African Journal of Applied Zoology & Environmental Biology. 2005. Vol. 7, 140 – 143
ISSN 1119-023X
www.uniportjournals.com/ajazeb

ROASTED MAGGOTS (DIPTERAN LARVAE) AS A DIETARY PROTEIN SOURCE FOR LABORATORY ANIMALS

R. F. Ogunleye and J. B. Edward
DEPARTMENT OF ZOOLOGY, UNIVERSITY OF ADO EKITI
P. M. B. 5363, ADO EKITI, NIGERIA.

ABSTRACT

The possibility of using the dipteran larvae (maggots) as protein substitute in the feeding of Albino rats was investigated. Two sets of rats were used. One set were fed with the convectional feed (set G,) with Clarias fish as its protein portion while the other set (M) were fed with same diet with maggots from poultry wastes as its protein portion. The feeding was done for five weeks before the experiment was terminated. Weekly assessment of weights (in g) and lengths (in cm) was done. The result of the proximate analysis shows a well comparable level of protein in the experimental diet (29.3%) and the control (27.4%). All the minerals contained in the experimental diet are higher in quantity than that of the control. Weight gain in rats fed with experimental diet rises more sharply than that of the control. There was however no significant difference between the lengths of the two sets of rats within the five weeks of the experiment.

Key words: Albino rats, growth rate, maggots.

INTRODUCTION

Poultry industry is one of the most lucrative business ventures both in the developed and developing countries of the world. These industry producers about 700 million-broiler chickens annually on the Delmarva Peninsula which generates a lot of income in the peninsula.

Despite the high level of protein derived from poultry farming as well as the monetary gain, the poultry litter (PL) produces a lot of undesirable effects in the environment. The effect includes; undesirable foul odour, which could be nauseating and trigger off vomiting, environmental pollution due to the massive amount of Nitrogen, phosphorus and potassium generated by the PL (Hollerman, 2004). The poultry litter when not properly managed, could be transported via erosion into the water bodies causing: excessive growth of algae, which may lead to depletion of dissolved oxygen of the water body; consequently, leading to massive death of fish and other aquatic fauna. Hallermen (2004), reduction of water quality Shewgoor et, al (1994), high level of Nitrates in water can cause Methemoglobinemia, a blood disorder in infants also known as "blue baby disease" Feacal coliform bacteria are present in excrements of all warm–blooded animals. These bacteria present health, risk problems to humans swimming in or consuming the contaminated water (Edwards 1986, 1993).

In order to keep the above listed effects to the barest minimum, farmers have device the following means; processing of PL into compost products either in form of pellets or in raw form and applied into the soil far enhanced crop yield, animal feeds; Because PL contains undigested feed, metabolic products from microbial synthesis, true protein and nutrients, it can potentially be used as a feed stuff in the diets of cattle, sheep poultry and some. Due to its high pathogens and contaminants, PL must be dried and sterilized by way of heating pelleting, chemical treatment and ensiling before its usage (Muller, 1980), bio – energy production; poultry litter has a gross energy value close to that of wood and about half that of coal. Therefore, PL has potential as a fuel to produce energy. Anaerobic digestion of organic wastes produces biogas which is approximately 60%. Methane (CH_4) and 38% carbon dioxide (CO_2). The remaining 2% is water vapour, ammonia (NH_3) and hydrogen sulphide (H_2S) methane can be directly burned for heat or serve as a find for internal combustion of engines. Dagnal, (1992).

One of the ways of utilizing the poultry wastes is to allow them to stay on poultry site for a minimum period of 10days before disposing them. During the ten days, the PL, if exposed to flies, could breed a lot of fly maggots, which are very useful in the following ways; as food source for carnivorous fish in ponds Michael and Imrecsavas (1993), maggots have been found useful in medicine as it facilitates the healing of long-term wounds. Fly maggots have the ability to digest the surface tissues of the wound and also engulfing and feeding of the Bacteria and other micro-organisms on the wound. The goes a long way in making the drugs applied on the wound work faster (NGN 2003).

This paper examines another possible use of maggots generated from poultry litter. Laboratory animals (Albino rats) are rodents belonging to the family Muridae. They are widely used in scientific studies and most frequently used in Biomedical Research such as surgical and anatomical research. Their use also include studies involving ageing, drug effects and toxicity dental cares, vitamin effects, behaviour, alcoholism effects, arthritis etc.

These animals are maintained the laboratory by feeding them with convectional growers marsh. One of the factors militating against the availability of food is the scarcity and cost of its protein constituent. Efforts are however been made to replace the protein constituent of convectional feeds with insects which are readily available and with no cost at all. Ogunleye and Omotoso (2006).

The objective of this paper is to find the effects of replacing protein constituent of a convectional grower's marsh with maggots on the growth performance of laboratory rats.

MATERIALS AND METHODS

THE POULTRY SITE

The poultry site used for this experiment was located at Akure Township in Ondo state, Nigeria. The poultry consisted of 240 layer fowls kept in cages from where the faecal matter dropped freely on a clean Cement floor.

BREEDING OF DIPTERAN LARVAE

Flies on sensing the odour of the faecal mater, do come naturally from the environment to lay eggs on it. However,, to attract more flies, about (10) eggs were broken, and the yolk and albumin of the eggs were sprinkled on the feaces. This actually attracted more flies into the poultry site.

Fly eggs were laid in bathes and they hatch the following day to first-instar larvae. The first instar larvae were left to develop to the fourth instars. (a cycle which in completed within four days). At this stage, the larvae (maggots) were larvae were collected on the faecal matter into large bowls of about 1000 litre capacity. They were left for 2 hours.

It was discovered that after two hours, all the maggots were coming out of the dung to receive atmospheric oxygen for respiration It was therefore easy to collect them en – masse on top of the dung.

PREPARATION OF MAGGOTS FOR FEED COMPOSITION

After collection, the maggots were washed several times in water and drained with a sieve that could retain the larvae while letting go the remaining waste products.

The larvae were then killed by pouring boiling water on them for two minutes and drained. The dead maggots were immediately oven-dried at the temperature of 950C.for six hours. The resulting dry maggots were kept in the refrigerator for six hours to retain its freshness.

FEED COMPOSITION

The convectional grower's marsh was used as the control. For the experimental diets, The protein component of the marsh was replaced with the fried maggots as shown in the table below:-

TABLE 1: FEED COMPOSITION

Control		Experiment Diet
Table of feed	1	
Maize	2.1	22.1
Wheat offal	15.0	15.0
Biscuit dust	15.0	15.0
Soya meal	5.06	-
Groundnut cake	9.03	-
Palm kernel cake	12.5	12.5
C / bran	6.02	6.02
Oyster shell	9.03	9.03
Bone meal	2.00	2.00
Salt	0.32	0.32
Fish meal	2.00	-
Lysine	0.08	0.08
Methionine	0.08	0.08
G. nut	0.16	0.16
Maggots	-	16.9

PROXIMATE AND MINERAL ANALYSIS

In analysing the proximate and mineral composition, 5 gm f the two diets were meighed separately and the proximate analytical methods of A.O.A.C (1995) were employed for the analysis.

FEEDING TRIALS

Experimental rats were purchased at the Department of Biochemistry, University of Ilorin. Two groups of ten (10) weanling rats were kept in separate cages for the purpose of the experiment. The two groups were fed with each of the diets separately for a period of five weeks.

Weekly assessment of growth performance of the rats in terms of weight gain and the increase in length was done for the five weeks.

RESULTS AND DISCUSSION

The results of the proximate analysis of the Conventional Growers' marsh (control diet) and that of the feed that contains maggots as its

protein portion (experimental diet) is presented in Table 2. It is interesting to note that the protein portion of the experimental diet (29.40%) is comparable with that of the control (27.30%). This is an indication that maggots from fly larvae could be used as a protein substitute. Although the value got for to percentage fibre content is quiet low that is 2.40% in the experimental as compared with 5.90% in the control, this value could be raised by introducing same little sources of fibre like plant proteins to the experimental feed. The carbohydrate (36.76%) and that of Ash (18.46%) are higher than that of the control which are 30.25% and 16.67% respectively.

TABLE 2 TABLE OF PROXIMATE ANALYSIS

	Control Diet	Experimental Diets
Moisture Content (%)	8.35	9.35
Ash (%)	16.67	18.46
Fat (%)	9.43	5.73
Protein (%)	29.40	27.30
Fibre (%)	5.90	2.40
Carbohydrate	30.25	36.76

Table 3 shows the table of proximate composition of the two test diets. The values for all the essential minerals are higher in the experimental diet when compared with the control.

TABLE 3 TABLE OF MINERAL COMPOSITION

	Control Diet	Experimental Diet
N (%)	4.704	4.368
P ppm	830.12	1041.83
K^+ ppm	1823	2025
Na^+ ppm	774.58	818.25
Ca^{2+} ppm	2434.78	2800.00
Mg^{2+} ppm	817.39	978.46

This indicates that the experimental rats that are fed with diets that contain maggots have the potential of better performance (than the other group) in terms of growth and good health. According to Tietz, (1996), magnesium ions are essential for maintenance of the functional and structural integrity of the myocardium and depletion of it leads to cardiac necrosis. Calcium was also reported to be the prime inorganic messenger for regulation of cell function. It also determines the activity of enzyme e.g. adenylate cyclase and phosphodiesterase. Sodium also plays a central role in maintaining the normal distribution of water and the osmotic pressure in the extra cellular fluid compartment while potassium plays a significant role in nerve impulse transmission.

Figure 1 shows the growth pattern (weight gain) of the two sets of the experimental rats. In the control diet, there was a gradual increase in the weight of the laboratory rats from 9.0gms in the 1st week to 48.0gms in the fifth week. The rats that were fed with the diet with poultry maggots as its protein constituent had a better growth performance than the control rats. There was a relatively sharp increase in weight from an average of 12.0g in the first week to 64.0g in the fifth week. This is not a surprise as the proximate analysis had revealed a greater quantity of protein 29.4% in experimental diet as compared with 27.30% in the control diet. The percentage of fat content (9.0%) is also higher than that of the control (5.00%).

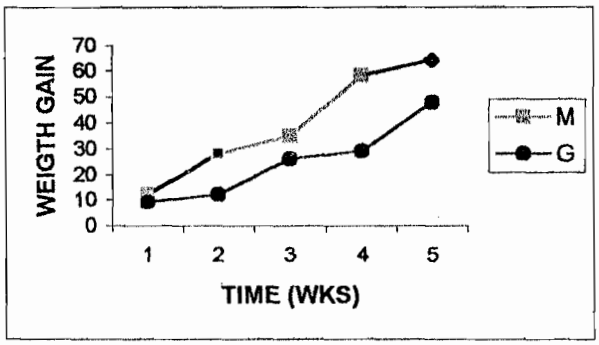

FIGURE 1 GROWTH PATTERN OF RATS (WEIGHT IN GRAMS) FED WITH DIETS CONTAINING POULTRY MAGGOTS AND FISH AS PROTEIN CONSTITUENTS OF ANIMAL FEED

The performance of the albino rats with respect to the length of the body measured from the snout to the tail-tip is presented in figure 2. It can be observed that, the average length of the rates in both the group fed with diets containing maggots (M) and those of the control (G) remained the same from week one to week five with the exception of what was obtained in week 4. However, there was also a steady increase in length from the first to the fifth week in both groups. In the first week, the lengths were 6.8cm and 7.0cm for group M and G respectively and in the fifth week the lengths increased to 9.00cm in both groups. The figure also showed that there was no correlation in the length of rates and its body weight. For instance, even the rats that weighted 64grams in group G in the fifth week (Fig 1) have the same length (9.00cm) as those have an average of 48g in the same week.

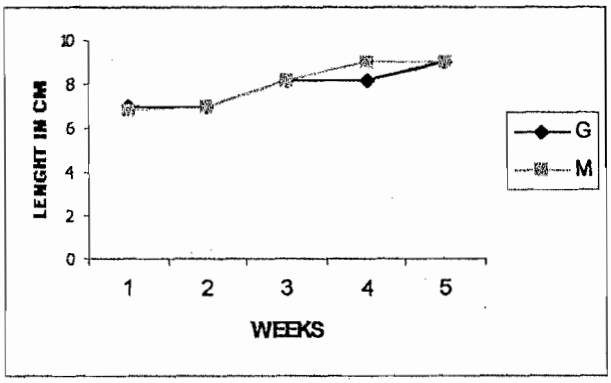

FIGURE 2 GROWTH PATTERN OF RATS (LENGTH IN CM) FED WITH DIETS CONTAINING POULTRY MAGGOTS AND FISH AS PROTEIN CONSTITUENTS OF ANIMAL FEED.

The result of this research work has convincingly established the fact that poultry maggots could be used as a substitute for protein in compounding feed for laboratory animals.

REFERENCES

A.O.A.C (1995): Official methods of Analysis. Association of official and Analytical chemists, Washington D.C 12th Edition.

Dagnal,S.P(1992): Poultry litter as a fuel in the U.K:A review of the 1992 Incineration Conference.Albuquerque,N.M.May 11-15 1992.

Edwards, P.(1986):Duck/Fish integrated Farming system P 267-291.In D.J Farrell and P. Stapleton (eds).Duck Production Science and World Practice 430pp.

Edwards, P.(1993): Environmental issues in Integrated Agriculture-aquaculture and waste water –fed Fish culture systems p 139-170.In R.S.V Pullin, H. Rosenthal and J.L MacClean (eds) Environmental and aquaculture in developing countries *ICLARM Conf. Proc.*31, 359pp.

Hollerman, (2004): In Arkansas, which comes first, the chicken or the environment? *Tulane Environmental Journal.* 6:21

Michael B.N and Imrecsavas (1993) Aquafeeds –A symposium paper on feeding and nutrition in Fish. Taba, Japan.

Muller, J. T (2004): Feed from animal wastes: State of knowledge. FAO animal production and health paper, Food and Agricultural Organisation of the United Nations. 190pp.

NGN (2003) Medicinal maggots treat as they eat. National Geographic News. October 24, 2003.

Ogunleye, R. F and Omotoso O. T. Edible Orthopteran and Lepidopteran as Protein substitutes in the feeding of Experimental /Albino rats African *Journal of Applied Zoology and Environmental Biology. In press.*

Shevgoor, L. Knud-Hansen,C.F.and Edwards, P. (1994) An assessment of the role of Buffalo manure for pond culture of Tilapia 111. Limiting Factors. *Aquaculture.*126-107

Tietz N.W (1986) Ed. Texbook of Clinical Chem. Philadelphia. W. B. Sanders and co. pp. 1180 -1199