WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 6.805
Volume 5, Issue 4, 2068-2077. Research Article ISSN 2277– 7105

THE TAXONOMIC COMPOSITION OF THE FORENSICALLY IMPORTANT INSECTS IN THE RABBIT CARCASSES DURING TWO SEASONS IN AN-NAJAF PROVINCE –IRAQ

Suhad Hameed H. Alboshabaa and *Harith R. Al Musawy

India.

Article Received on
22 Feb 2016,
Revised on 13 March 2016,
Accepted on 03 April 2016
DOI: 10.20959/wjpr20164-6056

***Corresponding Author**
Dr. Harith R. Al Musawy
india

ABSTRACT

This study was conducted to gather database information about forensically important insects on exposed rabbit carcasses at urban sites in An-Najaf province-Iraq during Winter and Autumn of year 2014. A total of 896.3 individual belonging to 10 species from 7 families under 3 orders were successfully identified from study sites. These orders were Diptera, Coleoptera and Hymenoptera. The most important families of Diptera breed on carcass was Calliphoridae such as Calliphora vicina (Rob-Desvoidy), Chrysomya megacephala (Fabricius), Chrysomya albiceps (Wiedemann), Lucilia sericata (Meigen), Sarcophagidae such as Sarcophaga africa (Wiedemann), Dermestidae was most important families of Coleoptera such as Dermestes maculatus (De Geer). The majority of the collected species were Calliphora vicina, Chrysomya albiceps and Sarcophaga africa. All of these species can used as forensic indicators to estimate the PMI.

KEYWORDS: Taxonomic composition, forensically.

INTRODUCTION

Forensic entomology is the study of arthropods including insects in a legal context (Hall, 2001), Medico-legal entomology is a tool that is frequently used to calculate the time interval between death and the discovery of the corpse, known as the post-mortem interval or PMI (Smith, 1986). Knowledge of the distribution, biology and behavior of insects found at a crime scene and the environmental factors can provide an information on where, when and how the crime was committed (Hall, 2008).

The taxonomic structure of insects are influenced by many factors e.g. geographic location, habitat, season, temperature, humidity, insect abundance and carrion accessibility (Carvalho and Linhares, 2001; Grassberger and Frank, 2004).

Aims of the study

Estimate qualitative and quantitative differences in the insects species assemblages associated with the exposed rabbit carcasses at urban site in An- Najaf province during winter and autumn seasons.

MATERIALS AND METHODS

Study sites

This study was conducted in January of 2014 and Octoper of 2014. within the campus of the University of Kufa (32°, 2,23N 44°22,6E) which located beside highway roads, and it is surrounded by buildings from all sides. The sites of the experiments was selected on the basis of specific criteria. It was also necessary to experiment sites are isolated enough to reduce human interferences and scavenger disturbances.

Experimental Animals and Cages

In this study, used approximately 6 of the mature rabbits ranging in weight from 1.5-2 (±0.5) Kg and different in colors. It had been purchased locally from a local market and used as models instead of human corpse. They were slaughtered by knife in the study sites. At each season, three cages were used. The rabbit carcasses were protected from scavengers by a metal cage (60 X 60 X 60) cm^3. Which was specifically designed to allow for the arrival of insects and prevent them from leaving (Al- Mesbah, 2010). inspection of the carcasses was done every day during early decomposition stages from 9 am to 12 am, then every two days in later stages. Date of killing and number of carcasses were determined for each cage. Flying insects were captured by an aerial net, all were removed and assembled in labeling plastic containers and transported to the laboratory for identification and counting. Larval specimens were collected randomly using gentle forceps or spoon and directly placed in numbered and dated vials and transporting to the laboratory for further identification and counting (Greenberg, 1991).

Laboratory work and Identification

In the laboratory the collected larvae were divided into two groups: the first group was killed in near-boiling water to avoid shrinking them, then placed in vials containing 70% alcohol for

further identification (Smith, 1986). Then the preserved larvae were prepared according to Lee et al. (2004). The second group was kept alive and reared in the laboratory to obtain the adults for sure species identification, by transferring them into dry glass jar with small amounts of minced chicken liver or beef lung on a layer of Sawdust to allow larvae to be pupate (Gosseline, 2011). Daily, they were observed and moistened with water. The collected flying insects and beetles were killed by freezing and mounted on insect pins. The specimens were observed under dissecting microscope and identified to order, family and species level according to specific keys (Mawlood, 2001; Spradbery, 2002). To confirmation, some samples were sent to the Natural History Museum/University of Baghdad, Iraq.

RESULTS

The results contained in table (1) and (2) reflect the taxonomic composition for the insect species which have been obtained from the exposed rabbit carcasses at urban sites of An-Najaf province during Winter and Autumn seasons of year 2014. Table (3) reflects the mean of max. and Min. Tempratures and Relative Humidity in An-Najaf province during study period. Ten species were identified belong to the 7 families under 3 orders, these orders were Diptera, Coleoptera and Hymenoptera.

A total of 896.3 individuals were collected during this study, the order of Diptera comprised (800.67) ind. 89.3 % of it and the order of Coleoptera and Hymenoptera comprised (64.66, 31) ind. 7.2% and 3.5% respectively (Table 1).

Table (1): Taxonomic composition of the insects species on exposed rabbit carcasses in An- Najaf province during study period, 2014

Order	No. of family	% family	No. of species	% species	No. of individual	% individual
Diptera	3	42.9	6	60	800.67	89.3
Coleoptera	3	42.9	3	30	64.66	7.2
Hymenoptera	1	14.2	1	10	31	3.5
Total	7	%100	10	100%	896.3	100

Table (2): Number of families and species, relative abundance (larvae and adults) on exposed rabbit carcasses in An-Najaf province during two seasons, 2014

Season	No. of families	Relative abundance (%)	No. of individuals	No of species
Winter	5	40.3	360.67	8
Autumn	7	59.7	535.6	10

Table: 3 The minimum,maximum and average Temperature and relative humidity of year 2014

Season	Min. TC	RH%	Ave.T.C	Max.TC
Winter	10.44	78.77	13.26	16.09
22.34	22.34	65.14	27.76	33.18

A total of seven families and 10 species were commonly found occurred in urban areas during Autumn and Winter, 2014. (Table 2) Interestingly, all species 10 existing in Autumn but decreased in Winter only 8 species were appeared. Also, the highest number of individuals and relative abundance was in Autumn reached to 360.67 ind. (40.3%). However, this abundance reduced in Winter to 535.6 ind. (59.7%) (Table 2).

In study site (Table 4) Diptera was mainly dominated and represented by 3 families which were, Calliphoridae, Muscidae and Sarcaphagidae.

Calliphoridae

Four species were collected, Calliphora vicina (Rob-Desvoidy): comprised 15.3% of all species collected. Results showed that species appeared to highest peak during winter reached 87 individuals. Chrysomya megacephala (Fabricius): comprised 10.63%. Chrysomya albiceps (Wiedemann): This species was abundant throughout the year comprised 26.66%. This species population has two peak reached during Autumn 176 individual, While Lucilia sericata (Meigen): comprised 8.03% it was highest during Winter 43.6 individual.

Muscidae

One species was collected Musca domestica (Linnaeus): comprised 16.62% this species was the most abundant in Autumn reached 96 individual.

Sarcophagidae

one species was collected Sarcophaga africa (Wiedemann):comprised 12.12% were abundant during Autumn 66.67.

The second Order of **Coleoptera** represented by three families were **Dermestidae**, **Histeridae** and **Clearidae.**

Dermestidae

one species was collected Dermestes maculatus (De Geer) comprised 3.64% reached during Winter 17 individual. Histeridae also one species was collected Saprinus sp. comprised

2.59% reached in Autumn 13.33 individual. Cleridae one species was collected Necrobia rufipes (De Geer) comprised 0.96% and 8.67 individule during Autumn.

The third order was Hymenoptera represented by one family Formicidae one species was collected Cataglyphis sp.(Förster)comprised 3.45% and reached 31 indivadule during Autumn, no collected in winter.(Table 3).

Table (4): Relative seasonal abundance of various species at study site on exposed rabbit carcasses duringtwo seasons, 2014

Species	Winter	Autumn	Total	%
Calliphora vicina	87	49.67	136.67	15.3
Chrysomya albiceps	63	176	239	26.66
Chrysomya megacephala	45	50.33	95.33	10.63
Lucilia sericata	43.67	28.33	72	8.03
Musca domestica	53	96	149	16.62
Sarcophaga africa	42	66.67	108.67	12.12
Dermestes maculatus	17	15.64	32.64	3.64
Saprinus sp.	10	13.33	23.33	2.59
Necrobia rufipes	0	8.67	8.67	0.96
Cataglyphis sp.	0	31	31	3.45
Total	**360.67**	**535.64**	**896.31**	**100**

DISCUSSION

This study was conducted on forensically important insects that were noticed on decomposing exposed rabbit carcasses at urban sites during two seasons Winter and Autumn of the year 2014. For studing carcasses ecology and insect activity, it was used the rabbits as animal models in this study as many researchers in different geographic locations and areas (Tantawi et al., 1996; Shah, ZA. and Sakhawat, T., 2004; Al-Mesbah, 2010), The rabbits were obtained in nearly uniform size and weight and are easily handled to study the decomposition rates, composition of insects on carcasses and succession patterns at site and seasons study (Lane, 1975; Catts and Goff, 1992). The results obtained from this study provided other information to forensic entomologists by diagnosing Diptera, Coleoptera and Hymenoptera species that are associated with rabbit carcasses in An- Najaf province-Iraq at which no researches on forensic entomology have been performed before.

In our study, Table (1) and (2) reflected the taxonomic composition for the insect species which have been obtained from the exposed rabbit carcasses at urban sites of An-Najaf province. The dominated fauna of the carcasses were the orders of Diptera, Coleoptera and

Hymenoptera. The three orders that optioned differ in terms of the number of families, species and individuals. The difference in aspects mentioned above can be considered natural things can be said about them as attributes of all insects, when it found in any certain ecosystem (Begon et al., 1986). Diptera were more dominant than the Coleoptera and Hymenoptera represented 60% of the total number of species, Coleoptera ranked 2^{ed} comprising 30% whereas Hymenoptera represented by 10% of all species. This probably reflects high dispersal capacity and access of Diptera species the carcasses shortly time after death. Coleoptera prefer to arrive at the carcass later, in drier stages, and the predator ones have the strategy of arriving before the fly larvae migrate far from the body (Olivera-Costa, 2007). This is agreement with most of the previous studies on forensic entomology (Tullis and Goff, 1987; Anderson and Van Laerhoven, 1996; Tantawi et al., 1996; Bharti and Singh, 2003 and Rosina et al., 2012).

Field observations supported by the data recorded in the present study (Table 2) showed that all collected insect species were more abundant during the moderate temperatures of Autumn seasons than during cold Winter seasons (Table 4). These data correspond to the previous studies carried out by Hanski (1987) which founded the species composition are also influenced by season factors and carcass microenvironment. Seasonal activity of fly species was fluctuating depending on season and environmental condition, temperature and relative humidity from the most important factors effective the growth and development of insects (Catts and Goff, 1992; El-Mehy et al., 2015). Carvalho and Linhares (2001) stated during Winter when the lowest temperature was 7.5°C, a low number of insects were recorded while, during Spring when the highest temperature 29.2°C, the highest number of insects were recorded. Abdul-Rassoul et al. (2009) concluded that the numbers of species which were collected on exposed carcasses in lowest number during Summer as compared with other season.

Bonacci et al. (2010) pointed to the composition and abundance of the arthropoda on carcasses were influenced by meteorological conditions (environmental temperature and rainfall) and by season. The results obtained by Abdul – Rassoul et al. (2009) showed that the majority of the collected species from exposed animal carcasses in Baghdad city could be collected all over the year with variations of their population density in different seasons.

The seasonal abundance of various forensically important insects species was illustrated in Table (4), the blow flies Ch. albiceps was the most common species invading carcasses

especially in Autumn. Ch. albiceps is found within warm weather Summer and Spring (Centeno et al., 2000 and Abdul-Rassoul et al., 2009) while in Winter it's very rare (Arnaldos et al., 2001). These results in one line with the observations in present study. It was noted that Ch. albiceps considered most important species in terms of abundance and frequency on rabbit carcasses in Kuwait (Al-Mesbah, 2010). The study of El-Mehy et al. (2015) in Middle Delta-Egypt revealed that, Ch. albiceps was found to be a highly indicative species to carcass found in urban and rural areas representing 67% and 33% on sequence during the warmer seasons. Some studies assumed Ch. albiceps have an important role in the composition of the fauna on the carcass. (Carvalho and Ribeiro, 2000; Grassberger and Frank, 2004).

C. vicina appeared to the highest peak during Winter, Schroeder et al. (2003) and Abdul – Rassoul et al. (2009) stated C. vicina started with a high population during February but no flies were collected In June, July, August, September, October and December. On the other hand Tantawi et al. (1996) found C. vicina was well occurred in carcasses during Winter only. In this study, the flesh flies S. africa were important components of carcass insects. So the most abundant during Autumn. Sam (2006) observed Sarcophaga species cannot survive in a cold temperate climate. However, the development rates of Sarcophaga species dependent on temperature and light factors, the exposure to less light and the cooler temperatures slows the growth and development of it.

The M. domestica collected throughout the expermint, especially in Autumn in urban site these results corresponding with the study of Hilal (2011) in Babylon-Iraq he recorded the most abundant of M. domestica with a peaks of activity were recorded during Autumn and he found a high activity of this fly during times with temperatures ranged between 20-25C^{o}. Anton et al. (2011) collected M.domestica near the building in Central Europe- Thuringia.

In this study the order of Coleoptera represented by three species D.maculatus, Saprinus sp. and N.rufipes. Greenberg (1991) state the certain species in the orders Diptera and Coleoptera were the most common of the total necrophagous fauna found on carcasses. Most of beetles dominated at moderated seasons at Autumn. It is hypothesized that low temperature in Spring and Autumn season along with the high activity of beetles (Mahat et al., 2009). Many of the beetle species associated with carrion are predators of maggots and only a few are true carrion feeders (Smith, 1986). The relative abundance of several species in our results were different between seasons. Ibrahim et al. (2013) in Benha city, Egypt state that the first

coleopteran and hymenopteran colonizers of pig carcass members of Dermistidae and Formicidae were in all seasons.

CONCLUSIONS

1. This study shows Diptera was more dominant than the Coleoptera and Hymenoptera.
2. The blow flies Ch. albiceps was the most common species invading carcasses at urban sites in An-Najaf province.
3. Most species were existing in Autumn compared with Winter.

REFERENCES

1. Abdul-Rassoul, M. S.; Augul, R. S. and Al-Saffar, H. H. 2009. Seasonal abundance of adult fly species on the exposed carcasses in Baghdad city. Ibn Al-Haitham J. Appl. Sci., 2009; 22(4): 16-25.
2. Al-Mesbah, H.A., A study of forensically important necrophagous, 2010.
3. Diptera in Kuwait. University of Central Lancashire, Faculty of Science, Forensic and Investigation Department, M.Sc. thesis.
4. Anderson, G.S. and Van Laerhoven, S.L. Initial studies on insect succession on corpse in Southwestern British Columbia, J. Forensic Sci., 1996; 41: 617–625.
5. Anton E, Niederegger S, Beutel RG. Beetles and flies collected on pig carrion in an experimental setting in Thuringia and their forensic implications. Medical and Veterinary Entomology, 2011; 25: 353–364.
6. Arnaldos, I., E. Romera, M.D. Garcia and A. Luna. 2001. An initial study on the succession of sarcosaprophagous Diptera (Insecta) on carrion in the southeastern Iberian peninsula. Int. J. Legal Med., 114: 156-162.
7. Begon, M., Harper, J. L. and Townsend, C.R. Ecology: individuals, populations and communities. Blackwell. Oxford, 1986; 945.
8. Bharti and Singh: Insect faunal succession on decaying rabbit carcasses in Punjab, India. J Forensic Sci., Sep, 2003; 48(5): 1133-43.
9. Bonacci T., Brandmayr P., Greco S., Tersaruolo C., Vercillo V. and Campobasso, C.P.; Di Vella, G.; Introna, F. Factors affecting decomposition and Diptera colonization. Forensic Sci Int., 2001; 120: 18-27.
10. Catts E. P. and Goff M. L., "Forensic entomology in criminal investigations," Annual Review of Entomology, 1992; 37(1): 253–272.

11. Carvalho, C.J.B., de Ribeiro, P.B. Chave de identificac¸ ão das espécies de Calliphoridae (Diptera) do sul do Brasil. Rev. Bras. Parasitol. Vet, 2000; 9: 169–173.
12. Carvalho, L. M. L., and A. X. Linhares. Seasonality of insect succession and pig carcass decomposition in a natural forest area in southeastern Brazil. Journal of Forensic Sciences, 2001; 46: 604–8.
13. Centeno, N., Maldonado, M. and Oliva, A. Seasonal patterns of arthropods occurring on sheltered and unsheltered pig carcasses in Buenos Aires province (Argentina). Forensic Science International, 2002; 126(1): 63-70.
14. El-Mehy, Sief A, Soliman E, Hassan NAand Alrouf TA. Application of Entomology in Some Medicolegal Issues. Austin J Forensic Sci Criminol, 2015; 2(4).
15. Grassberger, M., and C. Frank. Initial study of arthropod succession on pig carrion in a central European urban habitat. J. Med. Entomol, 2004; 41: 511–23.
16. Greenberg B. Flies as forensic indicators. Journal of Medical Entomology, 1991; 28: 565–577.
17. Gosselin M, Wille SM, Fernandez Mdel M, Di Fazio V, Samyn N, De Boeck G, Bourel B Entomotoxicology, experimental set-up and interpretation for forensic toxicologists. Forensic Sci Int., 2011 May 20, 2011; 208(1-3): 1-9
18. Hall R. D: Introduction: perceptions and status of forensic entomology, in Forensic Entomology: The Utility of Arthropods in Legal Investigations, J. H. Byrd and J.L. Castner, Eds., 2001; 1–15, CRC Press, Boca Raton, Fla, USA.
19. Hall, M.J.R., Brown, T., Jones, P. and Clark, D. Forensic sciences. In M. Cox, A. Flavel, I. Hanson, J. Laver and R. Wessling (eds) The Scientific Investigation of Mass Graves: Towards Protocols and Standard Operating Procedures. Cambridge University Press, Cambridge, 2008; 463–497.
20. Hamza A.K. A succession of insects of medicolegal importance on rabbits Carrion in rural and urban area during summer and winter seasons in AL-Diwaniyah Province/Iraq". PhD. Thesis, 2015.
21. Hanski, I: Carrion fly community dynamic: patchiness, seasonality and coexistence. Ecol. Entomol, 1987; 12: 257-266.
22. Hilal, S.M. Daily and seasonal active to the fly species using in forensic entomology. Euphrates Journal of Agricultural Sciences Babylon, 2011; 3(3): 85-94
23. Ibrahim A. A.; Galal F.; Seufi A. M.; and Elhefnawy A. A. Insect succession associated with corpse's decomposition of the guinea pig Cavia porcellus in Benha city, Egypt. Egypt. Acad. J. Biolog. Sci., 2013; 5(1): 1-20.

24. Lee, H.L., Krishnasamy, M., Abdullah, A.G. & Jeffery, J. Review of forensically important entomological specimens in the period of Tropical Biomedicine Supplement. 2004; 69: 1972-2002.
25. Mahat, N. A., Zafarina, Z., and Jayaprakash, P. T. Influence of rain and malathion on the oviposition and development of blowflies (Diptera, 2009).
26. Mawlood, N. A. 2001. Taxonomic study of the blow flies (Diptera: Calliphoridae) in middle of Iraq. A thesis of Ph.D., college of agriculture, university of Baghdad.
27. Oliveira - Costa, J. Entomologia Forense: quando os insetos s~ao vest__gios. 1 ed. Campinas: Millennium Editora. (S-erie: Tratado de Per-cias Criminal -sticas), 2007.
28. Rosina A. K.; Kyerematen, Bernard A.; Boateng,; Michael H. and Vincent Y. E., (2013):Decomposition and insect succession pattern of exposed domestic pig (Sus scrofa L.) carrion, ARPN Journal of Agricultural and Biological Science, 8(11).
29. Sam S. A Study of the Effect of Temperature on the Developmental Rate of Flesh Flies, Sarcophaga sp. Saint Martin's University Biology journal, 2006; 1.
30. Schroeder H., Klotzbach H., Sharanowski K.P.BJ, Walker EG, Anderson G.S. (2003): Insects' colonization of human corpses in warm and cold season. Insect succession and decomposition patterns on shaded and sunlit carrion in Saskatchewan in three different seasons. Forensic Science International, 2008; 179: 219–240.
31. Shah ZA, Sakhawat T. The effect of flesh age, trap colour, decomposition stage, temperature and relative humidity on the visitation pattern of blow and flesh flies. Int J Agri Biol, 2004; 6: 370-374.
32. Smith, K. G. V. A Manual of Forensic Entomology. Trustees of the BritishMuseum (Natural History), London, 1986.
33. Spradbery J.P: A Manual for the Diagnosis of Screw-worm Fly. Authored by JP Spradbery of XCS Consulting1991, Design, Artwork & Printing by Expressions riculture, 2002.
34. Tantawi T. I., El-Kady E. M., Greenberg B. and El-Ghaffar H. A. Arthropod succession on exposed rabbit carrion in Alexandria, Egypt. Journal of Medical Entomology, 1996; 33(4): 566–580.
35. Tullis, K., and M. L. Goff. Arthropod succession in exposed carrion in a tropical rainforest on O'ahu, Hawai'i. J. Merl. Entomol, 1987; 24: 332-339.