

## Research Article

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# Study on food consumption by blow fly maggots and their percent adult emergence under laboratory conditions

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### Abstract

Blow flies plays an important role in decomposition process and consume the maximum carrion. To study the food consumption by blow fly larvae and percent adult emergence, the present research works was carried out at Entomology research laboratory, The University of Agriculture, Peshawar during the year 2015. In 1<sup>st</sup> experiment, two rabbits were killed by intra cardiac injection of 10cc magnesium sulphate per rabbit and one each was placed in sunny and shaded areas. In 2<sup>nd</sup> Experiment, one rabbit was killed by intra cardiac injection of magnesium sulphate while one rabbit was slaughtered with a sharp knife. Blowfly maggots were collected from the rabbit carrion with the help of forceps and were brought to the laboratory for rearing on cow meat at  $25 \pm 2$  °C and RH  $65 \pm 10\%$  to get the adult blowfly. Meat consumption was calculated by exposing 30 grams meat slice to 10 actively feeding larvae. The meat consumption per larvae was recorded highest (1.95 gram) in larvae collected from slaughtered rabbit and lowest (1.91 gram) in larva collected from the rabbit killed by injection. Furthermore, results revealed that the meat consumption per larva and percent adult emergence appeared to be similar in both sunny and shaded areas while the rabbit killed by injection yielded higher percent adult emergence (88.97%) in comparison to slaughtered rabbit with (83.39%) emergence.

**Keywords:** Blow flies; Carrion flies; Food consumption; Forensic entomology; Percent adult emergence

### Introduction

Carrion-feeding invertebrate fauna is mainly made up of insects and the estimation of post mortem interval using the succession of insects on dead body and age necrophagous larvae has been used extensively [1].

Insects are the primary fauna associated with carrion [2]. Certain species in the

orders Diptera and Coleoptera represent the majority of the total necrophagous fauna found on carrion [3]. Among the insects visiting carrion, larvae of flesh flies (Sarcophagidae) and blow flies (Calliphoridae) consume the maximum carrion [4]. It is known that there is an assemblage of insect species that are attracted to decomposing animal remains

and play an active role in the decay process [5].

Insect are the first visitors on the carrion immediately after the death [6]. Calliphorid species (blow flies) play a very important role in the carrion decomposition [7]. It is evident that various insect species are attracted by animals carrion and play important contribution in the decomposition process [5].

Those insect species which make colonies in the carrion differ extensively with various climatic regions and factors e.g. rainfall, humidity, temperature and microclimate. These factors can affect the sequential pattern of insects, their arrival and the duration of their stay on the carrion [8]. Information of insects succession pattern along with a specific environmental variable such as temperature, humidity etc. play a very important role in calculating postmortem interval. These acquired information's may be compared with the species collected from the carrions in particular geographic region to estimate the time elapsed since death [9].

Published literature shows that non-significant work has been done in Pakistan related to forensic. Since the blow flies (dipteran) play a key role in the carrion decomposition and consume most of the carrion. They also play a very important role in estimating the post mortem interval. Therefore, the present study is an attempt to know the food consumption of blowfly and their adult emergence which may be used as a tool to evaluate the time interval between death and finding of the dead body.

### Materials and methods

Two experiments were carried out in Peshawar-Pakistan during 2015. Rabbit, *Oryctolagus cuniculus* was used as a test animal during the study. In 1<sup>st</sup> experiment, two rabbits were killed by intra cardiac injection of 10cc magnesium sulphate per rabbit and were placed in sunny and shaded areas. In 2<sup>nd</sup> Experiment, one rabbit was killed by intra cardiac injection of magnesium sulphate while one rabbit was slaughtered with a sharp knife.

### Meat consumption by blowfly larvae

First instar larvae were collected from carrion with the help of forceps and brought to laboratory to get adult blowfly. In laboratory, these larvae were reared on a fresh sliced meat of cow in order to determine their meat consumption. For this purpose, four plastic containers were taken and filled with 4-5 cm deep layer of soil in order to provide the larvae with a substrate for pupation later on. 30 grams fresh sliced meat was placed on a paper board in each container and 10 collected larvae were released on it. The containers were covered with nylon muslin cloth and tightened with rubber bands. The containers were kept at  $25 \pm 2$  °C and RH  $65 \pm 10\%$  and were daily observed for adult emergence. The weight of the remaining meat in each container was calculated separately. Hence the average meat consumed by the blowfly maggots was calculated [10]. Newly emerged adults were killed straight away by placing them in the killing jar and were preserved in 70% ethanol for identification.

### Meat consumption calculation

The meat consumption by the larvae was calculated by the formula followed by [10].  
Meat consumed= Total meat weight - Remaining meat weight

Meat Consumed per Larva= Total meat consumed (gm) / Total number of larvae

### Percent adult emergence

When all larvae finished their feeding and reached the last instar, they left the food and migrated to the soil for pupation. All the pupae were collected from the soil, counted and placed in separate rearing cages in the laboratory for adult emergence. After emergence all the adult were killed and counted. Number of male and female were also separated from total emerged adults on the basis of space between the eyes i.e. in male flies, the eyes are touching on the top of the head while in female flies, the eyes are markedly separated medially.

The percent adult emergence was calculated as follow.

Percent adult emergence= Total number of pupae/ Total number of adults emerged x 100

Percent sex ratio= Total number of Male & female / Total number of adults emerged x 100

### Results and discussion

Results in figure 1 showed that the meat consumption per larvae was almost similar (P= 0.6713) in larvae collected from both sunny and shaded areas i.e. (1.91±0.03 gm) and (1.93 ± 0.06 gm) respectively. Sunny and shady environments had no effect on

the meat consumption when similar numbers of larvae were provided under laboratory conditions. These results agree with the findings made by [10].

Results in figure 2 revealed that the meat consumed per larvae was highest (1.95 ± 0.03 gm) in larvae collected from slaughtered rabbit and lowest (1.91 ± 0.09 gm) in larvae collected from the rabbit killed by injection. A non-significant difference was recorded in meat consumed by each blowfly larva collected from the rabbits slaughtered and euthanized through injection as P= 0.4083, however, [11] reported that the growth rates of blow flies larvae vary significantly on different tissues.

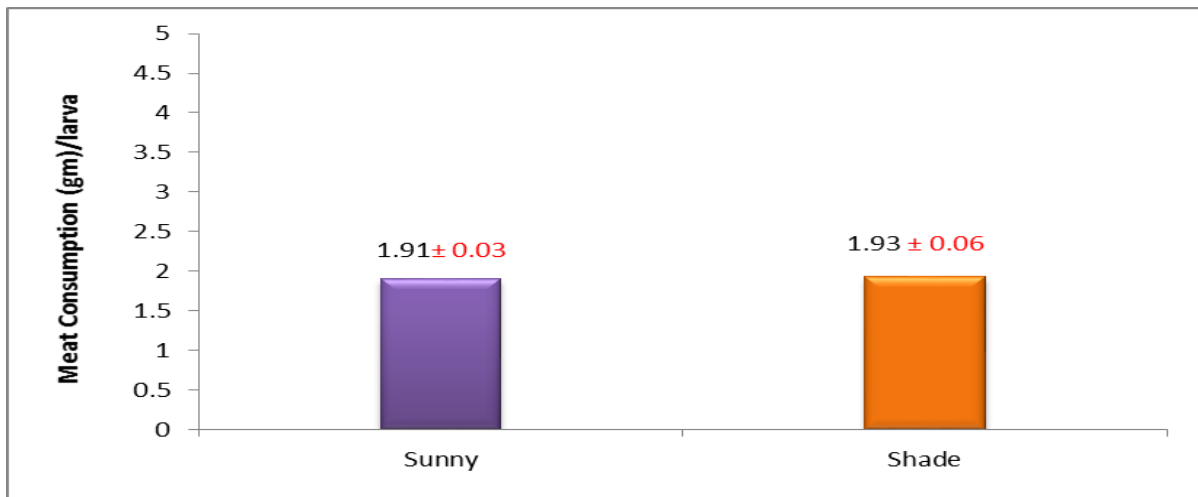


Figure 1. Meat consumption (gm) larvae<sup>-1</sup> collected from rabbit carrion during 2015

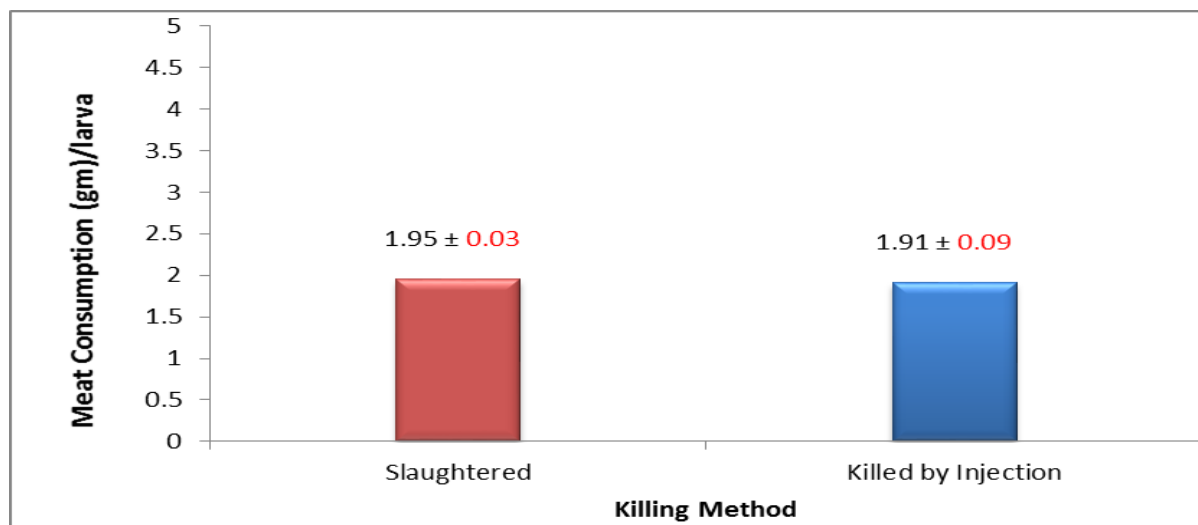


Figure 2. Meat consumption (gm) larvae<sup>-1</sup> collected from the rabbit killed by injection and slaughtered during 2015

Results in table 1 showed no significant difference in the percent adult emergence as  $P=0.7487$ . Percent adult emergence recorded in both the sunny and shady places were 85.41 % and 85.51 % respectively. Percentage of male and female emerged from the carrion in sunny place was 38.04 % and 62.96 % respectively. Similarly, the male and female ratio recorded in shady environment was 43.75 % and 56.25 % respectively.

Carrions in shade were remaining soft and providing the food source for the flies to feed on for longer period of time. Hence more flies were attracted to deposit eggs in the carrion placed in shaded area as compared to the one in sunlight. Temperature and humidity may also have a major influence on the carrion decomposition, larval development and pattern of insect succession. Our results are at par with the findings of [12]. Minimal difference may be due to slow rate of decomposition in the shady environment. Carcass exposed to full sunlight decomposed faster in relation to the carcass in shaded area. Low temperature slowed down the rate of decomposition and insect fauna succession and high temperature increased them as reported by [13].

Results in table 2 shows that significant

**Table 1. Percent emergence of blow flies collected from rabbit carrion placed in sunny and shaded area during 2015**

Method of killing	Total No. of Pupae	Total Adults Emerged	% Adult Emergence	Sex Ratio (%)	
				Male	Female
Injection (Sunny)	251.33	214.67	85.41 %	38.04 %	62.96 %
Injection (Shaded)	280.67	240	85.51%	43.75 %	56.25 %
P-value	0.7487 <sup>ns</sup>				

ns: non-significant

**Table 2. Percent emergence of blow flies collected from rabbit carrion killed by injection and slaughtered during 2015**

Method of killing	Total No. of Pupae	Total Adults Emerged	% Adult Emergence	Sex Ratio (%)	
				Male	Female
Injection	613.33	545.67	88.97 %	41.66 %	58.43 %
Slaughtered	461.67	385	83.39 %	36.97 %	63.03 %
P-value	0.0007 <sup>s</sup>				

difference was recorded in percent adult emergence from the rabbits killed by injection and slaughtered kept in the same environment. Highest (88.97 %) adults emerged were recorded from the rabbit killed through an injection while the lowest adults (83.39 %) were emerged from rabbit slaughtered with a knife. The percentage of adult male (41.66 %) and female (58.43 %) emerged from the rabbit euthanized with injection was highest than the rabbit slaughtered having adult males (36.97 %) and females (63.03 %).

Higher percent adult emergence was recorded for injection killed rabbit in comparison to the slaughtered could be due to excessive loss of body fluids from slaughtered rabbit. The intra and inter-specific species competition for food and breeding material may be more intense and hence most of the larvae leave the slaughtered carrion. These results are also supported by [14] who reported that most species of insect were not attracted to the carcass due to high rate of decomposition. They also suggested that if the fleshy and soft tissues were not quickly eaten, may be more variety of insects would be recorded. Therefore, lowest percent adult emergence was recorded in slaughtered rabbit than the rabbit killed through an injection.

## Conclusion and recommendation

Present study focused on food consumption by blowfly maggots and their percent adult emergence under laboratory conditions. Our findings indicate that under laboratory conditions same number of blow fly maggots had no effect on the meat consumption. Furthermore, higher percent adult's emergence was reported from the carrion killed by injection in comparison to slaughtered carrion, while in sunny and shaded areas similar percent adult's emergence was recorded. However diverse insect species were observed from the carrion placed in shaded area. Studies should be carried out under different environmental conditions in order to study the life cycle of insects attracted to carrion to estimate the post mortem interval.

## Authors' contributions

Conceived and designed the experiments: SF Shah, A Usman & M Shah, Performed the experiments: F Amin, MA Khan & K Sohail, Analyzed the data: J Sarwar & M Usman, Contributed reagents/ materials/ analysis author: SF Shah, Wrote the paper: F Amin.

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