Analysis of Poultry Waste as A Potential Feed for the Growth and Development of Fishes

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Abstract: **This research work was carried out to evaluate poultry waste as a potential feed for fish growth and development. The poultry droppings from five different locations were collected and analysed for the presence of Crude protein, fat, Crude fibre, Carbohydrate, Moisture, dry matter and ash percentage, as well as some of the mineral nutrients such as calcium, potassium, magnesium, sodium, copper, zinc, iron and manganese which are necessary for the fishes. The proximate analysis showed the estimated content of crude protein-21.92±0.06%, fat content-2.61±0.13%, crude fibre-16.00±0.08, carbohydrate- 21.56±0.04, moisture-9.94±0.13%, dry matter-90.14±0.025% and ash-28.58±0.04%. The minerals nutrient composition for metals analysed is as follows; calcium-2342±4.31mg/kg, potassium: 6161.83± 54.80mg/kg, Magnesium-1121.667±4.014mg/kg, sodium-302.266±5.18mg/kg, copper-100.54±2.40mg/kg, zinc-397.33±3.05mg/kg, iron-512.66± 3.05mg/kg and manganese- 253.4± 2.25mg/kg. based on the result it can be stated that poultry waste is a good source of nutrients for fishes on the other hand minerals are in the higher quantity than the requirement of fishes, so instead of using poultry manure as a direct feed it can used in combination with other available fish food and can be helpful in formulating a complete fish food.**

Index Terms **roximate, Composition, Potential Fish feed, Mineral, etc**

I. INTRODUCTION

The use of poultry waste as manure and other farm animal manure as feed for fish is very old method. Manuring of fish ponds is a means of increasing fish production was known in China in the fourth and fifth century B.C. The increasing cost of fish feed has made research interest to be focused on alternative source of fish feed. The reuse of manure is one way of creating edible protein from waste material which is disposed off uneconomically and also creates a nuisance (FAO) [8, 9 and 10]. Poultry manure is a potential source of protein. It has attracted the attention of animal nutritionists all over the world because of its richness of protein, calcium, phosphorus as K2O and magnesium as MgO and other minerals [19 and 20]. Recently, fish farming especially integrated fish farming system has been encouraged to recycle wastes from animal dung (especially poultry) as food for fish rather to discard it. Poultry manure is not only used as organic manure in the production of plankton but also directly consumed by fish in the culture system. Although, this observation has been verified by many workers [11, 12, 15 and 17] information on the effect of the dung when incorporated into artificial fish diets are scarce. A range of poultry by products are produced and re use in livestock feeds, including feather meal, blood meal, poultry litter meal etc. [16] and poultry waste are also used as fertilizer and soil conditioners. Also manure supply nitrogen and phosphorus for utilization by algae and provide a substrate for zooplankton production [5 and 20]. Poultry manure has been used widely in both fresh and brackish water aquacultures. Furthermore, research has shown that fish cultured under the integrated chicken-fish farming system are fit for human consumption [1]. Therefore the objective of this paper is to analyse poultry wastes as a potential feed supplement for fish growth.

II. MATERIALS AND METHODS

Poultry manure was collected from five different poultry farms from Beed District. The study was conducted between July to September, 2023, at the Department of Zoology, Milliya Collage Beed.

Sample Preparation: The samples were sun dried for two weeks to reduce the odour and also to prevent microbial contamination. After which the samples were pulverized in a cleaned pre-treated mortal.

Thereafter, samples were sieved and packed in clean pre-treated polyethylene bags and were taken for the proximate and mineral composition analysis.

Proximate Analysis: Proximate analysis (Crude protein, fat, Crude fibre, Carbohydrate, Moisture, dry matter and ash) and mineral nutrient composition (calcium, potassium, magnesium, sodium, copper, zinc, iron and manganese) were carried.

1. Determination of Crude Protein: Micro kjeldhal method [6 and 13] as used to determine the crude protein.

Calculation: % Nitrogen= $\frac{\text{Value of HCL}\times 0.1\times 0.014}{\text{weight of sample}}\times 100$

% of Crude Protein = % Nitrogen × Conversion factor (Conversion factor for animal and plant origin is 6.25 & 5.90 respectively).

2. Determination of Fat:

Fat is examined with low boiling organic solvent (petroleum ether/ diethyl ether, xylem) by soxhlet extraction and the extract thus obtained weighed after recovery of the solvent. Crude fat was determined through Soxhlet extraction technique [13 and 14] sing hexane (65 ºc-70 ºc) as the solvent.

Calculation % of crude fat = (corrected weight of fat ÷ weight of sample) × 100

3. Determination of Crude Fibre:

0.5g of sample (dried) was weighed into 500ml conical flask. 100ml of trichloroacetic acid digestion reagent was added to the conical flask. The mixture in the conical flask was boiled and refluxed for 40 minutes. After refluxing, the flasks was removed from the beater and cooled under cold running tap of water. The cooled mixture in the flask was filtered through whatman filter paper and residue washed six times with hot water and once with methylated spirit. The residue was then transferred into a crucible, dried in an oven an 105^0C, cooled and weighed. The Crucible and content was transferred to a muffle furnace preheated at 600^0C and ashed for about 4 hours. After ashing was judged completed, the crucible was cooled in desiccators and weighed after cooling and weigh recorded as W2. Thus the % fibre was then calculated using the formula

$$\text{\%of Crude fiber} = \frac{\text{W2} - \text{W1}}{\text{weight of sample}}\times 100$$

W1 = Weight of Crucible + content before ashing, W2 = Weight of crucible after ashing.

4. Determination of Total Carbohydrates:

The total carbohydrates content in the sample was obtained by difference as follows.

100-(Weight in grams {protein + fat + water + ash} in 100g of sample).

5. Determination of Moisture:

Moisture contents in the feed were determined by [2, 3 and 4]. The percentage of the moisture content in the sample was calculated by the following formula:

$$\text{\% of moisture} = \frac{\{\text{weight of original sample} - \text{weight of dried sample}\}}{\text{weight of original sample}}\times 100$$

6. Determination of Dry Matter:

This was obtained by deducting the moisture content from 100 % Dry matter= 100-%moisture

7. Determination of Ash:

Ash content of each feed was estimated by following incineration method [14]. Calculation: % of ash= (weight of ash ÷ weight of sample) × 100

8. Determination of Mineral Content (Na, K, Cu, Ca, Mg, Zn, Fe and Mn):

5g of already pulverized sample of poultry manure was weighed into pre-cleaned crucible. Then a few drops of HNO3 were added as ashing aid. The sample was then dry-ash in a muffle furnace by stepwise increment of temperature for 4 hours [6]. Dry ashing was carried out in the sample before analysis to destroy all or most of the organic matter present in the sample so as to reduce matrix interference and concentrated most of the metals in a ready available form for analysis. Furthermore after ashing ash sample was cooled in the desiccators and dissolved in 5ml 1M Nitric acid, then the digested sample was filtered into 25ml volumetric flask and the crucible further rinsed with distilled water into the flask to ensure quantitative transfer. The digest was then made to mark with distilled water and store in a polyethylene bag for ready for analysis. Blank was also determined by taking distilled water through the whole process but omitting the sample and taking for analysis too. Concentration of mineral nutrient is derived from the formula below.

$$\text{Concentration Mg/Kg} = \frac{(\text{C} - \text{B})\times \text{E}}{\text{S}}$$

Where: C = the instrument concentration reading (mg/L), B = blank, E = extract volume which represent the final volume of digest used and S = Sample weight used.

III. RESULTS AND DISCUSSION:

The result of proximate Analysis of poultry waste was presented in table 1. The result shows that dry matter has the highest proximate constituent (90.14±0.025), followed by ash (28.58±0.04), crude protein (21.92±0.06), total carbohydrates (21.56± 0.04), crude fibre (16.00±0.08), moisture content (9.94±0.13) and fat content (2.53±0.07) as the least proximate constituent.

Table 1: Result of Proximate Analysis (%) of Poultry Waste

Sr.No	Constituents	Means ± SD
1	Crude Protein	21.92±0.06
2	Fat Content	2.53±0.07
3	Crude Fiber	16.00±0.08
4	Total Carbohydrate	21.56± 0.04
5	Moisture content	9.94±0.13
6	Dry matter	90.14±0.025
7	Ash	28.58±0.04

Result expressed in Mean ± Standard Deviation of triplicate analysis

Mineral Nutrient Composition of Poultry Waste (mg/kg): The result of mineral nutrient composition of poultry waste was presented in table 2. K recorded the highest mineral nutrient composition (6161.833±54.80), followed by Ca (2342±4.31), Mg (1121.667±4.014), Fe(512.66± 3.05), Zn (397.33±3.05), Na (302.266±5.18), Mn (253.4± 2.25) and Cu (100.54±2.40) as the least mineral composition.

Table 2: Mineral Composition of Poultry Waste (Mg/Kg)

Sr.No	Minerals	Means ± SD
1	Ca	2342±4.31
2	K	6161.833±54.80
3	Mg	1121.667±4.014
4	Na	302.266±5.18
5	Cu	100.54±2.40
6	Zn	397.33±3.05
7	Fe	512.66± 3.05
8	Mn	253.4± 2.25

Result expressed in Means ± Standard Deviation of triplicate analysis;

Ca = calcium, Cu = copper, K = potassium, Fe = iron , Mg = magnesium; Mn = manganese, Na = sodium.

Minerals are inorganic elements necessary in the diet for normal body functions. They can be divided into two groups (macro-minerals and micro-minerals) based on the quantity required in the diet and the amount present in fish. Common macro-minerals are sodium, chloride, potassium and phosphorous. These minerals regulate osmotic balance and aid in bone formation and integrity. Micro-minerals (trace minerals) are required in small amounts as components in enzyme and hormone systems. Common trace minerals are copper, chromium, iodine, zinc and selenium. Fish can absorb many minerals directly from the water through their gills and skin, allowing them to compensate to some extent for mineral deficiencies in their diet [7 and 12]. The mineral composition (Ca, K, Cu, Mg, Na, Zn, Fe and Mn) of the poultry waste were estimated and found to be as follows for each mineral element determined.

IV. CONCLUSION

This study offer insight into the nutritive value of poultry waste, which was disposed of thereby constituting environmental menace. However, form the evaluation of the poultry waste it can be concluded that it is a rich course of Protein, Carbohydrate, fat content, crude fibre, ash content and also the mineral nutrients required by fish in traces were also satisfactory. Thus poultry waste with these levels of nutrient value can serve as feed as well as feedstuff blended with other conventional feeds to enhance fish growth and production.

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