Acta Scientific Veterinary Sciences (ISSN: 2582-3183)

Volume 3 Issue 6 June 2021

Review Article

Use of Larva Meal as an Alternate Protein Source to Soya Bean and Fish Meal in Backyard Poultry in Low Income Areas of Country

Rana Umar Tayyab[1], Nasir Iqbal[2] and Hamza Jawad[3]*

[1]Faculty of Veterinary Sciences, Bahaudin Zakariya University, Multan, Punjab, Pakistan

[2]Department of Veterinary Surgery and Pet Sciences, University of Veterinary and Animal Sciences, Lahore, Punjab, Pakistan

[3]Faculty of Veterinary and Animal Sciences, The Islamia University of Bahawalpur, Punjab, Pakistan

***Corresponding Author:** Hamza Jawad, Faculty of Veterinary and Animal Sciences, The Islamia University of Bahawalpur, Punjab, Pakistan.

Received: May 18, 2021

Published: May 28, 2021

Abstract

All areas of a country can never be same so as the residents at different localities. Backyard poultry is an edible protein source for the low-income area residents that they can earn by selling in the high demand areas of the country. Larva meal is a cheap and rich source of protein diet. It contains crude protein (CP) = 43% - 60%, unsaturated fatty acids = 27% - 75% and metabolizable energy (ME) = 24 MJ/kg DM. They also contain minerals like potassium, calcium, phosphorous, and zinc. They are used in feeding poultry, fisheries, piglets and research is being done for its use in the ruminants. Commonly Black Soldier Fly and Housefly larvae are used. Larva meal can replace soy bean meal and fish meal from 27 to 100% depending upon the species of the animal. They can be used as fresh and live in backyard poultry as well as killed and dried to be mixed with other feed. 1kg of larva biomass can be produced from 2 kg of substrate biomass. Black Soldier Fly (BSF) and Housefly larvae are commonly used. Housefly has lifecycle of 10 days as compared to that of Black Soldier Fly that has life cycle of 45 days. Moreover, Black Soldier Fly is native to U.S.A, South and North America whereas Housefly is found everywhere. So, it is convenient to use Housefly to produce larva. The ideal temperature for larva production is 30° to 40°C and moisture content of air is 75%. Housefly larva can be best reared on substrates like poultry droppings, cow manure, rotten fruits and vegetables, animal offal. In this activity wheat bran and cotton seed cake are used. Then larva is harvested either by floatation method or by screening method. After harvesting, larva can be killed by boiling or using NaCl and then dried in oven or sun. There is need to commercialize it and persuade investors to invest in larva production making it a productive industry that will help backyard poultry industry.

Keywords: Larva Meal; Monogastric; Ruminants; Housefly; Black Soldier Fly

Abbreviations

CP: Crude Protein; ME: Metabolizable Energy; DM: Dry Matter; BSF: Black Soldier Fly

Introduction

People from different regions of the country have the right to earn in various ways. One of the ways is backyard poultry system

and as the time passes some poultry feed resources are getting expensive with the passage of time so it is a need of hour to evolve something cheaper and readily available. Larva meal is a cheap and rich source of protein diet. The larvae of the insects are reared and then harvested to be used as feed. Larva meal contain high protein percentage with CP= 43% - 60%, unsaturated fatty acids= 27% - 75% and ME= 24MJ/kg DM (Cadag., *et al*. 1981; Akpodiete., *et al*. 1997; Bamgbose, 1999; Fasakin., *et al*. 2003; Zuidhkof., *et al*. 2003; Hwangbo., *et al*. 2009; Adesina., *et al*. 2011; Okah., *et al*. 2012). They also contain reasonable amount of minerals like Ca= 8g/kg DM, P= 16g/kg DM, K= 8g/kg DM and Zn= 220mg/kg DM (Cadag., *et al*. 1981; Gohl,1982; Bamgbose, 1999; Odesanya., *et al*. 2011; Pretorius, 2011) [1]. They are used in feeding poultry, piglets (Veldkamp., *et al*. 2012) and fish (Ebenso and Udo, 2003; Madu and Ufodike, 2003). Trials are being conducted to use larva meal in ruminant's feeding. In Russia, larva meal is used in feeding piglets and sow. Larva meal is an excellent substitute for soybean meal and fish meal and can replace them from 27% to 100% depending upon the species of the animal [1,2]. They can be used as fresh and live in backyard poultry birds (Ekoue and Hadzi,2000; Dankwa., *et al*. 2002) as well as killed and dried to be mixed with other feed. 1kg of the larva biomass can be produced from 2kg of substrate biomass (Collavo., *et al*. 2005). Black Soldier Fly (BSF) and Housefly larvae are commonly used. BSF as name indicates is black in color and is wasp like [3]. It is native to U.S.A, South America and North America. But now it is being imported to different countries. Its larvae can grow up to 27mm in length. Housefly is found everywhere and is easy to rear. Its life cycle is of 10 days which is much shorter than that of BSF which is of 45 days in total. It is discussed in detail.

Study plan

The housefly (*Musca domestica*) is the most common fly species. It is a worldwide insect and feed on decaying organic matter and manure. The housefly larva has ability to grow on wide range of substrates. Since 1960's, production of housefly larva to feed farm animals has been investigated (Calvert., *et al*. 1969; Miller and Shaw, 1969) and since late 2000's the use of housefly larva to feed fish has been studied [4,5]. The larvae are produced at warm temperature and in moist conditions. Adult female flies lay 500- 600 eggs which hatch after 8h to 12h under natural conditions. The larvae feed for 4 to 5 days then migrates to pupate in dry conditions. The pupa stage lasts for 5 days and then it is converted into fly. The fly mainly feeds on decaying matter [6,7]. Large populations of the flies can be reared on relatively scarce substrate; for example, 450g of fresh manure can feed 1500 larvae (Hardeuin and Mahoux, 2003).

Composition	Larva Meal	Soybean Meal	Fish Meal
CP (%)	60	49	65
ME (Mcal/kg)	5.73	3.51	4.87
DM (%)	25.4	88.2	92.1
Fat (%)	19.64	0.90	10.22
Ash (%)	7.06	-NA-	-NA-
Zinc (ppm)	1039	28	160
Copper (ppm)	32.4	18	12
Manganese (ppm)	274	34	36
Phosphorus (%)	2.11	0.73	3.13
Potassium (%)	1.31	1.97	0.71

Table 1: Statistical analysis of nutrient composition.

- All values are reported on 100% DM basis.
- Soybean meal, solvent extracted, Intl. feed #: 5-20-009.
- This is total Phosphorus. Soybean meal has 0.30% non-phytate Phosphorus.

Larva production

The housefly can best reared on substrates like poultry droppings (Akpodiete., *et al*. 1997), cow manure, rotten fruits, vegetables and animal offal (Odesanya., *et al*. 2011), cattle and fish gut contents (Ekoue and Hadzi, 2000; Ossey., *et al*. 2012) [8]. Mixture of wheat bran (chukar) and cottonseed cake (khall) (Aniebo., *et al*. 2008) soaked in water also gives good results regarding larva production. Production: Take 650g of cottonseed cake and mix it with 350g of wheat bran in a crate or bucket. Then soak the mixture in water thoroughly as shown in Figure 1. The moisture content should be maintained at 75% by sprinkling water regularly. The temperature range should be 30°C to 40°C (Miller., *et al*. 2006). Place the mixture under shade at place where flies are likely to come. The flies will lay hundreds of eggs and these eggs will hatch into larvae. The larvae are visible on 3rd day of activity as shown in Figure 2. They are up to 10mm of size on 3rd day of activity and grow up to 18mm of size on day 5-6 of the activity. This 1000g of substrate mixture will yield up to_half kg of larva. 650g of cottonseed cake will cost about Rs.35 and 350g of wheat bran will cost

about Rs.15. Total mixture substrate will cost about $0.295 which will yield about half kg of larvae that can be sold at $2.95 on harvesting if dried and stored properly.

Figure 1: Larva production in cottonseed cake and wheat bran.

Figure 2: Larva produced.

Harvesting larva

Larvae are harvested by several methods. In floatation method, the substrate is mixed with water and the larvae begin to float on the surface which are then collected with sieve as shown in figure 3. In screening method, the substrate is spread in a thin layer on a screen net(3mm) placed over a basin (Sogbesan., *et al*. 2006). The collected larvae are washed and killed and then dried and milled [9,10]. Larvae can be killed by sprinkling table salt (NaCl) or by boiling them as shown in figure 4. The larvae are dried in sun or oven. Then larvae can be stored in air tight container or in zip polythene bags to be sold [11].

Figure 3: Harvesting larvae by flotation method.

Figure 4: Successfully harvested larvae.

Conclusion

At present, insect meal is being produced at small scale. To be the significant part of bird diets, insect meal should be prepared at large scale and processed in large amounts and it must be done as described in figures. It should be available annually so that backyard poultry will get maximum benefit with low cost. For this, investors should be persuaded to bring a generous amount of investment to commercialize it and making it a productive industry. Moreover, there is need to develop a regulatory system and legislations for use of insect meal as animal feed and to improve the risk assessment methodologies.

Bibliography

1. Adeniji AA. "The feeding value of rumen content-maggot meal mixture in the diets of early weaned piglets". *Asian Journal of Animal and Veterinary Advances* 3 (2008): 115-119.

2. Adeniji AA. "Effect of replacing groundnut cake with maggot meal in the diet of broilers". *International Journal of Poultry Science* 6 (2007): 822-825.

3. Adesina MA., *et al*. "Performance of broilers' finishers fed graded levels of cassava peel -maggot meal- based diet mixtures". *Journal of Agriculture, Forestry and the Social Sciences* 9 (2011): 226-231.

4. Cadewolu MA., *et al*. "Evaluation of an animal protein mixture as a replacement for fishmeal in practical diets for fingerlings of *Clarias gariepinus* (Burchell, 1822)". *Israeli Journal of Aquaculture = Bamidgeh* 62 (2010): 237-244.

5. Adeyemo GO., *et al*. "Effects of feeding desert locust meal (*Schistocerca gregaria*) on performance and haematology of broilers". Tropentag 2008, Hohenheim (2008).

6. Cadag MTMa., *et al*. "Production and evaluation of maggot meal from common housefly (*Musca domestica*) as animal feed". *Philippine Journal of Veterinary and Animal Sciences* 7 (1981): 40-41.

7. Calvert CC., *et al*. "Housefly pupae as food for poultry". *Journal of Economic Entomology* 62 (1969): 938-939.

8. Cao JunMing., *et al*. "Effects of replacement of fish meal with housefly maggot meal on growth performance, antioxidant and non-specific immune indexes of juvenile *Litopenaeus vannamei"*. *Journal of Fisheries of China* 36 (2012): 529-537.

9. Cao JunMing., *et al*. "Effects of replacement of fish meal with housefly maggot meal on digestive enzymes, transaminases activities and hepatopancreas histological structure of *Litopenaeus vannamei"*. *South China Fisheries Science* 8 (2012): 72-79.

10. Hwangbo J., *et al*. "Utilization of house fly-maggots, a feed supplement in the production of broiler chickens". *Journal of Environmental Biology* 30 (2009): 609-614.

11. Ido A., *et al*. "Positive effects of dietary housefly (*Musca domestica*) pupa for fish and mammal Abstract book Conference "Insects to Feed the World". The Netherlands 14-17 (2014): 156.

Volume 3 Issue 6 June 2021