

House Fly- *Musca domestica* L.: A Challenging Pest

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SUMMARY

House flies *Musca domestica* L., belong to the order Diptera and family Muscidae, are the most prevalent synanthropic pest worldwide. They are characterised by the presence of two pair of membranous wings and sponging type of mouth parts. *M. domestica* undergo complete metamorphosis consisting of egg, maggot, pupa and adult. They exist as major pests of humans, poultry and livestock facilities throughout the world. They act as carriers of disease causing agents like bacteria *Escherichia coli*, *Shigella* spp., *Salmonella* spp., which spread more than hundred diseases in humans and animals like amoebic dysentery, helminthic and rickettsial infections. They also transmit bird flu virus that is a threat to humans, poultry and livestock industry throughout the world. It is reported that spreading of intestinal diseases like diarrhoea in cities and countryside areas in developing countries is attached to seasonal abundance of house flies and by taking necessary steps to their control results in reduction of such diseases. Therefore, it should be managed in an integrated manner. The economic importance, morphology, lifecycle and management of *M. domestica* are briefly discussed in this chapter.

INTRODUCTION

The housefly *M. domestica* is the synanthropic insect which has worldwide distribution and is found throughout the country in close association with human activities. It has always been able to colonise the organic substrate which man has placed at its disposal. The environments, in which the fly lives make it a carrier of a number of pathogenic organisms. It is a carrier of over 100 different pathogenic organisms causing diseases *viz.*, typhoid, cholera, bacillary dysentery, tuberculosis, anthrax, ophthalmia neonatorum and infantile diarrhoea as well as parasitic worms (Sasaki *et al.* 2000; Fotedar *et al.* 1992). It is considered as a successful insect due to its ability to multiply rapidly and to its fecundity. If the presence of very high fly populations is constant in rural environments, especially in livestock farms, it is possible to find large populations in food industries. These occur when organic matter is heaped up without due precautions and fermentation starts. It is also possible to observe their presence in towns, where organic waste is gathered irregularly and incompletely. In addition to being a nuisance pest, it is a vector of many pathogens. Pathogenic organisms are picked-up by the flies from garbage, sewage and other sources of filth and transferred to human food either mechanically from contaminated external body parts or after consumption by houseflies through vomiting and defecation while feeding on food (Sasaki *et al.* 2000).

Economic importance of *M. domestica*

- The houseflies *M. domestica* are worldwide pest of agricultural and public health importance that have plagued humans throughout recorded history (West, 1951)
- They play a role in spreading disease-causing organisms, especially *Escherichia coli*, *Shigella* spp. and *Salmonella* spp. (Macovei *et al.* 2008)
- They carry the eggs and cysts of many intestinal worms, including *Ascaris* spp., hook worms and tapeworms
- Flies with pathogens can contaminate milk, steak and potato salad (Macovei *et al.* 2008)
- They are involved in the spread of trachoma (*M. Sorbensis*) and epidemic conjunctivitis and given the attraction of this species to skin infections and wounds, the housefly is also involved in infection of these sites
- They cause economic problems to all farm animals (cattle, camel and sheep) in addition to poultry. They reduce milk production because cows must expend extra energy fending off flies
- They reduce farm worker productivity: flies interfere with work such as feeding and milking as well as house fly increased frequency of animal disease transmission, leading to increased medication veterinary service costs and increased potential for spread of human diseases (Douglass and Jesse, 2002)

Morphology of *M. domestica*

Housefly *M. domestica* has only one pair of membranous wings. The hindwings are modified in to halteres. It possesses prominent compound reddish eyes, tarsi five segmented with dull grey appearance. The length of

fully mature fly is $\frac{1}{4}$ inches with four dark strips on thorax. Its abdomen possesses yellowish sides on its basal half. Its mouthparts are of sponging type as they do not possess teeth or sting and they work like a sponge to soak up the liquid food. Although they can feed only on liquid food but they can also use many solid food by changing them in to a liquid through spitting or vomiting on it or readily dissolving it in the salivary gland secretions or in the crop. They eat any wet or decaying matter but are especially attracted to the pet waste because their odour is strong. Both male and female house flies feed on all types of human food, sweat, excreta, garbage and animal dung. In house flies, liquid food is sucked up and solid food is wetted with saliva so that it could easily be dissolved before ingestion. Water is a compulsory part of its diet as it cannot live without water for more than 48 hours. Other sources of food of house fly include milk, syrup, meat broth and many other materials present in human settlement areas. The requirement for food in house fly is twice or thrice a day. Larvae of housefly are called maggots which are coloured and 0.3 inches in length.

Life cycle of *M. domestica*

The house fly exhibits holometabolous metamorphosis by passing through all stages of insect development like egg, larva (maggot), pupa and adult. They are multivoltine and go through 10-12 generations annually in temperate regions with populations peaking in summer. The fly does not migrate with the seasons or go in to diapause during winter but survives and continues to breed in refuges. Sites utilized for overwintering include barns and other animal associated locations that are warm enough and offer sufficient development sites and food to support the flies' lifecycle (Kettle, 1995).

A female house fly may lay 4-6 hatches and each hatch consists of 75-150 eggs. Eggs are deposited in crevices to save them from desiccation. The *M. domestica* is diurnal and adult activity consists mostly in seeking food and water, feeding, mating, resting and oviposition (Diether, 1976). Filthy food and garbage are the major breeding sites for house flies. Life span of adult housefly is about 15 to 30 days. Just on the day of their emergence, males are ready to mate but mating occurs when female is three days old. After few days of copulation, oviposition takes place. Eggs are white in colour with pear shape having length of about 1-2 mm. Just after oviposition, within a day eggs are hatched in to maggots and after a week, the maggots develop through three instars. Maggots are without legs, 3-9 mm long, whitish in colour and saprophagus in nature as they feed on dead and decaying organic material, such as garbage or faeces. They live for 14 to 36 hours. After completion of their third instar, maggots crawl to a cooler and drier place where they change in to pupae. The color of pupa is reddish or brown and length is about 8 mm. Finally, pupa changes in to an adult house fly within 5 days. In warm climatic conditions, house fly completes its life cycle from 2-3 weeks. It produces a large population at a rapid rate due to the large number of egg production and high rate of development. In a year, it may produce 10-12 generations in temperate region. But in contrast, they may produce 4-6 generations in cold regions where its breeding is limited to warmer months.



Fig 1. Eggs of *M. domestica*

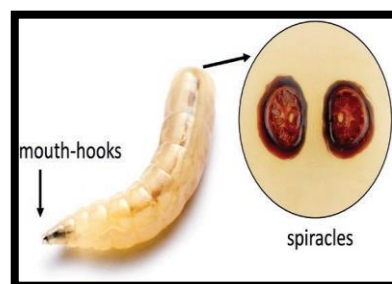


Fig 2. Maggot of *M. domestica*

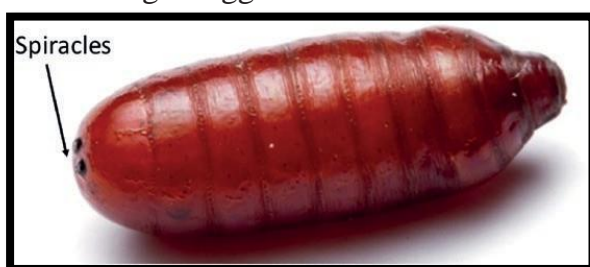


Fig 3. Puparium of *M. domestica*



Fig 4. Adult female of *M. domestica*



Fig 5. *M. domestica* female (Right) and male (left)

Management of *M. domestica*

- Good sanitation
- Keeping the farm house dry
- Proper drainage
- Installation of ultraviolet lights in dark area in house and 5 feet away from kitchen essentials. Lights should be cleaned regularly as dead flies are food source for other flies too
- Cleaning manure twice a week, as life cycle of fly is 7 days
- Application of baits in the form of sticky odour strips
- Use of large sticky traps
- Application of mixture of syrup, scraps and milk as baiting material
- Use of parasite *Muscidafurax raptor*
- Use of various neem products, neem seed kernel extract, neem cake and neem oil
- Use of chemical cords both natural (e.g. cotton and manila) and synthetic (e.g. nylon), that were treated with a small amount of insecticide (Fipronil or Indoxacarb)
- Use of Dichlorvos EC and Diflubenzuron granule formulation which are housefly larvicides
- Use of fly attractant (z-9 tricosene) along with imidacloprid as insecticide
- Use of baits of different colours. Black and white colours are more attractive for fly, while white colour is least effective, that were used by using with blood, sugars and honey applying on baits
- Use of K-othetine on bait viz., dry milk, dog cookies and jiggery
- Use of various biocontrol agents such as mites viz., *Macrocheles muscae domesticate*, *Fuscuro podavegetansgave*, beetle *Carcinops pumilo*, wasps *Spalangia nigroaenea*, *Muscidifurax raptor*, *Muscidifurax zaraptor*, *Spalangia cameroni*, flies *Hydrotaea aenescens* wiedeman) and birds
- Use of bio-insecticides viz., nematodes *Steinernema*, *Heterorhabditis*, fungi *Entomophthora muscae*, *E. schizophorae*, *Beauveria bassiana* and *Metarhizium anisopliae* bacteria *Bacillus thuringiensis* and viruses MdSGHV (Salivary Gland Hypertrophy virus) virus
- Use of chemicals such as Cryl B, 1,8-cineole, pulegone, limonene, menthol and certain active oils

CONCLUSION

House flies *M. domestica* are pervasive pests, accompanying humans worldwide and serving as nuisances and vectors of pathogens. They multiply very rapidly within a short period and spread several pathogenic organisms which cause various diseases in human beings as well as other organisms. These flies can be reduced by maintaining sanitation and proper disposal of wastes. These should be managed effectively in order to reduce the spread of diseases.

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