LARVAE AS AN ALTERNATIVE PROTEIN SOURCE FOR SMALL SCALE POULTRY PRODUCERS IN NIGERIA: A REVIEW

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Abstract

This paper reviews information and studies that have been conducted to determine how larvae could be used as a source of protein in the diets of poultry. Larvae potentialities, nutritional value, production systems and cost effectiveness were outlined. The review justified the replacement of conventional protein sources with larvae. It is concluded from this literature review that larvae which was regarded as protein from the air, show greater potentialities as an alternative renewable protein source that can replace conventional protein sources used by small-scale poultry producers in formulating poultry diets. There is a need for more research on the safety of using larvae in poultry nutrition. Furthermore, economic assessments of using larvae meal need to be carried out and compared to the conventional protein sources used by the small-scale poultry producers.

Key words: larvae, protein, poultry, small- scale, cost effectiveness

Introduction

The global trend in the increase in prices of protein sources for poultry feed has placed more emphasis on the exploitation of alternative protein sources in Nigeria and beyond. Consequently, many studies were carried out to proffer solution to this quest in the field of poultry nutrition (Atteh and Ologbenla, 1993; Ojewola *et al.*, 2005). Unconventional protein source such as larvae meal is recently gaining popularity among researchers and poultry producers as an alternative to the conventional protein sources in formulating poultry diets. There is an extensive research work on the suitability of larvae to rear chicks and broilers (Akpodiete and Inoni 2000; Téguia *et al.*, 2002; Adesina *et al.*, 2011), layers (Agunbiade *et al.*, 2007; Okah and Onwujiariri, 2012), ducklings (Mensah *et al.*, 2007), cockerel chicks (Bamgbose, 1999) and turkey (Despines and Axtell, 1995). These studies showed that larvae (fresh or dried) could entirely or partially replace conventional protein ingredients such as fish meal, meat meal or groundnut cake without affecting survival, daily feed intake, weight gain, feed conversion ratio, egg laying and other performance parameters (Kenis *et al.*, 2014). However, some studies have suggested better results with larvae meal than with conventional fish meal (Téguia *et al.*, 2002). According to Kenis *et al.*, (2014), best growth performance was often observed with variable combinations of larvae maggot meal and conventional meal than with a single protein source. Poultry as monogastrics, require proteins to compensate the inability to synthesize specific amino-acids. However, conventionally used protein ingredients are not ecologically or economically sustainable (Barona *et al.*, 2010; FAO, 2012). This problem may be attenuated if a more economically sustainable protein source for small-scale poultry farmers. The objective of this paper was therefore to review the potentials of feeding poultry with insect larvae as an alternative cheap protein source for small-scale poultry producers.

Larvae nutritional value in poultry nutrition

Larvae meal compares well with other sources of protein in poultry nutrition according to previous studies (Ogunji *et al.*, 2006; Agunbiade *et al.*, 2007). Nutritional contents of a larva use in poultry nutrition depends on time (age) of harvest (Aniebo *et al.*, 2008a; Aniebo and Owen, 2010), method of drying (Fasakin *et al.*, 2003) and larval feed substrate (Newton *et al.*, 1977). Researches on larvae nutritional contents reported that larvae have a high crude protein content (40 to 60% DM) and lipid content (9 to 25% DM) (Kenis *et al.*, 2014). Similarly, larvae meal nutrient analysis have showed that lysine and methionine (the two most limiting essential amino acids) were found to be higher in maggot meal than in fish meal and other conventional protein sources (Aniebo *et al.*, 2008a). Ogunji *et al.* (2006) and Agunbiade *et al.* (2007) made remarkable conclusion in their studies that house fly larvae meal has a suitable nutritional composition and can serve as a replacement for fish meal and other protein sources used in poultry nutrition.

Larvae production systems

There are various methods used in larvae production systems which can either be conventional or non-conventional. The production systems are based on the exposure of substrates, placed on rearing beds directly on the soil, to attract adults for oviposition. A few days later, the substrate is sifted or brushed to extract mature maggots, which are either sun dried or given fresh to the animals (Pretorius, 2011). According to Nzamujo (1999) About 10-15 kg of dry matter in 1×1×0.1 m beds produce up to 3 or 4 kg of fresh maggots in 4 days. However, yields varied with substrate composition and seasons. The most common substrates used in larvae production include animal manure, animal offal, rumen content, brewery waste, decaying fruits (Pretorius, 2011), blood, wheat bran, rice dust, saw dust (Aniebo *et al.*, 2008b), dry leaves, poultry droppings, kitchen waste (Personal communication, 2015) and rumen content (Loa, 2000). Substrates can be a mixture of plant and animal parts as well as entirely plants or animal origin, in either case it has to be attractive for adults and suitable for larvae development.

Cost effectiveness of using Larvae in poultry diet

Many studies (Akpodiete and Inoni, 2000; Téguia *et al.*, 2002; Oyelese, 2007; Hwangbo *et al.*, 2009; Okah and Onwujiariri, 2012) have indicated cost effectiveness when larvae meal is use as a source of protein in the formulation of poultry diets. Study by Atteh and Ologbenla (1993) calculated that maggot meal represents only about 15% of the value of fish meal. Furthermore, Fashina-Bombata and Balogun (1997) have found that the cost of harvesting and processing the larvae meal was less than 20% of the cost of a similar weight in fishmeal. Similarly, Akpodiete and Inoni (2000) increased the net return of broiler production by 15% when replacing 75% of fish meal by maggot meal.

Conclusion

It is concluded from this literature review that larvae which could be regarded as protein from the air show greater potentialities as an alternative renewable protein source that can replace conventional protein sources used by smallholder farmers in formulating poultry diets for cost effectiveness.

Recommendation

It is recommended that larvae from the house fly (Musca domestica) (Diptera Muscidae) and the black soldier fly (Hermetia illucens) (Diptera Stratiomyiidae) being the most promising insects and their maggots can be produced in large scale suitable for smallholder farmers or industrial level. Furthermore, economic assessments of using larvae meal need to be carried out and compared to the traditional protein sources used by the small-scale poultry producers in order to justify its usage economically.

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