

Original Research Paper

An Entomological Study to Determine the Time since Death in Cases of Decomposed Bodies

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Abstract

Forensic entomology is the application of knowledge of insects during investigation of crimes or other legal matters. For investigation of crime, it is very important to determine time since death, which is easy to determine in the early post-mortem period, but poses a problem in the late stages. In this study an effort has been made to determine post-mortem interval in the late stages (decomposed bodies) by studying insect evidence. Insect evidence in the form of blow flies in their different stage of development was found on fresh and decaying corpses. Beetles were found on skeletonised bodies. Since the arthropods are poikilothermic and their development period gets influenced by ambient temperature therefore a record of prevailing temperature was maintained for the set period. Average temperature and humidity was calculated from the meteorological department at Raja Sansi Airport, Amritsar, from the day of recovery of body to rearing up of insects to adult stage. Identification of insects was carried out in collaboration with Zoology Department of Guru Nanak Dev University, Amritsar.

Key Words: Forensic entomology, Post-mortem interval, Decomposed bodies, Blow flies, Beetles

Introduction:

The determination of post-mortem interval (PMI) is one of the main objectives of doing medicolegal autopsy. In the early post-mortem period, the PMI can be calculated from algor mortis, rigor mortis, livor mortis, eye changes, and gastric contents etc. [1] In the late post-mortem period in addition to signs of decomposition, insect play a considerable role in calculating PMI. Sarcophagus flies, lay their eggs on moist areas, particularly around the eyes, nose, mouth and if exposed anus and genitalia. The eggs hatch into larvae, which grow and shed their skins a number of times, each moult being called an instar, finally they pupate and a new winged insect emerges. The time from egg lying through the instar to pupae depends on the species and on the ambient temperature. [1]

Materials and Methods:

The study was carried out on 47 decomposed bodies brought for post-mortem examination in the Department of Forensic Medicine and Toxicology at Government Medical College, Amritsar.

Bodies were divided into four stages of decomposition i.e. fresh, bloated, decay and dry. [2] Signs of decomposition like colour changes, marbling of skin, foul smelling gases, bloating of body features, skin slippage, degloving of skin, easy pull out of hairs, loosening of nails and teeth, colliquative putrefactive changes, adipocere formation, conditions of viscera whether recognizable or not, degree of skeletonisation of body etc were noted. [3]

Bodies were screened thoroughly for the adult arthropod specimens flying or crawling over it. Crawling insects were collected with a camel hair brush and flying insects by making aerial collections with sweep nets. The collected adult specimens were dry mounted for identification. The body was screened for eggs, larvae or pupae particularly around the eyes, ears, nostrils, mouth, vagina, anal region and wounds. The collected material in the form of eggs, larvae or pupae were reared by transferring them to 500 ml transparent glass beaker partially filled with sterilized sand covered with circular piece of filter paper. A piece of flesh from same body was provided as food for the development of material to adult stage. After transferring immature stage insects the mouth of jar was covered with muslin kept in position with rubber bands. [4]

The glass beakers were observed daily for emergence of adults and development period was noted. The emerged adults were preserved by dry mounting for identification. The standard

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data about total development period of identified species was collected from literature, as well as from their rearing under experimental conditions and time of infestation by insects was calculated by subtracting the observed development period from it and this data were used for making estimates regarding the time of death. [5]

Since the arthropods are poikilothermic and their development period gets influenced by ambient temperature therefore a record of prevailing temperature was maintained for the set period. [6] Average temperature and humidity was calculated from the meteorological department at raja sansi Airport, Amritsar, from the day of recovery of body to rearing up of insects to adult stage. Identification of insects was carried out in collaboration with Zoology Department of Guru Nanak Dev University, Amritsar.

Observations:

Table 1: Frequency Distribution of Dead Bodies according to Various Characteristics

Characteristic	Number (%)	
Distribution of cases according to age (in years)	0-20	5 (10.63)
	21-40	25 (53.19)
	41-60	10 (21.27)
	>60	4 (8.50)
	Unknown	3 (6.38)
Distribution of cases according to Sex	Male	41 (87.23)
	Female	4 (8.50)
	Unknown	2 (4.25)
Distribution of cases according to the location from where dead body was found	Water	11 (23.40)
	Ground	33 (70.21)
	Buried	3 (6.38)
Distribution of cases according to the stage of decomposition	Fresh	7 (14.89)
	Bloated	23 (48.93)
	Decay	15 (31.91)
	Dry	2 (4.25)

Table 2:

Distribution of cases based upon entomological evidence found*	Adult fly	29 (61.70)
	Egg colonies	16 (34.04)
	1 st instar larva	11 (23.40)
	2 nd instar larva	10 (21.27)
	3 rd instar larva	7 (14.89)
	Pupae	2 (4.25)
	Beetles	8 (17.02)
Distribution of cases based upon insects identified*	Sarcophagidae	45 (95.74)
	Calliphoridae	45 (95.74)
	Muscidae	45 (95.74)
	Silphidae	15 (31.91)
	Dermestidae	17 (36.17)

*values are more than total number of dead bodies studied as in many bodies more than one entomological evidence or insect was found

Table 3: Decomposition Stage wise Distribution of Arthropods

Decomposition stage	Arthropod	Developmental state
Fresh (up to 36 hours)	Calliphoridae (Diptera)	Adult
	Sarcophagidae (Diptera)	Adult
	Muscidae (Diptera)	Adult
Bloated (36 hours to 7 days)	Calliphoridae (Diptera)	Adult and larvae
	Sarcophagidae (Diptera)	Adult and larvae
	Muscidae (Diptera)	Adult
Decay (7 days to 3 months)	Calliphoridae (Diptera)	Adult and larvae
	Sarcophagidae (Diptera)	Adult and larvae
	Muscidae (Diptera)	Adult and larvae
	Silphidae (Coleoptera)	Adult and larvae
	Dermestidae (Coleoptera)	Adult and larvae
Dry (3 months to 1 year)	Dermestidae (Coleoptera)	Adult and larvae

Discussion:

The present study was conducted on putrefied bodies recovered from ground, water and burial. Rodriguez and Bass [7] conducted their studies on buried corpses, Whereas Vanlaer Hoven and Anderson [8], Arnaldos et al [9] Devinder and Meenakshi [2] conducted their studies on putrefied carcasses on ground. Campobasso et al [10] studied various factors influencing putrefaction as well as crop pattern of insects. In this study also it was observed that in bodies underwater and in burial, process of putrefaction was delayed. In the present study it is quite clear that when the body was in fresh, bloated and early decay stage, dermestidae (Beetles) were conspicuously absent. They were only seen when skeletonisation occurred, whereas blow fly i.e. green and blue bottled were the main insect attracted to the corpses in wet stage. Knight [11] Kulshrestha and Satpathy [12, 13] also observed same as in the present study.

Decomposition process is slowed in winter season and buried bodies as favourable factors for decomposition and bacterial growth are not available. This was evident from the current study, it took longer time for bodies to get putrefied and even infestation of these bodies with arthropod also took longer time and even rearing of arthropod took longer time. Similar observations were made by Bass [14], Arnaldos [9] and Carvalho & Linhares. [15]

Conclusions:

Forensic entomology is a highly specialized branch of Forensic Science which needs special equipment and facilities. In this study an effort has been made to calculate the post-mortem interval from entomology, but to

make the study applicable for legal purpose further studies needs to be done and standard data should be prepared for the local arthropod of the region and then standard life cycle under various weather condition should be prepared and visit to the scene of crime should form a part of the exercise.

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