

Black crickets

Black crickets *Gryllus assimilis* (Orthoptera) are found in America. They are usually farmed in plastic, fiber or cement containers. Females lay eggs in substrate (cotton, sand, vermiculite). Eggs hatch after 6 days in the nymph stage. After 2 months, nymphs may be killed in hot water to produce the meal. If not, they get wings and become adults. Crickets are fed on chicken, fish, cat food, but it specific commercial diets for crickets are already available. The nutritional characteristic of cricket meal is shown below.



Black cricket farming box: egg boxes are shelter; chicken feed on trays; water in plastic containers.

Two cricket nymphs feeding on sugar cane.



Black soldier fly pupae.



Black soldier fly cage.



Black soldier fly adults laying eggs.

Black soldier fly (BSF)

Black soldier fly *Hermetia illucens* (Diptera) are found in America, Europe, Asia, Africa and Oceania. Adults are usually farmed in cages, live about 7-10 days and don't feed. Larvae grow well in organic residuals (kitchen waste, animal manure). Then, larvae become pre-pupae and this is the stage used for BSF meal. Killing is done in boiling water. There are industrial scale BSF meal producers, and BSF oil is also sold. The composition of black soldier fly meal is shown below (MagMeal from AgriProtein).

Técnicos responsáveis

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FARMING INSECTS AS FOOD AND FEED SOURCE



Farming insects as food and feed source

Insects are important animals that provide ecosystems services, such as pollination of crops, products such as honey, propolis, silk, cochineal, wax, and... they can be eaten also! There are thousands of edible insect species in the world, and their consumption as feed has been increasingly believed to be the future of animal and human feeding within the next 30 years.

But... why insects?

Some advantages:

- Insects are high quality protein rich.
- They are rich in minerals, such as calcium, zinc, iron.
- Farming is easier and cheaper than most animal farming.
- High productivities can be reached in small areas.
- They can replace protein sources such as soybean or fish meal.
- It's environmentally friendly.
- Opportunities for business and jobs at any level, everywhere.
- They contribute to food security.

Bugs as feed for chicken and fish

The protein ingredient in chicken and fish diets are mainly soybean and fish meal, respectively. Insects meal provide a similar amino acids profile comparing to these meals, and may be obtained with significantly lower environmental impact. Also, many bugs may feed on co-products or organic wastes, which is good to recycle nutrients. So, insects are interesting protein sources in chicken and fish diets.

How to farm insects? Mealworm

Yellow mealworms (*Tenebrio molitor*) are beetles (Coleoptera). They are spread worldwide and feed on grains. They are usually farmed in plastic boxes on a substrate composed by a mix of wheat meal, chicken feed, yeast, sometimes milk powder and calcium additive. Females lay eggs in the substrate, and after 15 days, larvae hatch from eggs. Larvae may be used to produce the mealworm meal to be included in diets for chicken or fish, usually after 60 days. Mealworms can also digest plastic! The nutritional characteristic of mealworm meal is shown below.



Larvae, pupae and adult mealworm.



Adults feeding on sugar cane (source of vitamins and water).



Larvae of mealworms.



Mealworms pupae.

Mealworm larvae meal composition

Dry matter	Crude protein	Ash	Fat	Phosphorus	Calcium	Sodium	Potassium	Magnesium	Copper	Iron	Manganese	Zinc
94.76	51.71	5.62	18.80	7.12	0.65	1.39	5.76	1.97	18.32	37.64	8.67	71.35
				g/kg								

Black cricket meal composition

Dry matter	Crude protein	Ash	Fat	Phosphorus	Calcium	Sodium	Potassium	Magnesium	Copper	Iron	Manganese	Zinc
95.36	54.74	4.74	19.23	8.27	4.74	2.02	7.85	0.57	24.75	144.82	31.89	72.24
				g/kg								

Black soldier fly meal (MagMeal from AgriProtein)

Dry matter	Crude protein	Fiber	Fat	Phosphorus	Calcium	Magnesium	Potassium	Sodium	Copper	Iron	Manganese	Zinc
90	500	130	100	5	30	0.29	0.96	34.25	10.8	237	158	122.4
				g/kg		%		mg/kg				