

**ABUNDANCE OF MOSQUITO LARVAE AT JAGANNATH UNIVERSITY AND
DHAKA UNIVERSITY CAMPUS OF DHAKA, BANGLADESH**

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Abstract: A year-round survey on the abundance of mosquito larvae was conducted at Jagannath University - and Dhaka University - Campus from October 2018 to September 2019. A number of total 4415 mosquito larvae were collected of which 3086 were identified as *Culex* and 1329 were *Aedes*. Only 3 species belonging to 2 genera were identified in this study. At Jagannath University campus, highest number of *Culex* larvae was recorded in the month of August which was 167 (10.9%) and the lowest number was recorded in February which was 66 (4.3%), on the other hand, highest number of *Aedes* larvae was recorded in the month of July which was 137 (23.8%) and the lowest number was found in December which was 9 (1.6%). At Dhaka University campus, the highest number of *Culex* larvae was found in the month of April, which was 179 (11.5%) and the lowest number was found in June, which was 66 (4.3%), on the other hand, the highest number of *Aedes* larvae was found in the month of June which was 200 (26.5%) and lowest number was found in February which was 8 (1.06%). This study could be helpful in launching larvicidal programs in a more cost-effective way at these two urban public universities of Dhaka city.

Key words: *Aedes*, *Culex*, larvae, monthly, abundance.

INTRODUCTION

The distribution space of both mosquitoes and mosquito-borne diseases has been changing and expanding for reasons such as increasing rates of environmental corruption, climatic changes, vector and pathogen resistance to insecticides and drugs, progressive urbanization and population movements (Gubber, 1988; Patz *et al.*, 1996; Jetten and Focks, 1997). Mosquito surveillance is most effective when combined with an ongoing program for monitoring meteorological and environmental factors that may influence mosquito population level, adult mosquito flight behavior and dispersal (Senior-White, 1926). The knowledge of the ecological characteristics of the breeding habitats and the environmental factors affecting mosquito abundance can help in designing optimal vector control strategies (Overgaard *et al.*, 2001).

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Ferdousi *et al.*, in 2015 stated that mosquito surveillance can give data about addresses of grown-up and larval populace thickness and species synthesis, rainfall and can anticipate relative mosquito plenitude and variety which are convenient to prevent breakout of dengue in Dhaka city. Afroza *et. al.*, in 2016 conducted survey at three places of Old Dhaka city (Jagannath University, Bahadur Shah Park, and Ahsan Manzil) and stated that, favorable climatic condition along with human activities and poor waste management make this place a harbor to dengue vector, *Aedes aegypti* at an alarming rate. Another study, conducted in three parks of Dhaka city, namely Osmani Uddyan, Suhrawardi Uddyan and Baldha Garden explored the association of five mosquito species distribution with their breeding habitat diversity. These findings concluded that ecological factors influence mosquito species to favor their breeding habitats (Afroza *et. al.*, 2017).

In recent years, Dengue and Chikungunya has become a common issue in Dhaka city. A major outbreak of chikungunya virus occurred for the first time in Dhaka in 2017, between May and September with 1,326 cases of chikungunya patients. On the other hand, Bangladesh saw its worst year of dengue outbreak in 2019 with 101,354 cases and 156 confirmed deaths resulting from the disease according to the official report by Directorate General of Health Services (Hossain *et al.*, 2018; DGHS, 2019). Every year many students, teachers and staffs of both Dhaka University and Jagannath University are being affected by dengue and chikungunya. So, considering the necessity of larval surveillance in mosquito control program, the present study was undertaken to record the status of mosquito larvae as well as their breeding sites and determine the mosquito density & species variation for up to 12 months in both Jagannath University and Dhaka University campus.

MATERIAL AND METHODS

Study area: The study was conducted from October 2018 to September 2019 at two university areas. The selected locations were- Jagannath University campus & Dhaka University, Curzon Hall area. The geographical location of Jagannath University Campus is 23°42'37" N to 90°24'40" with about 11 acre of land area, while the geographical position of University of Dhaka, Curzon Hall is 23.727389°N, 90.401902°E with about 215 acre of land area.

Identification of breeding sites of mosquitoes: The potential breeding locations were examined on a regular basis and drains along all buildings of both Universities were also checked for mosquito larvae.

Sample collection: The mosquito larvae were collected by standard dipping method (using dipper) on weekly basis from the two areas, i.e. in every month four surveys were conducted at each sites. While dipping, care was taken not to disturb the water too much as this may make larvae dive downwards.

Counting and preserving larva: After collection, the larvae were counted and the samples were preserved in 90%-95%ethanol.

Larval identification: The larvae were identified at the laboratory of Department of Zoology, University of Dhaka under a trinocular microscope using the taxonomic keys of Rattarithikul *et. al.* (2005;2006) and Ary and Dana (2013). After identification, the larvae were sorted under particular taxonomic groups.

Data analysis: The recorded data on mosquito larval density were tabulated and calculated on a monthly basis.

RESULTS AND DISCUSSION

During the study period, nine spots were identified as mosquito breeding sites at these two public Universities of Dhaka City. A number of total of 4415 mosquito larvae were collected of which 3086 (69.9%) were identified as *Culex* and 1329 (30.1%) were identified as *Aedes* mosquito larvae. From Dhaka University (Curzon Hall), 2306 (52.23%) number of mosquito larvae were collected and from Jagannath University, number of mosquito larvae collected was 2109 (47.77%) (Table-1).

Table 1. Number of *Culex* and *Aedes* larvae collected from Jagannath and Dhaka University (Curzon Hall) campus

Study sites	<i>Culex</i>	<i>Aedes</i>	Total no. of larvae	(%) of larvae
JnU	1534	575	2109	(47.77%)
DU (Curzon Hall)	1552	754	2306	(52.23%)
Total no. of larvae	3086	1329	4415	
(%) of larvae	69.9%	30.1%		

Taxonomic identification of mosquito larvae: In this study, only 3 species belonging to 2 genera were identified as follows:

Genus- *Culex*: Siphon distinctly longer than saddle; pecten not extending to apex of siphon; siphon usually with 1-3 lateral setae.

Species- Culex quinquefasciatus: Median labral plate distinct and separate from dorsal apotome; upper head setae 5-C, 6-C, 7-C with 4-6 branches; siphon swollen medially, length less than 4 times width at base.

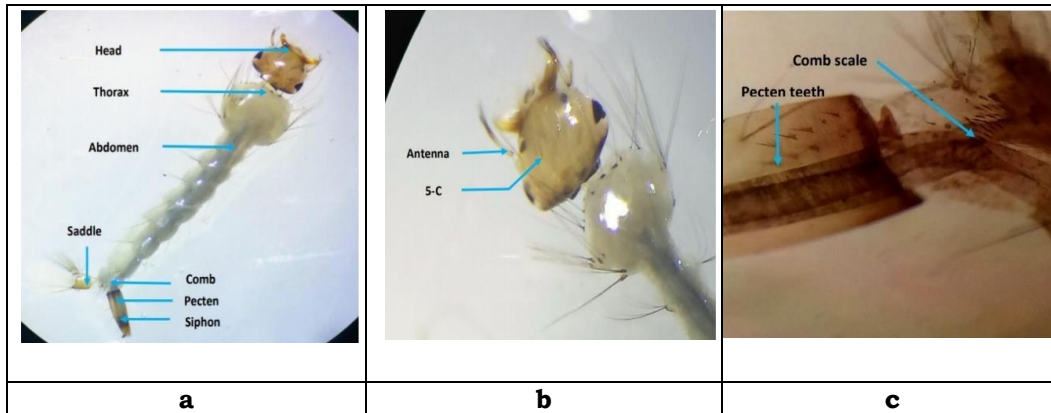


Fig.1- a) Larva of *Culex quinquefasciatus*; b) head and thoracic region; c) terminal segment (magnified).

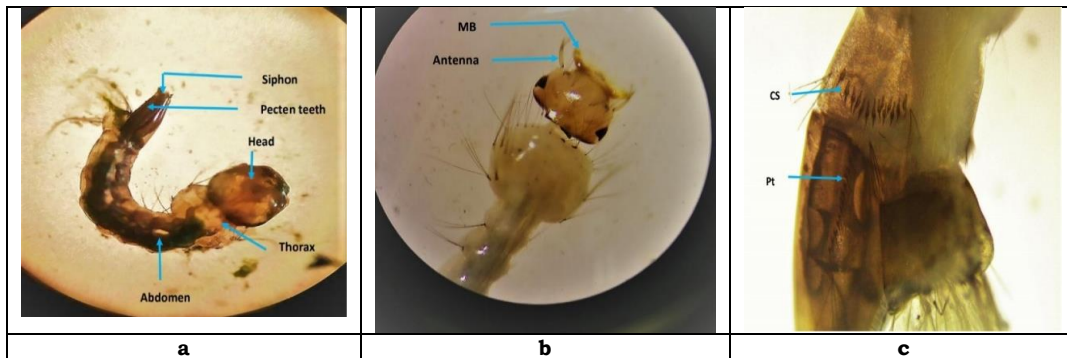


Fig.2-a) Larva of *Aedes aegypti*; b) head and thoracic region; c) terminal segment (magnified).

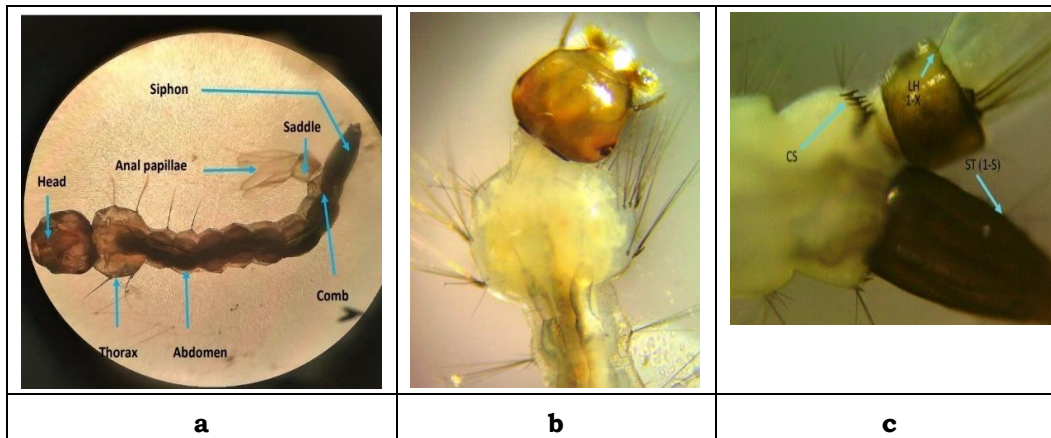


Fig.3- a) Larvae of *Aedes albopictus*; b) head and thoracic region; c) terminal segment (magnified). [CS= Comb scale; Pt= Pecten teeth; ST= Seta; LH= Lateral hair of siphon]

Genus Aedes: Siphon usually shorter; saddle without spines on posterior margin; comb scales variable and aligned in a single straight row.

Species- Aedes aegypti: Pecten teeth on siphon evenly spaced; siphonal tuft (seta 1-S) inserted beyond pecten teeth; comb scales with prominent subapical spines resembling a pitchfork; head hair 7-C single lateral sides of thorax with prominent black hooks.

Species- Aedes albopictus: Pecten teeth on siphon distally detached, siphonal tuft (seta 1-S) inserted within pecten teeth; comb scales with straight and long median spine, resembling a thorn head hair 7-C double; lateral sides of thorax with small hooks or no hooks.

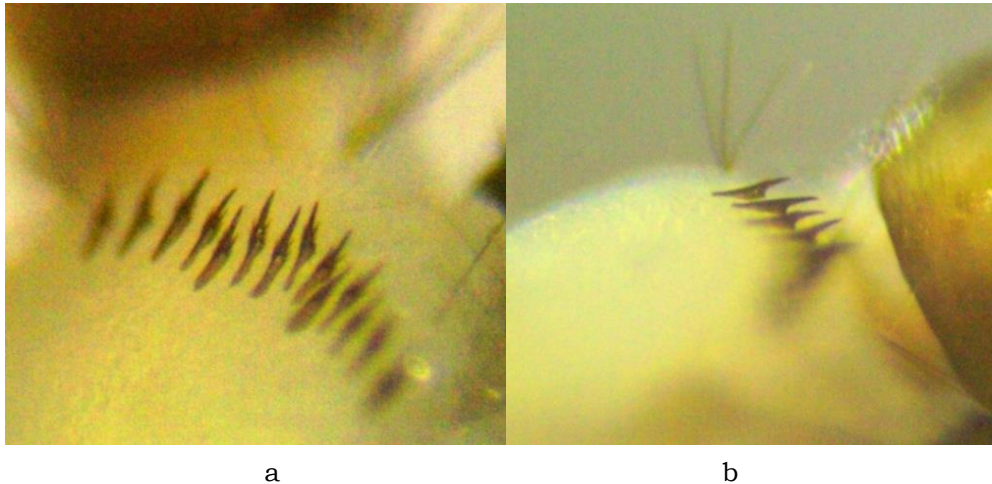


Fig.4. a) Comb scales of *Aedes aegypti*; b) Comb scales of *Aedes albopictus*.***Please show the comb scales with arrows on the photographs

Monthly collection data of mosquito larvae from Jagannath University and Dhaka University (Curzon hall) Campus: Abundance of Culex Larvae: During the study period, from Jagannath University a total of 1534 *Culex* larvae were collected of which 1483 larvae were identified as *Culex quinquefasciatus* and 51 *Culex* larvae could not be identified up to species level and could be a sub species of *Culex*. Highest number of *Culex* larvae was recorded in the month of August which was 167 (10.9%) and the lowest number was recorded in the month of February which was 66 (4.3%) On the other hand, from Dhaka University (Curzon Hall) campus 1552 *Culex* larvae was found of which 1492 was identified as *Culex quinquefasciatus* and 60 *Culex* larvae could not be identified up to species level and could be a sub species of *Culex*. Highest number of *Culex* larvae was found at Dhaka University (Curzon Hall) in the month of April which was 179 (11.5%) and the lowest number was found in the

month of June which was 66 (4.3%) (Table 2). Though at Jagannath University, during the month of June the number of *Culex* larvae collected was much higher (Table 2). This was probably due to the initiative taken to clean and spray the drains at Dhaka University campus during the month of June (by Dhaka South City Corporation) leading to drastic fall in the number of *Culex* larvae at those breeding spots.

Abundance of Aedes Larvae: During the study period, from Jagannath University campus a total of 575 *Aedes* larvae were collected of which 431 were identified as *Aedes aegypti* and 144 were identified as *Aedes albopictus*. Highest number of *Aedes* larvae was recorded in the month of July which was 137 (23.8%) and the lowest number was found in the month of December which was 9 (1.6%). On the other hand, from Dhaka University (Curzon Hall) campus 754 *Aedes* larvae were collected of which 567 were identified as *Aedes aegypti* and 187 were identified as *Aedes albopictus*. Highest number of *Aedes* larvae was found at Dhaka University (Curzon Hall) in the month of June which was 200 (26.5%) and lowest number was found in the month of February which was 8 (1.06%) (Table 2).

Table 2. A year-round monthly collection of mosquito larvae from Jagannath University & Dhaka University (Curzon Hall) Campus

Mosquito Larvae	Study Area	Months												Total no. of larvae
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
<i>Culex</i>	JnU	18	18	18	19	19	19	19	19	19	19	19	19	1534
	DU	134	127	109	75	77	142	179	162	66	176	152	153	
<i>Aedes</i>	JnU	21	21	9	11	13	22	27	49	119	137	99	47	575
	DU	33	20	13	9	8	17	23	87	200	171	131	42	754
Larvae/ month		328	278	250	173	164	299	389	455	497	650	549	383	4415
(%) of larvae		7.42	6.29	5.66	3.92	3.72	6.77	8.81	10.31	11.26	14.72	12.44	8.68	

*JnU= Jagannath University; DU= Dhaka University

Ahmed *et al.*, in 2007 conducted a survey on the dengue vectors and found that the seasonal prevalence of *Ae. aegypti* and *Ae. albopictus* in Dhaka City showed a peak in the month of July. However, in 2016, Afroza *et. al.*, conducted a study at three places of old Dhaka city (Jagannath University, Bahdur Shah Park and Ahsan Manzil) and found that, the overall prevalence of *Ae. Aegypti* shows a gradual increase during rainy season and a sharp decline from the post monsoon to summer season. That is, zero or minimum larval population was observed in March and maximum larval population was reported in both August and September. This finding was consistent with the studies done by Nargis *et al.*, in 2012 on *Aedes aegypti* and *Ae. albopictus* mosquito of Dhaka city. In 2018, Paul *et al.*, collected 12,680 larvae and pupae throughout the study period

(2011±2013) from 12 wards of Dhaka city and identified about 82% of the immature mosquitoes as *Aedes aegypti*, while the remnants were *Ae. albopictus* and other mosquito species.

In the present research, particularly from the two study areas, highest number of mosquito larvae (both *Culex* and *Aedes*) were collected in the month of July which was 650 (14.72%) and lowest number of mosquito larvae was found in the month of February which was 164 (3.72%). In both areas, *Culex* larvae were more prevalent than the *Aedes* (Table-1 and 2). Though, Jagannath University campus area was much smaller than that of Dhaka University Curzon Hall area, the mosquito larval density was not lower as expected. Rather the number of *Culex* larvae found was more or less same in these two areas. Perhaps, the presence of open drains and poor drainage systems, construction sites, stagnated fresh water sources and moreover densely populated surrounding area may be responsible for this higher number of mosquito larvae in Jagannath University Campus.

CONCLUSION

In order to control the mosquito-borne diseases, it is necessary to know the status of the larval density and diversity and the timing of mosquito control operations. For this purpose, it is essential to know the monthly mosquito larval population density of different areas of Dhaka city. Mosquito control programs should be launched on regular basis by the City Corporation, especially at those places where density of mosquito larvae is relatively high and actions should be taken during the months when the mosquito larval density remains quite low. More studies are needed to determine which factors were responsible for breeding and survival of the mosquito larvae at Jagannath University and Dhaka University (Curzon Hall) campus areas to prevent further mosquito larval population in these two important areas of Dhaka city. These actions might prevent higher outbreak of mosquitoes and mosquito-borne diseases in near future.

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