The identification of Genus, species and distribution of sand flies (Diptera Psychodidae) in Khorramabad County, Lorestan Province, Iran

Mohammad Hassan Kayedi[1], Yavar Rassi[2]

[1.]Razi Herbal Medicines Research Center and Department of Parasitology, School of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran.
[2.]Department of Medical Entomology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
Kayedi78@yahoo.co.uk

Abstract: Background: Ecological study of sandflies with emphasize on fauna, habitats and seasonal distribution are very important to determine different tools in campaign against Cutaneous Leishmaniasis. Until now, ecological study of sandflies have not been carried out in the study area, so the findings of the present study can introduce tools to campaign against the disease. **Materials and methods:** Sticky traps were used to collect sand flies from 6 villages of Khorramabad district in west of Iran from May to November 2010. Each month 120 sticky traps were used to collect sand flies from human and animal dwellings, outdoor shelters (mountain), Rodent nests, outdoor walls and warehouses. All collected specimens were kept in 70% ethanol and were sent to Medical Entomology Department, Tehran University of Medical Sciences for species identification. **Results:** In total 3692 sandflies (1861 female, 1831male) were captured that 1729 were identified as *Phlebotomus* (1013 male and 716 female) and 1936 were identified as *Sergentomyia* (818 male and 1145 female). *P. Papatasi* and *S. dentata* were the dominant species from *phlebotomous* genus (68.3%) and *Sergentomyia* genus (93.2%) in the area. The minimum and maximum prevalence of sandflies in order belonged to May and August during the field studies. The most species diversity in two genus were belonged to mountain and outdoor walls. The most prevalence of *phlebotomus* Genus were catched from human dwellings. **Conclusion:** The results of the present study showed that fauna of sandflies in the study area approximately is similar to the other parts of the country and the seasonal and monthly activities of sandflies are dependent to climate in the area.
[Mohammad Hassan Kayedi, Yavar Rassi. **The identification of Genus, species and distribution of sand flies (Diptera Psychodidae) in Khorramabad County, Lorestan Province, Iran.** *J Am Sci* 2015;11(3s):1-4]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org. 1. doi:10.7537/marsjas1201s1601.

Keywords: Sandflies, ecology, Psychodidae, *Phlebotomus*, *Sergentomyia*, Khorramabad.

1. Introduction

The Cutaneous Leishmaniasis and Visceral Leishmaniasis are parasitic diseases caused by a protozoan parasite of the *Leishmania* Genus. Of the 15 known species of *Leishmania* parasites that cause diseases in humans, 13 are common between both humans and animals that contain Visceral Leishmaniasis, Cutaneous Leishmaniasis and Muco-Cutaneous Leishmaniasis pathogens in the old and new world. In recent years the Leishmaniasis disease cases in different areas of the world has increased. Environmental factors, demographic factors and human behavior increases the risk factors of catching Zoonotic Cutaneus leishmaniasis and Zoonotic Visceral Leshmaniasis (1).

In the disease transmission cycle an insect vector called the *Phlebotomus* sand fly from the Psychodidiae family that has drunk blood from a *Leishmania* contaminated animal is mainly responsible for the diseases in humans and other mammals by biting them (2,3,4,5). In rare cases the disease is transmitted by venereal transmission (6), congenital transmission (7), blood transfusion (8) and needle transmission by drug addicts (9). There are alleged cases that Leishmaniasis is transmitted by other blood sucking invertebrates, but none have been confirmed by laboratory evidence (2).

Iran is one of the 6 countries in the world that 90% of all annually reported cases of Cutaneous Leishmaniasis occurs in those countries. Unfortunately in recent years new local foci of the disease have been created in different parts of the country and the disease cases in lorestan province have been increasing in a way that has caused concern in health officials and experts. If necessary studies on the ecology of sand flies in the province, especially in the County of Khorramabad, with special attention to the identification of sand flies in urban and rural areas, habitats and seasonal activities and adopting vector control methods doesn't take place, new foci of the disease might be created in the County and a local spread could occur, in which then the fighting and controlling the disease will be difficult and costly.

2. Material and Methods

This study is an epidemiological study based on experimental data. The sand flies of the rural and mountainous areas of khorramabad County were captured and collected monthly using sticky traps and after separation from the traps and degreasing, were put in glass containers containing 70% ethanol and then were sent to the Medical Entomology Department of, School of Public Health, Tehran University of Medical Sciences to identify the species.

Six villages from different parts of Khorramabad County (north, south, west and east) were selected as the areas for collecting the sand flies. The rural areas selected were: Falak oldin village (Khorramabad suburbs), Galebi golzar village (Khuzestan route, to the south), Sarnamak village (Chaghelvandi route, to the east), Varnamad village (Aleshtar route, to the north), Sarzangoleh village (Koohdasht route, to the west), dare eshkaft village (Sepiddasht route, to the south east). The sand flies in rural areas were collected from the human dwellings, animal dwellings, outdoor walls, warehouses, and in the surrounding areas of the villages from the caves holes and cracks in the mountainous areas and Rodent nests.

A4 papers treated with castor oil. In the villages 20 sticky traps were placed in each location that were predetermined, in human and animal dwellings, warehouses behind open windows and inside, on the surface of the walls at the bottom, middle and top of the wall perpendicular to the wall. In the mountainous areas they were placed at the entrance of caves, holes and gaps and the entrance of Rodent nests in the plains.

In all the locations the installation of the traps was done before sunset and the collecting of them was done the next day after sunrise. So the sand flies that came out during sunset would stick to the castor oil on the A4 papers and be collected with the traps the next morning. All of the collected sticky traps were sent to Razi Herbal Medicines Research Center for maintenance, separation of sand flies from the A4 paper and degreasing and were put in glass containers containing 70% ethanol and then were sent to the Medical Entomology Department of, School of Public Health, Tehran University of Medical Sciences to identify the species.

3. Results

All of the sand flies collected from May to October from six collecting locations (animal dwellings, human dwellings, mountains, nests, warehouses and external walls) of the six villages were 3692 which 1861 were female and 1831 were male. By Genus separation 1729 were from Phlebotomus Genus (818 male and 1145 female). The different species of *Phlebotomus* and *Sergentomyia* Genus's captured and their abundances are shown in Table1. As can be seen from the table *Phlebotomus papatasi* was the predominant species and after that the predominant species was *Phlebotomus sergenti* and the highest amount captured from the *Sergentomyia* Genus was the dentate species.

In Table 2, the abundances of the different species of the *Phlebotomus* Genus captured from different locations are shown. As can be seen from the table the highest amount captured were from human dwellings and the least were from Rodent nests and after the human dwellings the highest amounts captured were from outdoor walls, animal dwellings, mountains and warehouses respectively.

Table 1. *Phlebotomus and Sergentomyia* species collected from different dwellings

Phlebotomus (Genus and species)	Male	Female	Total	*Sergentomyia* (Genus and species)	Male	Female	Total
P.papatasi	680	501	1181	*S.dentata*	762	1068	1830
P.sergenti	141	81	222	*S.clydei*	34	37	71
P.alexandri	82	77	159	*S.tiberiadis*	10	36	46
P.perfiliewi	55	22	77	*S.sintoni*	12	3	15
P.tobbi	17	14	31	*S.sumbarica*	0	1	1
P.major	12	13	25	-	-	-	-
P.andrejevi	17	0	17	-	-	-	-
P.(Adlerius)sp	0	7	7	-	-	-	-
P.brevis	5	0	8	-	-	-	-
P.mongoliensis	4	0	4	-	-	-	-
P.pawloski	0	1	1	-	-	-	-
Total	1013	716	1729	Total	818	1145	1963

In Table 3, the abundance of the different species of the *Sergentomyia* Genus captured from different locations is shown in which the highest amounts captured were from the mountains and the least were from warehouses and after the mountains the highest amount of sand flies captured were from human

dwellings, outdoor walls, animal dwellings, warehouses and nests respectively.

The highest species diversity in both the *Phlebotomus* and the *Sergentomyia* Genus were from mountains and outdoor walls and the least species diversity was the warehouses for the *Phlebotomus* species and Rodent nests for the *Sergentomyia* Genus (Tables 2 and 3).

Table 2. Prevalence of species of *Phlebotomus* that were collected from different places

Collecting site Species	Human dwellings	Animal dwellings	Mountain	Outdoor walls	Warehouses	Rodent nests	Total
P.papatasi	391	289	114	282	55	50	1181
P.sergenti	31	0	115	50	26	0	222
P.alexandri	15	42	39	54	9	0	159
P.perfiliewi	58	0	0	0	0	19	77
P.tobbi	25	2	0	0	0	4	31
P.major	0	3	2	20	0	0	25
P.andrejevi	0	0	8	9	0	0	17
P.(Adlerius)sp	4	0	0	3	0	0	7
P.brevis	0	0	1	3	0	1	5
P.mongoliensis	0	0	3	1	0	0	4
P.pawloski	0	0	1	0	0	0	1
Total	524	336	283	422	90	74	1729

Table 3. Prevalence of species of *Sergentomyia* that were collected from different places

Collecting site Species	Human dwellings	Animal dwellings	Mountain	Outdoor walls	Warehouses	Rodent nests	Total
S.dentata	521	84	702	413	49	61	1830
S.clydei	7	0	48	11	5	0	71
S.tiberiadis	2	0	43	0	1	0	46
S.sintoni	4	0	0	11	0	0	15
S.sumbarica	0	0	1	0	0	0	1
Total	534	84	794	435	55	61	1963

4. Discussions

The findings in this study show a good and vast variety of different species of the *Phlebotomus* and *Sergentomyia* Genus in Khorramabad county, in Lorestan province that is located in the central Zagrous region and west Iran.This county has a variety of different climatic conditions in a way that the northern part of the county has a cold climate, the central areas have a mild climate and the southern areas have a warm climate and in general has a mild climate and in most areas is covered with central Zagrous oak forests and the average annual precipitation is 400 to 500 millimeters. This county is mountainous and most of the villages studied were located in mountainous or plains areas.

In the study that carried out by Ok et al. *Phlebotomus sergenti*, *P. papatasi*, *P. major* and *P. syriacus* were introduced as the probable vectors of Cutaneous Leishmaniasis and Visceral Leishmaniasis in Turkey. Although other species like *p. alexandri*, *P. tobbi, P. perfiliewi* and *P. simici* were also identified in west Turkey (10).

In the study that was carried out in Libya by Ashford et al. *P. papatasi* was introduced as the vector for Cutaneous Leishmaniasis (11).

Darchenkova et al. introduced *p. papatasi* as the main vector for Cutaneous Leishmaniasis in central Asia and south Kazakhstan. The most abundance of the above species were found in valleys with rivers and foothills and the least abundance were found in desert areas (12).

Kamhawi et al. reported 5 species of *Phlebotomus* and 4 species of *Sergentomyia* in their ecological study in a cave in the Ras Elnagb region of Jordan. 2 kinds of species of *Phlebotomus (P. alexandri and P. sergenti)* and 3 kinds of species of *Sergentomyia (S. taizi, S. clydei and S. adleri)* were reported for the first time from Jordan. The *P. kazeruni* was the most abundant sand fly amongst all captured (13).

In the study carried out by Abai et al. in the suburbs of Shahroud, Semnan province, Iran 2 kinds of *Phlebotomus* species and one kind of *Sergentomyia* species called *S. sintoni, P. caucasicus and P. papatasi* were caught and identified using sticky traps. The *P. papatasi* was the dominant species in the

region and consisted of 53% of all the species kinds captured (37). 12.5% of *P. papatasi* and 4.2% of *P. caucasicus* captured were contaminated to Zoonotic Cutaneous Leishmaniasis. The above results showed that *P. papatasi* and *P. caucasicus* in order are the main and second vector of Zoonotic Cutaneous Leishmaniasis in the region (14).

In the study carried out by Yaghoobi-Ershadi et al. on Zoonotic Cutaneous Leishmaniasis in a village in northern Natanz in central Iran, *p. papatasi* was contaminated with *Leishmania major*. This study showed that *P. papatasi* is the vector of Zoonotic Cutaneous Leishmaniasis in this part of Iran (15).

Acknowledgements:

We would like to thank the deputy of research and technology of Lorestan University of Medical Sciences that financed this research, the people of the villages in which the studies were conducted and the samples collected and other colleagues who cooperated in the research.

Corresponding Author:
Dr. Mohammad Hassan Kayedi
Department of Parasitology, School of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran.
E-mail: kayedi78@yahoo.co.uk

References

1. Gramiccia M, Gradoni L. The current status of zoonotic Leishmaniases and approches to disease control. International Journal for Parasitology. 2005; 35:1169-1180.
2. Killick-Kendrick. The biology and control of phlebotomine sand flies. Clinics in Dermatology. 1999; 17:279-289.
3. Kayedi MH, Chinikar S, Mostafavi, E, Khakifirouz S, Jalali T, Hosseini-Chegeni A, Naghizadeh A, Neidrig M, Fooks A, Shahhosseini N. Crimean-Congo Hemorrhagic Fever Virus Clade IV (Asia1) in Ticks of Western Iran. J Med Entomol. 2015; 52(5):1144-1149.
4. Kayedi MH, Khamisabadi K, Dehghani N, Haghdoost AA. Entomological Evaluation of PermaNet 2.0 ® and K-O Tab 1-2-3® treated nets in comparison to nets conventionally treated with deltamethrin, after repeated washing. Path and Glo Heal. 2015; 109(4): 196-201.
5. Kayedi MH, Haghdoost AA, Salehnia A, Khamisabadi K. Evaluation of Repellency Effect of Essential Oils of Satureja khuzestanica (Carvacrol), Myrtus communis (Myrtle), Lavendula officinalis and Salvia sclarea using Standard WHO Repellency Tests. J Arthropod-Borne Dis. 2014; 8(1): 60-68.
6. Symmers WS. Leishmaniasis acquired by contagion. A case of marital infection in Britain. Lancet. 1960; 7116: 127-132.
7. Eltoum IA, zijlstra EE, Ali MS, et al. Congenital Kala-azar and leishmaniasis in the placenta. Am J Trop Med Hyg. 1992;46:57-62.
8. Bruce-Chwatt LJ. Blood transfusion and tropical disease. Top Dis Bul. 1972; 69:825-862.
9. Desjeux p, Alvar J, Gradoni L, et al. Epidemiological analysis of 692 retrospective cases of Leishmania / HIV co-infection. Geneva: World Health Organization. 1997:1-11.
10. Ok UZ, Balcioglu IC, Taylan Ozkan A, Ozensoy S, Ozbel Y. Leishmaniasis in Turkey. Acta Tropica. 2002; 84:43-48.
11. Ashford RW, Schnur LF, Chance ML, Samaan SA, Ahmed HN. Cutaneus Leishmaniasis in the Libyan Arab Republic: Preliminary ecological findings. Ann Trop Med Parasitol. 1977; 71(3):265-271.
12. Darchen kova NN, Dergacheva TL, Zherikhina LL. The spread of *phlebotomus papatasi* Scop., 1786 through the territory of Central Asia and southern Kazakhstan. Med parazitol (Mosk). 1992; 4:30-33.
13. Kamhawi S, Abdel-Hafez SK, Moly neux DH. The behavior and dispersal of sandflies in Ras el Naqb, south Jordan with particular emphasis on *Phlebotomus kazeroni*. Parassitologia. 1991; 33:307-314.
14. Abai MA, Rassi Y, Imamian H, Fateh M, Mohebali M, Rafizadeh S, Hajjaran H, Azizi K, Ismaili M. PCR cutaneous leishmaniasis in Shahrod district, central of Iran. Pak S Biol Sci. 2007; 10(12): 2061-2065.
15. Yaghobi-Ershadi MR, Akhavan AA, Zahraei Ramazani AR, Jalali-Zand AR, Piazak N. Bionomics of *Phlebotomus papatasi* (Diptra: Psychodidae) in an endemic focus of zoonotic cutaneous leishmaniasis in central Iran. J Vector Ecol. 2005; 30(1):115-118.

1/17/2016