



(RESEARCH ARTICLE)



## Study on the development of maggots on meat

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### Abstract

Studying the behavior of maggots on a decaying body can assist in determining the victim's time of death in Forensic Entomology. In this experiment, different parts of chicken meat were placed in an experiment box in different settings. These experiment boxes were modified into fly traps to prevent interference from other creatures like rats, cats or dogs. Experiment box contains the legs' part, neck part, muscle part, wing part and liver. The plastic bucket is used for the setting of the different parts of meat pieces in a plate box which has holes and a space to hold the meat pieces. The meat placed on the Plastic box holder counter begins to be decomposed by microorganisms and attracts flies as a rich food source. By hanging this Experiment Box near the outside garbage of the house for a week, flies were able to access them and lay eggs. The eggs on the meat hatch into larvae. This experiment was conducted in different steps. Firstly, fresh meat was exposed to collect the eggs which were reared and used to study the development of maggots. Calculating the age of different life stages of maggots, hourly developmental data is presented i.e.- eggs hatched in 16 hours while all the three instars of larvae took 92 hrs. followed by the pupal stage which was 14 days. Surprisingly, the results were amazing observing the different developmental stages of maggots after hours, as the meat in the experiment box produced maggots in a few days and shows the different time duration for development stages of maggots and adult flies.

**Keywords:** Maggots; Instar; Forensic entomology; Blowfly; Carrion flies; Scavengers

### 1. Introduction

Maggots, the larval stage of flies, emerge from eggs laid on organic materials, undergoing metamorphosis into adult flies after a period of development. They thrive in tropical or wetland environments, commonly found in soil, plant or animal tissues, and carcasses where drying is minimized. The blow fly undergoes four stages of development: egg, larva (maggot), pupa, and adult. Eggs hatch within 8 to 12 hours, with larvae lasting about 5-6 days and pupae 4 to 5 days. Female flies can lay over two thousand eggs every few days. The development cycle varies with temperature and humidity, typically taking 8 to 10 days from oviposition to hatching. Flies lay eggs in wet or decaying materials like manure, grains, and scattered food. The size of adult flies depends on larval growth, with maggots (third instar) migrating away from wet areas to pupate. This stage can last 3 to 7 days, with pupation resulting in a non-feeding brownish pupa. Adult flies emerge by opening the pupal envelope and feed on decaying organic matter, mating, and laying eggs to continue the cycle. Maggots belong to the class Insecta, order Diptera, family Calliphoridae, genus *Calliphora* characterized by vermiform bodies without legs, reduced mouthparts, and oral hooks for feeding. They can reach up to 1 cm in length before pupation. The third instar (L3) is critical as it accumulates nutrients necessary for pupation, including carbohydrates, lipids, proteins, and minerals. The experiment aimed to assess the effectiveness of blowfly traps in observing the fly life cycle, investigating the impact of environmental alterations on the life cycle, and providing an educational experience in study of forensic entomology. This approach was inspired by the use of similar traps in horse barns for fly population control, adapted by substituting killing bait with meat bait to nurture maggots. The expectation was that maggots would develop fastest in the control bottle, followed by those meat attracting maggots

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last due to evaporation and odor containment. These findings offer valuable insights for educational purposes and pest management strategies.

## 2. Materials and methods

The plastic bucket is used to make a setup for an experiment. The different part of chicken meat is placed in the setting inside the plastic holder inside the bucket. In the control the meat was placed in the bottom of the bucket. In the Bucket downside holes are made for the drain out of extra water and diffusion of foul smell of the “death chicken meat pieces” plate was placed in the bottom of the experiment box. In plate the meat was placed into the bottles. The trap (experiment box) was constructed with all waste material of the house. The plastic lead is used to cover the bucket and the top of lead have T- shaped pipe for entering of flies through it. While the flies lay egg on the meat pieces and development of maggots takes place. The top of the culture boxes was covered with plastic material led to avoid predation by lizards, cats, dogs and other predators.

### 2.1. Maggot Production

The content was carefully mixed by hand wearing gloves and left exposed for 24 hours to allow flies to naturally lay eggs. After exposure, all boxes were covered with netting to prevent further egg deposition, which could lead to variations in maggot sizes at harvest time and to deter predation. The boxes were then placed outdoors, shaded, for three days to allow maggot development. This experiment box was monitored twice daily (morning and evening). The harvest of the maggot at the end 3 days, the content was taken out by forceps and kept in watch glass. Observation’s eggs ,1<sup>st</sup> ,2<sup>nd</sup> ,3<sup>rd</sup> instar period was done (Figure 1-6).

## 3. Results and discussion

he various stages of blowfly development. The results indicate that the egg stage of the blowfly lasts for 16 hours, with three larval instars. The first instar larvae take 24 hours to develop, while the second instar larvae progress to the third instar in 20 hours. Third instar larvae transition to the pupal stage in 48 hours. The pupal stage lasts for 336 hours, equivalent to 14 days, and the adult life span is 192 hours, or 8 days. The entire life cycle of the blowfly spans approximately 27 days. The egg hatch time, as reported by Kamal (1958) at a temperature of 26.7°C, ranged from 10 to 22 hours, consistent with the findings of this study (Table 1 and Figure 1-6). Additionally, the peak emergence of blowflies occurred in 16 hours, aligning with the studies of Kamal (1958). The results of this study are also confirmed by Firoozfar (2011), who reported that larvae complete their development in 4-13 days. However, our study found the duration of the adult stage and mating to be 8 days, contrasting with the two-week duration reported by Spiller (1966).

**Table 1** Biology of Blowfly

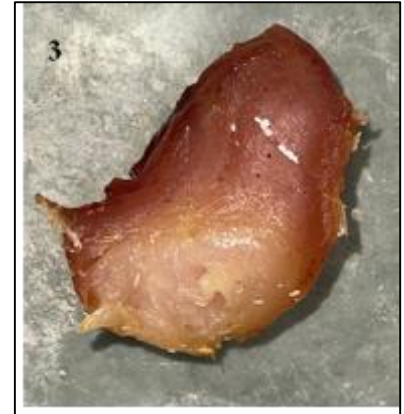
Life stages		Duration
Egg		16 hrs.
Larva	1 <sup>st</sup> Instar	24 hrs.
	2 <sup>nd</sup> Instar	20 hrs.
	3 <sup>rd</sup> Instar	48hrs
Pupa		336 hrs. (14 days)
Adult		192 hrs. (8days)
Total Duration		636 hrs. (26.5 days)



**Figure 1** 5-hour bed cut Broiler chickens.



**Figure 2** After 16 Hours the flies have laid eggs on meat



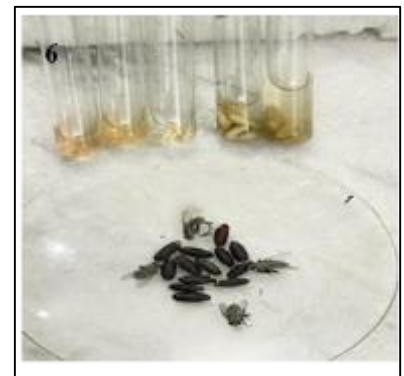
**Figure 3** Blowfly eggs on a meat piece



**Figure 4** 1 & 2 Instar stages of maggots



**Figure 5** Instars and Pupa stages



**Figure 6** All the different develop stages of maggots

#### 4. Conclusion

The research conducted here concludes that the complete life cycle of the blowfly (from egg to adult) is approximately 27 days, with variations influenced by temperature changes during different life stages and the availability of food sources. Examining the blowfly life cycle serves as a valuable forensic technique for estimating time of death, but it's a complex procedure. Investigators must account for factors such as temperature during specimen collection. For instance, if a body remains outdoors during summer for an extended period, the ambient temperature can fluctuate significantly. Moreover, certain types of blowflies mature more quickly in warmer conditions than in colder ones. An entomologist must meticulously observe growth cycle variations in specimens to establish a standard range.

#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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