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Adult vector mosquito feeding behaviour in a salt pan area near ennore creek, Chennai

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Abstract
Studies were conducted to know the feeding behaviour of adult mosquito species inhabiting salt pan area outside and adjoining salt pans. Feeding ecology of the adult mosquito species revealed that only 3 species of mosquitoes belonging to 2 genera namely *Culex sitiens*, *Culex tritaeniorhynchus* and *Anopheles subpictus*, colonized the salt pan area and they were largely zoophilic and opportunistic feeders during the study period *i.e*., from September 2004 to March 2006.

Keywords: mosquito, *Culex sitiens, Culex tritaeniorhynchus, Anopheles subpictus*, salt pan area

1. Introduction
Mosquitoes are biological vectors responsible for the transmission of various dreadful diseases affecting mankind. Mosquito borne disease transmission dynamics are influenced by many factors, host-vector contact being the key contributor. The mechanism of disease transmission is facilitated by the host-vector contact prevailing in the habitat *i.e*., the blood feeding behaviour exhibited by the mosquitoes prevailing in the salt pan area on different hosts in salt pan area which in turn will help us to understand the feeding ecology of adult mosquitoes inhabiting salt pan area. The understanding of feeding behaviour particularly Anthropophilic Index (A.I) of mosquitoes is of utmost importance to know the epidemiology of mosquito borne diseases.

2. Materials and Methods
Adult mosquitoes inhabiting salt pan area outside and adjoining salt pans near Ennore Creek, (longitude 80^0 15'E; latitude 13^0 05' N) were surveyed throughout the study period i.e, from September 2004 to March 2006. resting adult mosquitoes belonging to three species and two genera namely *Culex sitiens*, *Culex tritaeniorhynchus* and *Anopheles subpictus* were collected for one hour during dawn and dusk from two biotopes in salt pan area namely Biotope-I; Indoor Resting –Human Dwelling (IR-HD), Bioltope-II; Outdoor Resting –Shrub Vegetation (OR-SB) found on either sides of the water channel which brings sea water from Ennore Creek area to the salt pans. Mosquitoes were collected using aspirators (Service, 1976) identifies and counted species wise and monthly collections were pooled for analysis.
From the adult mosquitoes which were collected by aspirator (a total of 1092 adult mosquitoes) for finding adult density only blood fed adult mosquitoes were separated species wise and biotope wise and the blood smear were taken on Whatman No.1 filter paper and preserved. The smears were processed using Gel Diffusion Technique of Collins *et.al* (1986) [3] and were tested against human, cow, buffalo, goat, fowl and pig anti-sera, to find out the host blood feeding preference of mosquitoes inhabiting salt pan area. A total of 809 blood meal samples were analyzed, the epidemiological effectiveness of mosquito (Vector) varies according to the degree of contact between human beings and vector (Anthropophilic Index). The knowledge of feeding behaviour particularly Anthropophilic Index (A.I) of mosquito is of considerable importance. The anthropophilic Index may be defined as the percentage of positive blood meal samples of mosquitoes that contain human blood. This parameter gives the actual frequency the transmission probability.

3. Result and Discussion
During the course of study period, there were 809 fully feed adult mosquitoes comprising 3 mosquito species namely *A. subpictus* (318 Nos), *C. sitiens* (321 Nos) and *C. tritaeniorhynchus* (170 Nos) were collected from 2 different biotopes namely IR-HD and OR-SB and blood smears prepared and analysed separately during the study period from Sept. 2004 to March 2006. The results of 158 *A. subpictus* collected from IR-HD revealed Anthropophilic Index 12% and that of 160 *Anopheles subpictus* collected from Outdoor Resting Shurb Vegetation (OR-SB) revealed Anthropophilic Index of 8.75%. Out of the total 318 samples of *Anopheles subpictus* 33 were found to feed on human, 187 were found to feed on Cow and 95 were found to feed on buffalo and 3 were non-reactive (Table 1,2). Thereby giving the overall Anthropophilic Index of 10.37% irrespective of season and biotopes (mosquito blood meal positive for cow and buffalo blood (Table-3) confirming the zoophilic nature of the species. The results of 70 *C. tritaenorhynchus* mosquito collected from Human Dwelling (IR-HD) revealed A.I of 8.57% and that of 100 *C. tritaeniorhynchus* collected from OR-SB revealed A.I of 30% (Figure 1). Out of the total 170 samples of *C. tritaeniorhynchus*, 9 were found to feed on human, 103 were found to feed on Cow, 44 were found to feed on buffalo, 8 were found to feed on goat and 6 were found to feed on fowl (Table 4,5) thereby giving an overall AI of 5.29% (mosquito

blood meal positive for human blood)

There observed about 60.58% mosquito blood meal was positive for cow, 25.88% mosquito blood meal positive for buffalo and 4.70% blood meal positive for goat and 3.5% blood meal positive for fowl (altogether 94.66%) (Table -3) confirming the zoophilic nature of the mosquito species. The species also show double feeding for human and cow, human and goat and also human and fowl. In the case of *C. sitiens*, 159 mosquitoes were collected from IRHD and 162 mosquitoes were collected from ORSB Vegetation and the A.I recorded was 12.57% and 12.34% respectively (Figure 1). Out of the total 321 mosquitoes collected 40 were found to have fed on human, 151 on cow, 116 on buffaloes, 9 on goat and 5 on fowl (Table 6&7).

The overall AI irrespective of season and biotopes was found to be 12.46% (Table-3), Feeding behaviour of this species on other animals is the mosquito blood meal positive for cow is 47.04%, blood meal positive for buffalo is 36.16%, blood meal positive for goat 2.80%, and 1.55% blood meal positive for fowl indicating the zoophilic nature of the mosquito species. Result of the study revealed that the three mosquito species habiting salt pan area are largely Zoophilic and opportunistic feeders. The overall AI was found to be 10.37% for *A. subpictus*; 5.29% for *C. tritaeniorhynchus* and 12.46% for *C. sitiens.* (Table-3)

3.1 Influence of environmental factors on feeding behaviour of adult mosquitoes

Multiple feeding was encountered in both *A. subpictus* and *C. tritaeniorhynchus.* The environmental factor taken into consideration for the study during the study period in the study area. (Table 8) were minimum temperature, maximum temperature, rainfall, number of rainy days and relative humidity. To examine the interrelationship between mosquito multiple feeding rate and meteorological variable, Pearson's correlation was used. Pearson's correlation coefficients were calculated between environmental variables namely minimum temperature, maximum temperature, rainfall, rainy days and relative humidity and multiple feeding rate of *Anopheles subpictus* and adult *Culex taeniorhynchus* adult mosquito (Table-9)

The correlation, coefficient values revealed that *Anopheles subpictus*. Multiple feeding rate had a highly significant positive correlation with rainfall (r-0.8377; p<0.01), *i.e.*, when rainfall rate increases the multiple feeding rate of *A. subpictus* mosquito also increases and *vice-versa.* Similarly the multiple feeding rate of adult *A. subpictus* was significantly correlated positively with rainy days (r =0.6842; p<0.01) *ie.*, when rainy days increases the *A.subpictus* multiple feeding rate also increases. Correlation coefficient values between *A. subpictus* multiple feeding rate and environmental factors reveals that *A. subpictus*, multiple feeding rate shows negative correlation with minimum temperature (r =-0.2822; *p*>0.05) but not significantly. Similarly *A. subpictus*, multiple feeding rate is positively correlated with relative humidity but not significantly (r=0.4395; *p*>0.05).

The correlation coefficient values between *C. tritaeniorhynchus* multiple feeding rate and environmental factors reveal that there is significant negative correlation between minimum temperature and *C. tritaeniorhynchus* multiples feeding rate (r=-0.4678; *p* <0.05) Similarly there is negative correlation between maximum temperature and multiple feeding rate of *C. tritaeniorhynchus* (r=-0.2477; p >0.05). Correlation coefficient values between *C. tritaeniorhynchus* multiple feeding rate and environmental factors reveal that there is significant positive correlation between rainfall and *C. tritaeniorhynchus* multiple feeding rate (r =0.8301; *p* <0.01) Similarly there is significant positive correlation between rainy days and multiple feeding rate of *C. tritaeniorhynchus* mosquitoes (r =0.6883*; p*<0.01).Multiple feeding rate of *Culex tritaeniorhynchus* was also positively correlated with relative humidity (r=0.6305; *p*< 0.01) *i.e.*, when relative humidity increases the *C. tritaeniorhynchus* adult mosquito multiple feeding rate also increases. Studies by Srinivanakaran (1975) [7] revealed, that blood feeding habits of *Culex vishnui* complex are their preferred hosts include Cows, water Buffaloes and pig, they also attack human on occasions. Similarly in the present study it was found that the blood meal analysis of *C. tritaeniorhynchus* mosquito (a member of *C. vishnui* subgroup) also revealed that their preferred host include cows, water buffaloes and to a lesser extent humans.

Studies by Sahu (1998) [5] revealed that analysis of blood meal samples of *A.subpictus* adult mosquito collected from brackish water area of Orissa showed feeding preference of 44.6% on human and 46.5% on bovine. The high anthropophily in brackish water area might be due the lesser, cattle availability. On the other hand in the present study analysis of blood meal samples of *A.subpictus* adult mosquitoes collected from salt pan area showed feeding preference of 10.33% on humans and remaining 88.67% on Cow and Buffaloes which is not in accordance with finding of Sahu (1998) [5].

Present study reveals that host feeding preference of *C. tritaeniorhynchus* mosquitoes collected from ORSB in salt pan area reveals that 60% predominantly feed on cows, 30% on buffaloes, 4% on goat and both fowl and humans 3% each, this is in accordance with the findings of Arunachalam *et.al.* (2005) [2] which revealed that *C. tritaeniorhynchus* adult predominantly fed on cattle 56% and to a lesser extent on duck, fowl, goat and humans (<2%). Studies by Kaushal Kumar *et.al.* (2002) [4] on mosquito blood meal analysis of *A. subpictus* revealed that AI irrespective of season and biotope was 16.93%. Similarly in the present study on the feeding behaviour of adult *A. subpictus* mosquitoes in salt pan area revealed that the blood meal analysis shows an AI for IR-HD mosquitoes 12% and for ORSB mosquitoes 8.75%. The overall AI for *A. subpictus* mosquitoes irrespective of season and biotope was 10.37%.

In the present study the blood meal analysis of *C. sitiens* mosquitoes present in salt pan area reveals an AI of 12.57% for IRHD mosquitoes and AI of 12.34% for mosquitoes in ORSB and the overall AI of 12.46%. In the present study the blood meal analysis of *C. tritaeniorhynchus* mosquito one of the member of *C. vishnui* sub group that represent in the salt pan area reveals AI for IR-HD mosquitoes was 8.57% and for ORSB was 3.0% and the overall AI was 5.29%. The percentage reduction in the overall AI encountered in all the 3 mosquito species present in salt pan area reveals that this deviation is due to the lesser abundance of the three species of mosquitoes and so also its blood feeding hosts in the salt pan area. Studies by Kaushal Kumar *et.al.* (2002) [4] on preference

of blood meals from different hosts by adult mosquito namely *A. subpictus* reveal that the overall feeding preference of the mosquitoes was found to be human 16.93% bovine 72.51% and 8% non-reactive, this is in accordance with our studies where in the *A. subpictus* mosquito reveals overall feeding preference of 10.33% on humans and about 88.67% on cow and buffalo (bovine) confirming the zoophilic nature of this mosquitoes.

In the present study the overall feeding preference for *C. tritaeniorhynchus* mosquitoes reveal that 5.29% mosquito blood meal positive for humans and about 60.58% fed on cow and about 25.88% fed on buffalo and 47% blood meal positive for goat and about 3.52% blood meal positive for fowl. *C. tritaeniorhynchus* exhibited double feeding for human and cow, human and goat and also human and fowl this is in accordance with the findings of kaushal Kumar *et.al.* (2002) [4] wherein predominantly *C. vishnui* sub group of mosquitoes were found positive for bovine blood. Similarly it shows double feeding for human and bovine which is in accordance with our studies.

In the present study it was found that the feeding preference of *C. sitiens* mosquitoes showed blood meal positive 47.04% for cow, 36.13% blood meal positive for buffalo, 2.80% blood meal positive for goats and 1.55% blood meal positive for fowls indicating the zoophilic nature of the species. Studies by Amerasinghe and Amerasinghe (1999) [1] revcaled that *A. subpictus* mosquito showed multiple feeding with blood from 2 different host which is in accordance with our findings wherein. *A. subpictus* imbibed blood from 2 distinct hosts. Studies by Arunachalam *et.al.* (2005) [2] revealed that multiple feeding behaviour was observed in *Culex tritaeniorhynchus* mosquitoes wherein blood meal test shows multiple feeding imbibed blood from 2 district host. Similarly in the present study it was found that *C. tritaeniorhynchus* mosquitoes imbibed blood from 2 distinct hosts (Double feeding).

The feeding behaviour of the 3 species of mosquitoes inhabiting salt pan area reveals that they are largely zoophilic and opportunistic feeders with the feeding behaviour influenced by biotope, climatic season and availability of different hosts. It may be deduced that mosquito borne disease transmission, whether it is Japanese Encephalitis or Malaria can be dampened by adopting zooprophylaxis (by using cattle) because the principal vector mosquito *Culex tritaeniorhynchus* as well as *Anopheles subpictus* and *C. sitiens* if they become efficient vectors has a high affinity for bovine blood.

Table 1: Host feeding preference of *Anopheles subpictus* (IRHD) in the salt pan area outside and adjoining salt pans during the study period September 2004 - March 2006

Month & Year	Number of Mosquito Blood Meal samples analyzed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig.	Non-Reactive	
September 2004	10	2	6	2	-	-	-	-	Nil
October 2004	12	2	7	3	-	-	-	-	Nil
November 2004	10	1	5	4		-	_	-	Nil
December 2004	16	_	8	8	-	-		-	Nil
January 2005	10	2	5	3	-	-	-	-	Nil
February 2005	10	2	7	1	-	-		-	Nil
March 2005	3	1	1	1	-	_		-	Nil
April *2005*	2	-	2	-	-	-		-	Nil
May 2005	1	-	1	-	-	-	-	-	Nil
June 2005	2	-	1	1	-	-	-	-	Nil
July 2005	2	-	1	1	-	-	-	-	Nil
August 2005	3	-	2	1	_	-	-	-	Nil
September 2005	10	-	6	4	-	-	-	-	Nil
October 2005	18	1	8	8	-	-	-	1	Nil
November 2005	16	3	9	3	-	-	-	1	Human & Buffalo
December 2005	10	1	5	4	-	-	-	-	Nil
January 2006	12	2	6	4	-	-	-	-	Nil
February 2006	10	2	6	2	-	-	-	-	Nil
March 2006	1	-	1	_	-	-	-	-	Nil
Total	158	19	87	50	-	-	-	2	

Table 2: host feeding preference of *Anopheles subpictus* (ORSB) in the salt pan area outside and adjoining salt pans during the study period September 2004 to March 2006.

Month & Year	Number of Mosquito Blood Meal samples analysed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig.	Non-Reactive	
September 2004	10	1	8	1		—	-	-	Nil
October 2004	10	1	6	2	-			1	Nil
November 2004	12	-	8	4	-	-	-	-	Nil
December 2004	16	-	8	8	-	-	-		Nil
January 2005	13	2	9	2	-	-	_	-	Nil
February 2005	10	2	5	3	-	-	-		Nil
March 2005	3	1	1	1	-	-	-	—	Nil

April 2005	2	-	1	1	-	-	-	-	Nil
May 2005	1	-	1	-	-	-	-	-	Nil
June 2005	3	-	2	1	-	-			Nil
July 2005	3		2	1	-	-	-	—	Nil
August 2005	3	1	1	1	-		-	-	Nil
September 2005	15	-	11	4	-	-	-	-	Nil
October 2005	10	2	4	4	-	-	-	-	Human & Cow
November 2005	10	-	5	5	-	-	-		Nil
December 2005	12	_	8	4	-	-	-	-	Nil
January 2006	16	2	12	2	-	-	-	-	Nil
February 2006	10	2	7	1	-	-	-	-	Nil
March 2006	1	~	1	-	_	-	-	-	Nil
Total	160	14	100	45	-	-		1	

Table 3: Biotope-wise anthropophilic index (AI) and feed preference of various mosquito species inhabiting in salt pan area outside and adjoining salt pans during the study period - September 2004 to March 2006

SI. No	Mosquito species	Biotope	AI (%) / Total Blood meal samples analyzed	Positive for various Host Preference							Double Feeding
				Human	Cow	Buffalo	Goat	Fowl	Pig	Non Reactive	
1.	*Anopheles subpictus*	IR-HD OR-SB	12.0/158 8.75/160	33 (10.37)	187 (58.80)	95 (29.87)	-	-	-	3 (0.94)	1 Human and Buffalo 1 Human and Cow
2.	*Culex tritaeniorhynchus*	IR-HD OR-SB	8.57/70 3.0/100	9 (5.29)	103 (60.58)	44 (25.88)	8 (4.70)	6 (3.52)	-	-	1 Human & Cow 1 Human & Goat 1 Human and Fowl
3.	Culex sitiens	IR-HD OR-SB	12.57/159 12.34/162	40 (12.46)	151 (47.04)	116 (36.13)	9 (2.80)	5 (1.55)		-	-

A.I - Anthropophilic Index: IR-HD Indoor Resting Human dwelling; ORSB - Outdoor Resting Shrubs.

Table 4: Host feeding preference of *Culex tritaeniorhynchus* (IRHD) in the salt pan area outside and adjoining during the study period September 2004 - March 2006

Month & Year	Number of Mosquito Blood Meal samples analysed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig	Non-Reactive	
Sept. 2004	5		4	-	-	-	-	-	Nil
Oct. 2004	7	-	4	2	1	-	-	-	Nil
Nov. 2004	8	-	6	1	1	-	-	-	Nil
Dec. 2004	4	-	2	-	1	-	-	-	Nil
Jan. 2005	2	-	1	-	—	-	-	-	Nil
Feb. 2005	1	-	1	-		-	-	-	Nil
Mar. 2005	1	-	1	-	-	-	-	-	Nil
Apr. 2005	-	-	-	-	-	-	-	-	Nil
May 2005	-	-	-	-	-	-	-	-	Nil
June 2005		-	-	-	-	-	-	-	Nil
July 2005	-	-	-	-	-	-	-	-	Nil
Aug. 2005	1	-	1	-	-	-	-	-	Nil
Sep. 2005	6	1	4	1		-	-	-	Nil
Oct. 2005	11	2	5	2	1	1	-	-	Nil
Nov. 2005	10	1	6	2	0	1	-	-	Human &Cow
Dec. 2005	8	0	5	2	-	1	-		Human & Goat
Jan. 2006	4	1	2	1	-	-	-	-	Nil
Feb. 2006	2	-	1	1	-	-	-	-	Nil
Mar. 2006	-	-	-	-	-	-	-	-	Nil
Total	70	6	43	14	4	3	-	-	

Table 5: Host feeding preference of *Culex tritaeniorhynchus* (ORSB) in the salt pan area outside and adjoining during the study period September 2004 - March 2006.

Month & Year	Number of Mosquito Blood Meal samples analysed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig.	Non-Reactive	
Sep. 2004	7	-	5	2	-	-	-	-	Nil
Oct. 2004	10	-	8	2		-	-	-	Nil
Nov. 2004	10	-	5	5	-	-	-	-	Nil
Dec.2004	8	-	6	2		-	-	-	Nil
Jan.2005	5	-	2	2	1	-	-		Nil

Feb.2005	2	-	1	1		_	-	-	Nil
Mar. 2005	2	-	1	1	-	-	-	-	Nil
Apr.2005	1	-	1	-		-	-	-	Nil
May 2005	1	-	1	_		-	-	-	Nil
June 2005	1	-	„	1	-	-			Nil
July 2005	1	-	-	1		-	-	-	Nil
Aug. 2005	1		1	-	-	-	_	-	Nil
Sep. 2005	8	-	6	2	-	-	-		Nil
Oct. 2005	10	1	5	2	1	1	-		Nil
Nov. 2005	12	1	6	4	-	1	-	-	Nil
Dec.2005	11	1	6	2	1	1		_	Human & Fowl
Jan. 2006	6	-	3	2	1	-	-	-	Nil
Feb. 2006	3	-	2	1	-	-		_	Nil
Mar. 2006	1	-	1	-	-	-	-	-	Nil
Total	100	3	60	30	4	3	-	-	

Table 6: Host feeding preference of *Culex sitiens* (IRHD) in the salt pan area outside and adjoining salt pans during the study period September 2004 - March 2006

Month & Year	Number of Mosquito Blood Meal samples analysed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig	Non-Reactive	
September 2004	10	1	6	3	-	-	-	-	Nil
October 2004	18	4	8	5	-	1	-	-	Nil
November 2004	12	_	4	8			-	-	Nil
December 2004	16	1	6	9	-	-	-	-	Nil
January 2005	10	2	5	2	1	-	-	-	Nil
February 2005	12	1	7	4	-		-	-	Nil
March 2005	2	-	1	1	-	-	-	-	Nil
April 2005	2		1	1	-	-	-	-	Nil
May 2005	1		1	-	-		-	-	Nil
June 2005	2	-	1	1	-	-	-	-	Nil
July 2005	2	-	1	1	-	-	-	-	Nil
August 2005	2	-	1	1	-		-	-	Nil
September 2005	10	2	5	2	1		-	-	Nil
October 2005	13	1	8	4	-		-	1	Nil
November 2005	14	2	5	6	-	1	-	1	Nil
December 2005	12	2	6	4	-	-	-	-	Nil
January 2006	10	2	5	3		-	-	-	Nil
February 2006	10	2	4	4		-	-		Nil
March 2006	1	-	1	_	-	-	-	-	Nil
Total	159	20	76	59	2	2	-	2	

Table 7: Host feeding preference of *Culex sitiens* (ORSB) in the salt pan area outside and adjoining during the study period September 2004 - March 2006.

Month & Year	Number of Mosquito Blood Meal samples analyzed	Positive for various Host Preference							Double Feeding
		Human	Cow	Buffalo	Goat	Fowl	Pig	Non-Reactive	
Sep. 2004	10	2	3	5	-	-	-	-	Nil
Oct. 2004	12	2	6	4	-	-	-	-	Nil
Nov. 2004	16	-	7	7	2	-	-	-	Nil
Dec. 2004	12	2	5	3	1	1	-	-	Nil
Jan. 2005	10	1	5	4	-		-	—	Nil
Feb. 2005	16	1	9	6	-	-	-	-	Nil
Mar. 2005	3	1	1	1	-	-		-	Nil
Apr. 2005	3	1	1	1	-	-	-	-	Nil
May 2005	1	-	1	-	-	-	-	-	Nil
June 2005	2	-	1	1	-	-	-	-	Nil
July 2005	2	-	1	1	-	-	-	-	Nil
Aug. 2005	3	1	1	1	-	-		-	Nil
Sept. 2005	10	1	2	4	-	-	-	-	Nil
Oct. 2005	10	1	4	3	2	-	-	-	Nil
Nov. 2005	16	3	8	4	-	1	-	-	Nil
Dec. 2005	10	-	5	5	-	-	-	-	Nil

Jan. 2006	14	1	7	3	2	1	-	-	Nil
Feb. 2006	10	3	4	3	-	-	-	-	Nil
Mar.2006	2	-	1	1	-	-	-	-	Nil
Total	162	20	75	57	7	3	-	-	

Table 8: Meteorological data during the study period September 2004 to March 2006

SI. No.	Environmental Factor	Month and Year of the study period																		
		Sept. 2004	Oct 2004	Nov. 2004	Dec. 2004	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005	Jul 2005	Aug 2005	Sept. 2005	Oct 2005	Nov. 2005	Dec. 2005	Jan 2006	Feb 2006	Mar 2006
1.	Maximum Temperature	33.7	31.9	30.4	30.2	30.6	32.1	33.6	34.0	37.3	38.3	36.2	35.8	34.9	32.0	29.4	28.6	30.3	31.5	33.3
2.	Minimum Temperature	25.2	24.4	22.9	21.1	21.7	22.2	25.2	26.6	28.0	28,8	26.9	26.6	25.9	24.6	22.4	21.9	21.2	21.3	24.8
3.	Rain Fall (mm)	246.5	285.3	280.2	6.8	2.0	5.2	0.0	83.2	30.9	30.6	151.2	53.7	101.3	1077.8	608.4	421.5	3.5	0.0	9.5
4.	Number of Rainy Days	10	14	7	1	0	1	0	2	1	3	6	4	7	16	16	10	1	0	1
5.	RH (%)	76.5	80	79	71	72	70	71.5	75	69.5	56	67.5	68.5	70	81.5	80.5	84	73	69	71.5

Table 9: Correlation coefficients values showing relationships between multiple feeding rate of *Anopheles subpictus, Culex tritaeniorhynchus* mosquitoes and environmental factors

Species tested	Minimum Temperature	Maximum Temperature	Rainfall	Rainy Day	Relative Humidity
Anopheles subpictus Multiple feeding rate (%)	-0.2822	-0.1212	0.8377**	0.6842**	0.4395
Culex tritaeniorhynchus Multiple feeding rate (%)	-0.4678*	-0.2477	0.8301**	0.6883**	0.6305**

Note: * denote significant at 5% level; ** denote significant at 1% level

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