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Review Article

INSECTS-A NATURAL SOURCE FOR POULTRY NUTRITION

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Abstract: Animal protein requirement for human is expected to increase 60-70 per cent in the 2050. This increase in the consumption most challenging because of the limited availability of land, environmental climatic changes, cash crops cultivation and food–feed–fuel competition. Feed ingredients costs account for nearly 70 to 80 per cent of the total production costs of poultry production. The costs of conventional feed materials such as soymeal and fishmeal are very high demand and moreover, future availability may be limited. Insect rearing could be a part of the solutions. Utilizing insects as sources of proteins in poultry diets, because they are easily available throughout the year. The inclusion of insect meals in poultry diets is likely to lower the cost of feeds, thus contributing to the more profitability of smallholder poultry production.

Introduction

The requirement of protein sources huge demand in growing world population and demand for poultry meat and eggs is expected to increase significantly in the future. Fishmeal and soyameal are still quite commonly used in poultry diets. One potential solution is the use of insects as an ingredient for poultry diets, primarily as an alternative to fishmeal and soymeal. Insect rearing one of the easiest way to enhance food and feed security. Most edible insects are cheap, easily available and can provide a good source of protein and minerals needed to complement cereal-based foods consumed in the developing countries. Most edible insects are a good source of protein, fat, minerals. Insect proteins are more valuable protein sources for monogastric animals (Makkar *et al.*, 2014). Insects are cheap, fast growth and reproduce easily, they have high feed conversion efficiency and can be reared on bio-waste streams. One kg of insect biomass can be produced from on average 2 kg of feed biomass. Insects are already used in poultry feed in many parts of the world and to use them as an alternative protein source to pig and poultry diets. Feed ingredients, including meat meal, fishmeal and soybean meal, which represent 60–70 percent of production feed costs.

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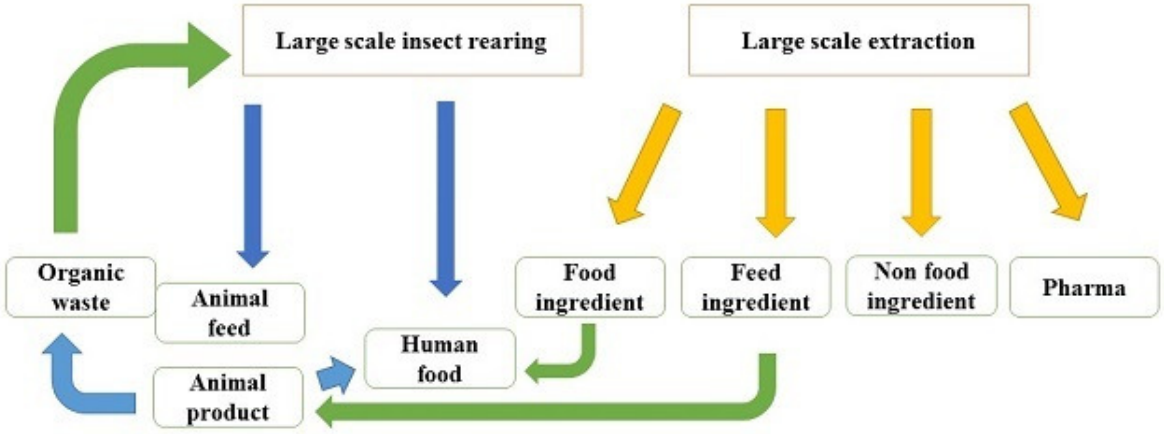

Figure 1: How to use insects in a circular economy

Insects as poultry feed

Insects are natural food sources for many backyard poultry. Insects using alternate feed resources for poultry such as grasshoppers, crickets, cockroaches, termites, lice, stink bugs, cicadas, aphids, scale insects, psyllids, beetles, caterpillars, flies, fleas, bees, wasps and ants.

Nutrient composition of Insects

Insects at all life stages are rich sources of animal protein (Bovera et al., 2015).Insects are an alternative source of protein for use in animal feed. Insects are a rich source of energy, crude protein, and fat (Tables 1, 2). Insect larval meal could be used as both a protein and an energy ingredient for feeds. Chitin, a polysaccharide presence in the exoskeleton of insects, which may have a positive effect on the immune system. Usually it is found as complex compound composed of chitin combined with cuticular proteins, lipids and minerals. Insect meals compared to fishmeal contain a lower amount of methionine and calcium which has to be considered when formulating diets based on insect proteins. Larvae of the black soldier fly provide substantially more calcium compared than other insects. Most insects contain only minimal amounts of micro and macroelements in their cuticle however, some species such as pupae of the face fly (*Musca autumnalis*) and larvae of the black soldier fly (*Hermetiaillucens*) contain a significant amount of calcium.

Table 1: Nutrient composition of different insect meals (De Marco *et al.,* 2015)

Insects	Item (per kg DM)	Gross energy, MJ	Crude protein, g	Crude fat, g	Crude fibre, g	Ash, g
Field cricket (*Gryllusassimilis*)	Imago	21.5	564	238	70	64
	Subimago	19.3	638	168	94	54
Housefly (*Musca domestica*)	Pupae	20.1	630-762	144-161	157	55-98
	Larvae	20-24	380-604	90-260	16-86	31-173
Black soldier fly (*Hermetiaillucens*)	Larvae	22.1	441-450	150-350	70	146-284
Mealworm (*Tenebrio molitor*)	Larvae	26.8-27.3	451-603	250-431	51-88	10-45
Turkestan cockroack (*Blattalateralis*)	Nymph	-	543-734	176-261	86-89	46-54

Table 2: Nutrient composition in different meals (Bukkens, 2015)

Food insect	Country	Gross energy, (kcal/100g)	Crude protein, (% w/w)	Crude fat (% w/w)	Crude fibre, (% w/w)	Ash, (% w/w)
Caterpillar of moth (*Imbrasiaertli*)	Angola	375	48.7	11.1	-	14.4
Caterpillar (*Nudaureliaoyemensis)*	Zaire	-	56.8	11.3	-	3.5
Mopane worm (*Gonimbrasiabelina*)	Africa	444	56.8	16.4	9.6	6.9
Witchetty grub	Australia	417	13.2	36.2	-	1.2
Bogong moth (*Agrotisinfusa*)	Australia	301	26.8	19.8	-	2.7
Spent silkworm larva	India	-	48.7	30.1	-	8.6
Silkworm (*Bombyxmori*)	East Asia	229	23.1	14.2	-	1.5

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