Int J Biol Med Res. 2012; 3(1): 1281-1283

BioMedSciDirect Publications

Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original Article

Species composition and diversity of mosquitoes in selected areas of vellimalai in sirumalai hills

S.Amala [a], V. Anuradha [* b]

[a] *Research Scholar, Department of biology, Gandhigram Rural Institute, Gandhigram, Dindigul.*
[b*] *Associate professor, Faculty of Rural Health and Sanitation, Gandhigram Rural Institute, Gandhigram, Dindigul.*

ARTICLE INFO

Keywords:
Anopheles
Aedes
Culex
Vector
Diversity

ABSTRACT

Sirumalai hills a part of Eastern Ghats situated at the south of Dindigul district, Tamil Nadu, has four types of vegetation –scrub jungle, dry deciduous forest, ever green forest and savannah grass lands. The present study was carried out at an altitude of 500m in scrub jungle eco system for a period of six months. Immature forms of mosquitoes were collected by dipper method and reared in the laboratory and the emerged adults were identified. A total number of 481 mosquitoes were collected that belonged to 3 genera and 13 species. The dominant genus was anopheles followed by aedes. The vector species of chikungunya *Ae.albopictus* larvae and secondary malarial vector *An.maculatus* larvae were collected more in number.

1. Introduction

Biodiversity refers to the ecological richness of the community and generally it is rich in tropical and subtropical countries. India ranks about 10th amongst the nations in terms of its diversity of species and world's top12 mega diversity nations [1]. Insects show greater diversity due to their ability to adapt to the changes in the environment. Among all insects diversity of mosquitoes is of greater importance in terms of public health. These highly adaptable insects continue to coexist with man and transmit many diseases to more than 700 million people annually [2]. Mosquito-borne diseases currently represent a greater health problems in tropical and subtropical climates and no part of the world is immune to this risk [3]. Dindigul district is endemic for malaria and no systematic study on mosquitoes has been carried out in Sirumalai Hills. Since the vector abundance indicates diseases outbreak, the management, adequate knowledge about species diversity, distribution pattern and preferential habitat selection of vector species will help to evolve a suitable strategy to control mosquito populations, thereby preventing outbreak of diseases, in the present study the diversity of mosquitos' fauna in the scrub jungle eco system of Sirumalai hills, at an altitude of 500m has been studied for six months.

* Corresponding Author : Dr.V. Anuradha
Associate professor in Entomology,
Faculty of Rural Health and Sanitation,
Gandhigram Rural Institute,
Gandhigram, Dindigul,
Email:nituntal @ yahoo.co.in

2.Materials and methods

2.1Study area

The Sirumalai Hills, a part of Eastern Ghats is situated at 6.5 km south of Dindigul District , Tamil Nadu, India and lies between 10^0 7' – 10^0 18' N latitude and 77^0 55' – 78^0 12' E longitude and covers an area of 317 km^2 and the altitudes ranging from 400 to 1650 m. The annual mean temperature of this area varies during summer and winter from 25^0 C to 28^0C and 15^0C to 10^0C respectively. The rainfall in the region is a tropical dissymmetric type with the bulk of rain received during the retreating monsoon period (October – December) due to depression and cyclones. The lower hill ranges consist of highly disturbed scrub forests while tropical dry deciduous forests occupy the major portion of middle hill ranges. Semi-evergreen forests are found in the higher elevations and along valleys. Woodland savannahs are found along slopes. The study area is Vellimalai kovil, has a perennial stream and a dam. The vegetations near the stream consists of trees like *Ficus carica* and shrubs like *Lantana camera*.

2.2 Mosquito collection

The adult mosquitoes were collected from the thick bushes using sweep net. Immature forms of mosquitoes were collected by dipper method [4] during Oct 2010-Feb 2011. The collected larvae and pupae were reared in separate enamel trays in the laboratory and fed with larval food (Yeast and dog biscuits in the ratio of 1:3). The emerged adults were collected and preserved in plastic vials containing powdered naphthalene balls and all the preserved mosquitoes were identified later in Center for Research in Medical Entomology, Madurai.

3. Results

A total number of 481 mosquitoes belonging to 3 genera and 13 species were recorded during the study period. The immature forms were collected from the margin of the slow running stream, rock pools and tree holes and from a grinding stone near the temple during the study period in the study area

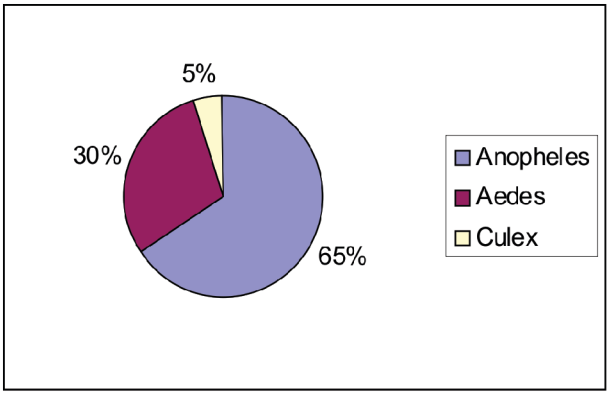
Table 1. species richness of mosquitoes collected in the study area during October 2010 to March 2011

Name of the species	Total number of mosquitoes	Percentage
Anopheles moghulensis	19	3.95
Anopheles subpictus	39	8.10
Anopheles vagus	11	2.3
Anopheles maculates	73	15.2
Anopheles varuna	10	2.1
Anopheles theobaldi	162	33.6
Aedes aegypti	20	4.15
Aedes vittatus	12	2.5
Aedes w albus	45	9.4
Aedes albopictus	67	13.92
Culex vishnui	5	1.03
Culex mimeticus	7	1.45
Culex quinquefasciatus	11	2.3
Total	481	100

Table 1 shows the different species of mosquitoes collected in the study area during study period. The genus anopheles was more diverse with 6 species, Aedes with 4 species and Culex with 3 species. Among the anophelines *An.theobaldi* was the predominant mosquito species (162), followed by An. maculates (73) and *An.subpictus* (39). The genus Aedes is mainly dominated by *Ae.albopictus* (67). The other Aedes species comprised A*e.w albus, Ae.aegypti,* and *Ae.vittatus*. The genus Culex was represented by *Cx. quinquefasciatus*, *Cx. mimeticus* and *Cx. vishnui*

Figure 1 shows inter generic composition of the mosquitoes collected in the study area during study period.

Fig 1: Inter generic composition of mosquitoes recorded in the study area



Peripheral vascular resistance does not reflect the after load status at LV myocardial level. The after load seen at LV myocardial level is actually the systolic wall force or stress. This wall force or stress can be assessed by use of law of Laplace (T= P x r / Th).

Table2: Species richness of mosquito fauna recorded during study period in the study area.

Name of the species	Oct 10	Nov 10	Dec 10	Jan 11	Feb 11	Mar 11
Anopheles moghulensis		19				
Anopheles subpictus	15		15			
Anopheles vagus	11					
Anopheles maculates			25	23	25	9
Anopheles varuna						
Anopheles theobaldi			9	30	70	10
Aedes aegypti		20				53
Aedes vittatus	13	4				8
Aedes w albus	11	25		4	3	
Aedes albopictus	5	18	22	8	5	3
Culex vishnui						
Culex mimeticus						7
Culex quinquefasciatus		11				
Total	55	97	71	65	103	90
Species richness	0.78	0.78	0.74	0.74	0.73	0.81

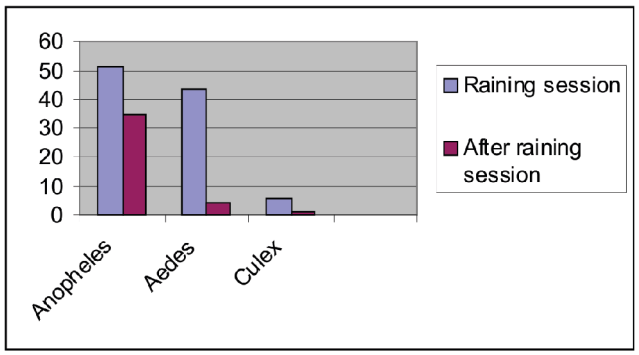
Table 2 shows the species composition of mosquitoes during different months. The larvae of *An..varuna*, *An.. maculates* and *An.subpictus* were collected in the shady regions of the stream and the other anopheline larvae were collected along the grassy margins of the slow running stream.

Among the malarial vector mosquitoes *An. maculates* larvae were collected during December to March and *An.varuna* larvae were collected only in March. The JE vector *An.subpictus* was collected in October and December. The larvae of *An.theobald*i (non-vector) were collected more from December 2010 to march 2011.

The aedes species were collected from the tree holes and rock holes. The larvae of *Ae.vittatus* were collected soon after rain once in December and again in March. Aedes albopictus larvae were collected through out the study period from the rock holes and along with *Ae.aegypti* larvae in a grinding stone near the temple.

The larvae of *Cx. vishnui* and *Cx. mimeticus* were collected only once in the shady regions of the drying stream where the water is polluted by the weathering leaves and fruits of the Ficus carica. The adult *Cx.quinquefaciatus* were collected during month of November among the bushes on the way to stream

Fig 2: Density of Mosquitoes recorded during the study period (Oct 2010-Mar 2011)



The density of larval population during the study period is shown in the Fig.2. Soon after the rain the larvae of anopheles were more (51%) followed by aedes (43.4%) and least was culex (5.6%). During the month of February and March as the temporary pools dried up aedes population was reduced to 3.9% and anopheline population was reduced to 34.71%.

4. Discussion

Dindigul district is endemic for malaria and in the last few years chikungunya and some viral fever has been a regular occurrence soon after the rainy season especially in villages in the foot hill. Hence in the present study is carried out in Vellimalai hill, a part of Sirumalai hills. Among the anopheline mosquitoes the *An.varuna* and *An.maculatus* were considered as secondary vectors of malaria [5]. Both the mosquitoes prefer the shady and cool water along the margin of the stream to lay the eggs in forest eco system. Among the collected vector species the adult *An.subpictus* is zoophilic and is considered as vector of Japanese encephalitis in Karnataka, Kerala and in Tamilnadu [6,7]

The adult Aedes albopictus, also known as 'Asian tiger mosquito' is vector of chikungunya [8]and dengue fever [9]. Generally as wild species they breed in rock holes and tree holes in forest areas but due to deforestation this mosquito now adapted to breed in discarded tires in many parts of India. [10]. *Ae.vittates* generally breeds in natural waters like rain water collected in rock pools and are vectors of yellow fever in African countries. *Ae.w-albus* larvae were collected from the stagnant pools formed by the trapped water between the rocks. These larvae seems to have the ability to survive in this habitat where algal growth was more [11] observed in their study at Darjeeling that Aedes w-albus were adapted to breed in stagnant stream pools formed by the trapped water between rocks where the water has low detritus and more algal growth.

Among the genus culex, the adult *Cx. vishnui* is *zoophilic* and outdoor resting and are considered JE vector in India, Malaysia and Taiwan and are wildly distributed in rural areas [12]. They prefer to rest in vegetation and other shaded places but in summer may also rest in indoors.

Cx. mimeticus adults are seen only natural habitats [13],[14] recognized the mimeticus subgroup breed in bodies of water that usually contain green algae, mosses, grasses and other aquatic vegetation. In the present study the larvae were collected from the margin of the slow running stream that contains algae and mosses. Distributions of larvae at different months show that when larval population of one genus increases, the larval population other genus shows reduction and vice versa. This may be due the water parameters like pH, turbidity and dissolved oxygen. Besides the presence of predators like tadpoles, dytiscid beetle and larvae of odonata also influence the larval populations. [15] observed that aedes species generally restricted to less turbid water with high dissolved oxygen and anopheles and culex prefer slightly turbid water with low dissolved oxygen.

The present study is a preliminary study carried out for 6 months. A thorough study at different points of the stream at higher and lower elevations revealing the possible breeding places of the vector mosquitoes and suitable actions may be taken along with the health department to control the vector species.

5. References

[1] Gadgil M . Documenting diversity: An experiment. Curr Sci. 1996; 70: 36-34.

[2] Taubes G. A mosquito bites back. New York Times Magazine. August.1997; 24: 40-46.

[3] Fradin MS, Day JF. Comparative efficacy of insect repellents against mosquito bite. New England Journal of Medicine.2002; 347(1): 13-18.

[4] Reuben R. A report on mosquitoes collected in the Krishna-Godavari delta, Andhra Pradesh. Indian J.Med.Res.1978; 68: 603-609.

[5] NVBDCP report. Health Bulletin for Asia on prevention and control of Vector Borne diseases: Malaria. Bulletin, 4 : April 2007.

[6] George S, Jacob PG, Rao JA. Isolation of Japanese encephalitis and West Nile viruses from mosquitoes collected in Kolar district of Karnataka state during 1977-79. Indian J Med Res. 1987;85: 235-238.

[7] Thenmozhi V, Rajendran R, Ayanar K, Manavalan R, Tyagi BK. Long term study on Japanese encephalitis virus infection in Anopheles subpictus in Cuddalore district, Tamil Nadu, South India. Trop Med Int Health. 2006:11: 283-293.

[8] WHO. Epidemic and pandemic alert and response. Chikungunya and dengue in the southwest Indian Ocean. Dis Outbreak News Malaria,2006.

[9] Tyagi BK, Dash AP. Dengue in India with special reference to the inter specific invasive and virus transmission potential of Asian tiger mosquito, Aedes albopictus (Skuse) in Kerala: an update. Vector Biol. 2006; 142-58.

[10] Baskara Rao B, Biju George . Breeding patterns of Aedes. Stegomyia albopictus in periurban areas of Calicut, Kerala, India. Southeast Asian J Trop Med Public Health.2010; 41(3): 236-540.

[11] Gautam Aditya , Mihir K.Pramanik and goutamk.Saha.. Larval habitats and species composition of mosquitoes in Darjeeling Himalaya, India. J.Vect Borne Dis.2006;43:7-15.

[12] 1Center for Health Protection. Scientific Committee on Vector Borne Diseases Vectors of Japanese encephalitis in Hong Kong,2004.

[13] Azari-Hamidian S, Yaghoobi-Ershadi MR, Javadian E. The distribution and larval habitat characteristics of mosquitoes (Diptera: Culicidae) in Rasht Country (Guilan Province, Iran). Modarres J Med Sci. 2002a; 4: 87-96

[14] Sirivanakarn S. Medical entomology studies: III. A revision of the subgenus Culex in the Oriental Region (Diptera: Culicidae). Contrib Am Entomol Inst (Ann Arbor). 1976; 12:1-272

[15] Sehgal SS, Pillai MK. Preliminary studies on the chemical nature of mosquito-breeding waters in Delhi. Bull World Health Organ. 1970; 42(4): 647–650