

# Insects in Solid Waste Management

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## ABSTRACT

The health and wellbeing of urban populations depend on proper solid waste management. Most developing cities leave many tonnes of trash on the streets each day that attracts pests that spread disease, clogs drains, and causes a variety of other health and infrastructure issues. A total amount of 2.01 billion tonnes of solid waste were generated in the world wide and its is expected reach 70% by 2050. There are several methods available viz., Landfill, Incineration (burning/thermal treatment), Composting and Vermicomposting for elimination of ill effects of waste materials but use of insects is one of the most economically and ecofriendly method that can be used to decompose the waste materials in an effective way. In insects, there are several species are available across the orders but most important orders include Diptera, Coleoptera, Isoptera, Lepidoptera, Hymenoptera and Blattodea etc.

## INTRODUCTION

**S**olid wastes are any discarded or abandoned solid materials resulting from industries, mining, agricultural operations, etc. Solid waste management refers to systematic control of generation, collection, storage, transport, source separation, processing, treatment, recovery and disposal of solid waste. Solid waste is a severe global problem because it pollutes both water and air. It has a direct impact on health and economic growth. It can cause environmental degradation as well as epidemics of vector-borne infections (diseases transferred by

rodents and insects). Harmful effects of solid waste includes Bad odour of waste, Production of toxic gases, Degradation of natural beauty, Air pollution, Water pollution, Soil pollution, Spread of diseases and Effect on biodiversity etc. In 2016, 2.01 billion tonnes of solid waste were generated in the World, accounting to a footprint of 0.74 kg per person per day and this is expected to increase by 70 per cent i.e., 3.40 billion tonnes in 2050 (World bank report, 2018). Hence, there is a need to manage these waste materials using ecofriendly methods.

## USE OF INSECTS IN SOLID WASTE MANAGEMENT

Classes Insecta and other arthropodans such as class arachnida consists of solid waste feeders. Among insects, species from six orders viz., Diptera, Coleoptera, Isoptera (Psammotermishyostoba), Blattodea (Periplanetaamericana and Shelfordella lateralis), Lepidoptera (Galleria mellonella) and Hymenoptera were associated with solid wastes. Diptera was the most abundant, with 16 families viz., Calliphoridae, Drosophilidae, Psychodidae, Fanniidae, Muscidae, Milichiidae, Ulidiidae, Scatopsidae, Sepsidae, Sphaeroceridae, Heleomyzidae, Stratiomyidae, Syrphidae, Phoridae, Tephritidae and Curtonotidae followed by Coleoptera with seven families viz., Carabidae, Promecheilidae, Staphylinidae, Ptiliidae, Salpingidae, Hydrophilidae and Phalacaridae. Diptera was the most exploited group, particularly Ornidiaobesa and Hermetiailluscens which are useful for decomposition of organic matter.

### Some of the major insects in solid waste management:

**Black soldier fly:**Hermetiailluscens Linnaeus (Diptera: Stratiomyidae), a black soldier fly (BSF), has been introduced as an organic waste converter.



**Fig 2. Black soldier flymaggot**

Researchers have concentrated their efforts on a relatively new organic waste treatment technology based on BSF. BSF larvae (BSFL) devour organic-rich waste such as food waste, agro-industrial byproducts, and dairy manure. Processing of bio-waste with larvae H. illucens can reduce the waste amount by 50–80 per

cent (wet weight). Reared black soldier fly larvae on liver, manure, fruits, vegetables and fish produceslarvae with a higher nutritional content, making it useful animal feed. (Lohriet al., 2017).

**Termites:** Termites (Isoptera) have often been proposed as decomposers of lignocellulosic waste, such as paper products. Hence, there is an opportunity to use their services to degrade this waste paper and use the resulting termite biomass as a food source for the aquaculture, pig, and poultry sectors. Termite faeces may include nutrients that can be used to make compost. Hussein et al., (2014) used termite (Psammotermis hyostoba) for the production of hydrogen gas and increasing soil fertility by feeding them with ribbed cardboard with the help of hydrogen bioreactor and it was found that 350 termites at 30°C produced 570 ml of hydrogen after 120 hours by feeding on ribbed cardboard.

**Wax moths:** Larvae of wax moth Galleria mellonella was used to degrade the commercial polyethylene shopping bags by smearing wax moth larval extract paste on the polyethylene bags. Due to its ecological behavior of feeding on bee wax, it feeds on the polyethylene bag as its containing same hydrocarbon bond (CH<sub>2</sub>-CH<sub>2</sub>). The bag was initially weighed (2730 mg), after incubation, larvae were removed from the bag and reweighed (2638 mg)so it clearly indicates that, larvae has reduced about 92mg of polyethylene bag (Bombelliet al., 2017).

### CONCLUSION:

Insects can be used for solid waste disposal of substrates such as cotton waste, coconut shells, polyethylene bags, organic food wastes, cardboards etc. At present situation, solid waste has become the serious problem and showing its negative impacts on environment. At global level, every country is initiating solid waste management practices and spending lot of money on it. If we can use these promising insects in solid waste management, there is a chance to get better ecofriendly results and reduce the cost of management.

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