WASTE MANAGEMENT

BLACK SOLDIER FLY AND OTHERS FOR VALUE ADDED MANURE MANAGEMENT

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Many scientists have known insects can digest manure and produce high quality feed for animals. Most of these have studied the house fly because the biology is well known, it is prolific and it produces a high protein feed. These systems have not been widely utilized because of the relatively high cost of managing the house fly. Biosecurity, the need for a separate facility and labor for harvesting increase the cost of production. The black soldier fly's habits and non-pest status allows for development of low-cost production.

Black soldier fly larvae consume a wide variety of organic matter including animal manures and food waste. While consuming this material they assimilate nutrients thus significantly reduce its volume and pollution potential. They also control house flies through competition, and produce high quality feedstuff and other products. The biology and habits of this large wasp-like fly make it well suited to large scale value-added waste management. Adults live and mate near larval habitat, not seeking to enter dwellings as house flies do. Adults do not need to feed, surviving on the large fat body developed as a larvae. This beneficial insect occurs worldwide in tropical and warm-temperate regions. Larvae occur in very dense populations, often covering the larval food resource in a solid layer. Mature larvae migrate from this mass of feeding larvae to find protected pupation sites. The migration of this energy and protein rich prepupae makes self-harvest possible. Prepupae do not feed and have an empty gut, making this the ideal stage to collect for a feedstuff.

A very simple system has been developed for manure management in animal housing where wild populations of black soldier fly colonize the fresh manure that has dropped to a lower level. A simple ramp and PVC pipe system directs prepupae to self-harvest for resource recovery. No extra facility or energy are required. This system can work for a few animals or a large farm. Projections indicate that 58 tons of prepupae could be self-collected from the manure of 100,000 hens in 5 months. One feeder pig (annual space) averaging 70 kg would produce 63 kg of prepupae worth over 12 USD. These larvae are 44% dry matter, and the dried feedstuff is 42% protein and 35% fat. Manure to larval conversion on a dry matter basis has been up to 8% for hens and 15% or more for swine. Published feeding studies have shown the dried larval feedstuff to be a good replacement for soybean or meat and bone meal in the diets of swine, poultry and fish. Bull frogs have been reared in two trials on a live soldier fly larvae with a pelleted feed mixture. Other utilization of this unique larval product may involve oleic-and linoleic essential fatty acids, which make up over 20% of the fats in the prepupae, and chitin with its many medical and industrial applications. Recent feeding studies show that the prepuape can effectively replace high quality menhaden fish meal with a value of 500 USD/ton.

See more detail on bsf prepupae utilization, amino acids, fatty acids, minerals and a frog feeding trial at Valuable By-Products of BSF (57 K - pdf).

Current research is being conducted on adult biology, colonization to support large scale use of this system in modern animal housing and nutrient depletion from the larval digested manure. See a schematic of the project (47 K) This nutrient depletion from manure would aid pollution abatement in areas of confined animal feeding operations.

View the Full Paper for more information (76 K - pdf)