The commercial fish feeds collected from the markets were Adolf Calyx, Coppens, Dizengoff and Durante. Proximate composition such as moisture, crude protein, crude lipid, ash, fibre and NFE (nitrogen free extract) were analysed. In general, there was variation between analysed and company declared nutrient contents of different feeds especially the protein and lipid content of the feeds. Apart from Adolf Calyx, all the analysed feeds had protein contents of above 40% which is good for catfish production as recommended by the manufacturer.

**Key words:** Proximate composition, commercial fish feeds, Adolf calyx, Coppens, Dizengoff, durante

## INTRODUCTION

The nutrient balance of feed influences feed utilization and growth of fish. It is very essential to know the nutritional requirements particularly for protein, lipid and energy for optimum growth of a fish species as well as in formulating a balanced diet. According to Lovell (1989), dietary protein and energy levels are known to affect the growth and body composition of fish species. Some authors (Phillips, 1972; Prather and Lovell, 1973; Shyong *et al*., 1998) observed that improper protein, energy and other nutrient levels in feed increased fish production cost especially the recurrent expenditure and deteriorates water quality. While insufficient energy in diets caused protein waste due to the increase proportion of dietary protein used for energy and the produced ammonia can pollute the water and make it unfit for fish culture. However, Daniels and Robinsons (1986) and Van der Meer *et al*. (1997) reported that excessive energy in diets could lead to increased body lipid deposition and growth reduction because of lack of necessary nutrient for growth. From the economic stand point, feed cost appears to be one of the major constraints against the expansion of aquaculture.

There is a paucity of information on the nutrient content of fish feed produced by different feed companies in Nigeria. There are also no reliable published information on chemical composition of commercial fish feed and feed ingredients in Nigeria. The farmers have to depend only on the existing information about the feed composition and growth performance that is given by the feed company. The government has no legal legislation and control over the feed components and feed quality. Also, there are no guidelines for the establishment of a new feed company. So, there is a

great possibility that the farmers will be deceived by the feed manufacturers. There is no monitoring by the government on the quality and nutrient content of the feeds produced by different feed manufacturers, even if there is a possibility to use unauthorized feed ingredients. Sofar, there has been dearth of information on evaluation of the nutrient content of feeds produced by commercial industries (Shyong *et al.*, 1998). Therefore, the present study investigated the nutrient composition of some commercial fish feeds available in Nigerian market and compares these values with those declared by the manufacturers.

## MATERIALS AND METHODS

**Collection and preparation of samples for analysis:** Four commercially available feed samples of 2 mm diameter namely Adolf Calyx, Coppens, Dizengoff and Durante were collected in the months of February to April 2009 from fish feed shops in Makurdi, Nigeria. The required amount of samples were finely ground by a laboratory grinding machine in University of Agriculture Makurdi Nigeria and kept in an airtight container for subsequent chemical analysis which was done within three months.

**Analytical methods:** The proximate composition of different commercial fish feeds were analyzed according to standard procedures given in Association of Official Analytical Chemists (AOAC, 1980). Triplicate samples of each commercial fish type were used to determine the following chemical compositions.

**Moisture:** Moisture was determined by keeping 2 g of the commercial fish feed samples in a thermostat oven at 105°C for 24 h. The difference between the initial weight and the final weight gave the moisture content.

**Crude protein:** Samples (2 g) were digested in digestion unit (Digester, model 2020) for 45 min. The digester was then distilled in distillation unit (Khjeltdah System, Distilling unit, model 1026). Finally, it was titrated with 0.2 N HCL and crude protein was obtained by multiplying the total nitrogen by a conversion factor of 6.25.

**Crude lipid:** Crude lipid was determined by extracting a weighed quantity of sample with acetone in Sechelt Extraction Unit (model 1045).

**Ash:** Ash content was determined by igniting feed samples in a muffle furnace at 450°C overnight.

**Crude fibre:** Samples (2 g) were digested with 0.128 M $H_2SO_4$ with a few drops of octanol in digestion unit (Hot Extractor, Model-1017) for 30 min. Filtering and washing with boiling water removed acid. Residue was boiled with 0.223 M KOH for 30 min, then washed in boiling water and acetone. The residue was dried in an oven at 130°C for 2 h and ignited in muffle furnace at 500°C for 3 h. The loss of weight represented the crude fibre.

**Nitrogen free extracts (NFE):** NFE was calculated by subtracting the sum of moisture, crude protein, crude lipid, ash and crude fibre from 100 (Castell and Tiews, 1980).

**Statistical analysis:** Analysis of variance (ANOVA) at 5% level of significance was used to test the results obtained during this study.

## RESULTS

The results of proximate composition of different feeds analysed and manufacturers' declaration are shown in Table 1 and 2, respectively.

**Moisture:** Result obtained from analysis showed that moisture contents varied between 6.87 to 8.10 % (Table 1). However, manufacturers' declared moisture content of most of the collected feed samples was lower as indicated in Table 2.

**Crude protein:** Result of analysed crude protein contents was highest in Dizengoff (52.65%) and lowest in Adolf Calyx (25.89%). Cop pens and Durante had crude protein contents of 43.75% each (Table 1) as compared to company's declarations of 42, 45, 53, 45 and 45%. For Adolf Calyx, Cop pens, Dizengoff and Durante. Even though there were differences between the analysed and company declared protein values they were not significantly different except for Adolf calyx feed ($p>0.05$).

**Crude lipid:** The analysed crude lipid contents of different fish feeds varied considerably among the feed. The mean range of crude lipid was recorded as 10.75 (Durante) to 14.77% (Dizengoff) as shown in Table 1. Similarly, there were differences between the analysed and company declared crude lipid values even though they were not significantly different (except for Dizengoff) from the company mentioned values ($p>0.05$).

**Ash:** Result of analysed ash contents of the collected commercial fish samples were in the range of 5.33-9.45% as shown in Table 1 while Table 2 shows the manufacturer's declaration range of 5.1-8.4%.

**Crude fibre:** The analysed crude fibre contents of Adolf Calyx, Cop pens, Dizengoff and Durante were 12.73, 7.43, 3.20 and 5.27% (Table 1). Fibre contents of different feeds from all companies under study were significantly higher than the company declared maximum values ($p>0.05$).

Table 1: Mean proximate composition of analysed feeds

| Proximate composition (%) | Coppens | Dizengoff | Durante | Adolf calyx |
|---|---|---|---|---|
| Moisture | 8.10±0.27 | 8.62±0.087 | 7.20±0.06 | 6.87±0.11 |
| Ash | 9.44±0.12 | 5.33±0.02 | 7.23±0.17 | 7.45±0.15 |
| Crude protein | 43.75±0.00 | 52.65±0.10 | 43.75±0.00 | 25.89±0.51 |
| Crude lipid | 11.93±0.13 | 14.77±0.05 | 10.75±0.06 | 12.50±0.04 |
| Crude fibre | 7.42±0.62 | 3.20±0.04 | 5.27±0.05 | 12.73±0.10 |

Values are Mean±SD

Table 2: Manufacturers' proximate composition of feeds

| Proximate composition (%) | Coppens | Dizengoff | Durante | Adolf calyx |
|---|---|---|---|---|
| Moisture | 8.3 | 8.8 | 7.3 | 7.5 |
| Ash | 9.5 | 8.4 | 8.0 | 5.1 |
| Crude protein | 45.0 | 53.0 | 45.0 | 42.0 |
| Crude lipid | 12.0 | 14.0 | 11.0 | 13.0 |
| Crude fibre | 1.5 | 1.6 | 2.6 | 1.7 |

## DISCUSSION

Good growth, health and reproduction of commercial fish and other aquatic animals are primarily dependent upon an adequate supply of nutrient, both in terms of quantity and quality, irrespective of the culture system in which they are grown. Therefore, supply of inputs (feeds, fertilizers etc.) has to be ensured so that the nutrients and energy requirements of the species under cultivation are met and the production goals of the system are achieved (Hasan, 2001). Nowadays, commercial fish feeds are widely used to get more aqua cultural production. Protein is the major growth promoting factor in feed. The protein requirement of commercial fish are influenced by various factors such as commercial fish size, water temperature, feeding rate, availability and quality of natural foods and overall digestible energy content of diet (Satoh, 2000; Wilson, 2000). The present study was undertaken to know the actual proximate composition and compare with the nutrient content declared by the different companies in Nigeria. From the chemical analysis, it was observed that most of the analysed data on crude protein were more or less similar to the company declared values. The crude protein content of most of the feeds of different commercial fish industries analysed was within the acceptable range recommended for commercial fish (NRC, 1983). Wilson (2000) reported that most of the commercial fish feeds for example catfish feeds contain 32% crude protein. Boonyaratpalin (1988) estimated the protein requirement for tropical catfish to be 35-40, 25-35 and 28-32% for fry, grow-out and brood stock. Watanabe *et al.* (1990) observed that fish production increased through the utilization of high amounts of protein i.e., 35% and above in their diet and phase feeding may be more profitable. Lipids are primarily included in formulated diet to maximize their protein sparing effect (Hassan) by being a source of energy. The observed lipid values were in line with that of Cowey and Sargent (1979) who reported that in general, 10-20% of lipid in most freshwater fish diets gives optimal growth rates without producing an excessively fatty carcass. On the other hand, Wilson (2000) reported that lipid level in catfish feeds should be 5 to 6%. Luquet (2000) also, stated that dietary lipid levels of 5 to 6% are often used in tilapia diet.

All plant ingredients contain a certain amount of fibre. Fibre provides physical bulk to the feeds. A certain amount of fibre in feed permits better binding and moderates the passage of feed through the alimentary canal. However, De Silva and Anderson (1995) noted that it was not desirable to have a fibre content above 8-12% in diets for fish, as the increase in fibre content would consequently result in the decrease of the quality of an unusable nutrient in the diet. When the fibre content is excessive, it results to lower digestibility of nutrients. The analysed crude fibre content of all the diets under study were within the safe dietary limit for fish except for Adolf Calyx.

The research has revealed that even though there were variations between manufacturers' declaration and results obtained from the present study, the Crude protein contents of all the feeds, except Adolf Calyx, was above 40% and therefore suitable for catfish culture.

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