

Forensic Entomology : An Indian Prospective

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ABSTRACT

Insects are the dominant group of animals on earth today. They occur practically everywhere and far outnumber all other terrestrial animals taken together. Several hundred thousand different kinds of insects have been described, three times as many as there are in the rest of animal kingdom and some authorities believe that the total number of different species of insects may approach 30 million. Forensic entomology is the study of insects and fauna found in and around the carcasses, and their use in the estimation of post mortem interval (PMI). The aim of the present review is to show the current status of the forensic entomology in India.

Keywords : Forensic entomology, Insects, Medico-legal investigation, PMI

I. INTRODUCTION

Forensic entomology is a science, which applies knowledge of insects (and other arthropods) to civil proceedings and criminal trials [1]. Although it has come of age as a science only in the last 40 years, it is a field with a long history. The first documented case of forensic entomology took place in 13th century China. In the book, “Hsi Yuan Chi Lu” (one possible translation is “the washing away of wrong”) [2], Chinese criminalist Sung Tz’u reported a case in which insects were used to identify a murderer. A murder was committed by slashing, and all villagers were ordered to bring their sickles to a single location. The sickles were laid on the ground, and flies were attracted to a single sickle, presumably responding to traces of tissue and blood. On the basis, the owner of the sickle broke down and confessed.

II. Applications of Forensic Entomology

The applications of forensic entomology are numerous, encompassing any situation that may involve an interaction between insects and other arthropods, and the law. Therefore, the utility of the field is categorized under three separate headings: urban, stored product and medico legal forensic entomology [3,4].

Urban forensic entomology generally deals with the interaction of insects with man-made structures and other aspects of human society and may include the infestation of buildings by termites, cockroaches etc. [3], and the breeding of flies in livestock and similar facilities [5].

The stored product aspect of forensic entomology involves the infestation of stored commodities by insects. Infestations may include the harvesting and storage of crops and subsequent invasion by an insect pest and domestic invasion of kitchen products. This aspect also encompasses the infestation of food sold by retailers to the public, which may result in prosecution and substantial fines [3].

The most accepted aspect of forensic entomology is assuredly the medico legal aspect. Forensic entomology intends to establish the time of death, known as postmortem interval (PMI), or more precisely, how long a carrion has been exposed in the environment. By analyzing the parameters like, body temperature or livor and rigor mortis, time since death can only be correctly estimated for the first 2 to 3 days after death. On the other hand, by calculating the age of insect immature stages feeding on a corpse and analyzing the necrophagous species present on a cadaver, PMI from the first day to many days can be calculated [6]. Haskell

et al. [7] and Megnin [8] proposed that PMI can be determined by knowing the life cycle of insect species and by evaluation the insect succession waves present on the corpse at any given time.

The conclusion regarding the of post mortal transfer and the initial location of the body, if it was hidden and where it was hidden can be made through the specimens collected in and around the corpse because instead some common species are relatively ubiquitous, the presence of others found only in certain geographical areas and occurring in relatively definable environment can suggest that body was moved after death [7]. The presence of live maggots or remnants of insects in the absence of a dead body at a location is almost certain evidence that some kind of corpse has been removed from the scene [9].

III. Forensic Entomology In India

Forensic entomology in India is in its infancy state and few workers are doing their research in this field. The earliest work has been done by Mackenzie (Indian Medical Gazette, 1889), in which he made observations on dead bodies about the times of appearance of eggs and maggots. Dr. Pankaj Kulshrestha of Medico Legal Institute, Madhya Pradesh has published few papers in case studies of post mortem interval estimation based on flies infesting human corpses [10-12]. Dr. Devinder Singh (Second author) has done a lot of work on various aspects of this field. He worked with Dr. Bernard Greenberd, pioneer in the field of Forensic entomology, at University of Illinois at Chicago. Singh and Greenberg [13,14] identified the blow flies on the basis of egg morphology and studied the survival after submergence in five species of blow flies. Senior author has been the Principal Investigator in a major research project sponsored by Department of Science and Technology, Government of India (1998-2001).

Life history, bionomics and reproduction behavior of blow flies *C. megacephala*, *C. rufifacies* and *Lucilia cuprina* was studies by Subramanian and Mohan [15]. Rao et al. [16] carried out experiments on the developmental stages of the maggots to estimate time since death. Kashyap and Pillay [17,18] proved that entomological method is important than other methods for estimating post mortem interval by observing sixteen infested cadavers.

Bharti and Singh [19] carried out insect faunal succession on decaying rabbit carcasses at Punjabi University, Patiala (Punjab), India, from March 1997 to December 1999. They recognized four stages of decomposition, i.e., fresh, bloated, decay and dry. A total of 38 insect species belonging to 4 orders and 13 families were recorded. Diptera, Coleoptera and Hymenoptera dominated the carrion fauna. Calliphorids were the first to arrive in all the seasons of the year. Five species of Calliphoridae, four of Sarcophagidae, ten of Muscidae, and one each from Anthomyiidae and Otitidae were observed on rabbit carcasses. Representatives of six Coleopteran families, i.e., Staphylinidae, Histeridae, Cleridae, Dermestidae, Tenebrionidae, and Silphidae, were recorded. Eight species belonging to family Formicidae (Hymenoptera) and only one species of order Lepidoptera were recorded on carrion. Gupta and Setia [20] described the past, present and future status of Forensic entomology in India. Singh and Bharti [21] studied the nocturnal oviposition behavior of Indian species blow flies. Bharti and Singh [22] demonstrated the succession pattern of insect species on rabbit carcasses. Bajpai and Tewari [23] studied the phylogenetic relationship between five species (*Sarcophaga ruficornis*, *Sarcophaga albiceps*, *Sarcophaga argyrostoma*, *Sarcophaga dux* and *Sarcophaga knabi*) of Indian Sarcophagidae on the basis of COI and ND5. They showed that analysis based on mitochondrial genes can be useful for unraveling phylogenetic relationships in the Sarcophagidae. Sharma et al. [24] phylogenetically analyzed three species of Sarcophagidae on the basis of mitochondrial COI gene. Sharma et al. [25] also sequenced COI gene of ten forensically important species of Indian sarcophagids collected from four northern states of India.

IV. CONCLUSION

It is evident from the foregoing discussion that the field of molecular forensic entomology has been rapidly growing around the world for the last ten years. But in India, this is reverse and there are only few references [23-25] are available pertaining to the molecular study of family Sarcophagidae and Calliphoridae. The status of forensic entomology in India is quite encouraging and it is desirable to focus on this field for the future workers.

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