

Research Article

Horizontal Distribution and Larval Habitat Potential of Invasive Aedes Mosquitoes in South Delhi, India During 2023

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A B S T R A C T

Introduction: Aedes mosquitoes, notorious for transmitting diseases like dengue, chikungunya, Zika and Yellow fever thrive in urban environmental setups. It is crucial to understand the breeding habitats in the South Delhi area for effective mosquito control and preventive measures.

Method: The objective of the study was to conduct surveys to determine the abundance, distribution, and type of containers at South Zone, Municipal Corporation of Delhi. The study sites were selected on the basis of the maximum number of dengue cases reported by the Municipal Corporation of Delhi and a door-to-door entomological survey was carried out from January to December 2023. All kinds of breeding habitats were searched for the presence of immature stages of Aedes mosquitoes.

Results: Aedes mosquitoes prefer laying their eggs in stagnant water storage containers like plastic containers, overhead tanks, desert coolers, discarded tyres, bird pots, metallic waste containers, flower pots etc. Breeding indices were found low in January, February, and March and they peaked in the months of July, August, and September and decreased continually in September, October and December during 2023.

Conclusion: Regular water supply should be provided to the people and all containers should be covered properly, which will help in the prevention of breeding of Aedes mosquitoes.

Keywords: Aedes aegypti, Dengue, Breeding Habitats, Indices, Mosquito, Delhi

Introduction

Aedes aegypti and Aedes albopictus mosquitoes transmit mosquito-borne viral diseases like dengue,

DHF, chikungunya, Yellow fever and Zika in tropical and subtropical regions.¹⁻³ The Aedes mosquitoes breed in a domestic and peri-domestic environment. Environmental factors such as humidity and temperature contribute to the

breeding and distribution of different types of mosquito species in a given region. Water storage containers, especially water jars, bird pots, flower bases, plastic sheets, thermocol, unused disposables, overhead tanks, cemented tanks and coolers served as the main larval breeding habitats of *Aedes aegypti* mosquitoes, whereas several types of containers, such as broken cans, plastic containers, vases, flower pots, and retired tyres in urban areas,⁴⁻⁹ as well as rubber plantations and agricultural fields (e.g. under banana plants) within the forested areas^{10,11} are considered primary breeding sites for *Aedes albopictus* during the rainy season.¹² Dengue outbreaks are occurring with increasing frequency and intensity of vector species in India. Dengue infection affects more than 100 countries, including Europe and the United States (USA).¹³

The Municipal Corporation of Delhi is one of the largest municipal bodies in the world providing civic services to 20 million citizens of Delhi. It has 12 zones having 250 wards, which cover about 1397.3 sq. km. area. The New Delhi Municipal Council has three zones and 14 wards covering 42.7 sq. km. area while Delhi Cantonment Board covers 42.89 sq. km. area. Northern Railway is taking care of their residential colonies and railway stations as well as adjoining areas of railway track. Indira Gandhi International Airport (IGI) airport authority of India is being looked after by Central Government Institutes namely the National Centre for Vector Borne Disease Control, Delhi as well as the National Centre for Disease Control, Delhi. Unplanned urbanisation, global warming, and migration of population are responsible for the transmission of vector-borne diseases. Keeping in view, a study of the horizontal distribution and larval habitat potential of invasive *Aedes* mosquito was undertaken in South Delhi, India from January to December 2023.

Material and Method

The study sites were selected on the basis of the maximum number of dengue cases reported by the Municipal Corporation of Delhi. A door-to-door entomological survey was carried out in randomly selected different localities of the South Zone of the Municipal Corporation of Delhi. All types of wet containers in and around houses and their premises were searched in rural and urban setups of South Delhi from January to December 2023. Larval collections were made with the help of flashlights by dipping and pipetting method.¹⁴ All kinds of breeding habitats in the study areas like coolers, overhead tanks (OHT), plastic containers, earthen pots and iron pots were searched for the presence of immature stages of *Aedes* mosquitoes. In the larval survey, different entomological indices like House Index (HI%), Container Index (CI%) and Breteau Index (BI) were used to record the *Aedes aegypti* larval density.

Result

Eight localities were surveyed every month in the study area. A total of 6066 houses were searched during the year 2023 and 158 houses were found positive for *Aedes* breeding. During the survey, 174 containers were found positive out of 7103 containers searched. Slum areas were found highly positive for invasive *Aedes* mosquito larvae. Minimum HI, CI and BI were found in the month of January (0.4%, 0.36% and 0.4, respectively) while maximum HI, CI and BI were found in the month of August (5.3%, 4.9% and 6.1 respectively). Month-wise HI, CI and BI are depicted in Table 1.

Table 1. Month-wise Entomological Indices of South Zone of Municipal Corporation of Delhi from January to December 2023

Months	Entomological Indices		
	House Index (HI%)	Container Index (CI %)	Breteau Index (BI)
January	0.4	0.36	0.4
February	1.0	0.8	1.0
March	2.2	1.9	2.2
April	3.0	2.8	3.5
May	2.8	2.7	2.8
June	3.0	2.7	3.1
July	3.6	3.5	3.8
August	5.3	4.9	6.1
September	4.2	3.8	4.6
October	2.7	2.9	3.4
November	2.2	2.2	2.7
December	0.9	0.7	0.9

Larval Habitats Potential for Invasive *Aedes* Mosquitoes in South Delhi

Breeding potential containers were searched as overhead tanks (Syntax), underground tanks, plastic water storage containers, desert coolers, bird pots, refrigerator tray, flower pots, tyres, earthen pots, planters, cemented houdi, disposables (PVC & tin), solid waste, discarded containers for *Aedes* mosquito larvae. Maximum positivity as well as potential areas were in slum localities. A total of 174 containers were found positive, out of these containers, plastic storage containers were (50%) followed by coolers (17.24%), earthen pots (14.94%) and flower pots (8.05%) while minimum positivity was found in tyres (2.87%), OHT (2.29%), cemented houdi (2.29%), iron containers (2.29%) and others (1.72%) respectively. The percentage (%) of the positivity of containers is given in parentheses. Container-wise larval habitat potential for invasive *Aedes* mosquitoes is given in Table 2.

Table 2. Container-wise Larval Habitat Potential for Invasive Aedes Mosquitoes in South Delhi

Types of Containers	Plastic Container	Cooler	Earthen Pot	Flower Pot	Tyre	OHT	Cemented Houdi	Iron Container	Others
Number of containers found positive n (%)	87 (50.00)	30 (17.24)	26 (14.94)	14 (8.05)	5 (2.87)	4 (2.29)	4 (2.29)	4 (2.29)	3 (1.72)

Discussion

The results of larval indices reveal that HI was very low during the winter season i.e. December–January (0.9% & 0.4%) and maximum in August (5.3%), CI was very low in January (0.36%) and maximum in August (4.9%) and BI was also very low in January (0.4) and maximum in August (6.1). The rainfall data was found to be minimum from December to February, a peak was observed in the months of June–July 2023¹⁵ and temperature data was found to be minimum from December to February, moderate in March, April, October and November and maximum between May and September, 2023.¹⁶ The meteorological data also support the breeding trend of the Aedes mosquito species. These findings are correlated with the results of the Delhi survey done by Babita Bist & Himmat Singh, 2021.¹⁷

Preferable breeding habitats were plastic storage containers, coolers, Earthen pots, flower pots, tyres, OHT, iron containers and cemented houdi. These containers are important risk factors for the community. The residents are in the practice of water storage in different containers because of irregular and inadequate water supply, which leads to high vector breeding.

Conclusion

The study showed that the larval indices HI, CI and BI were high in the month of August and minimum in the month of January. It is also concluded that plastic containers are the most preferable containers for Aedes mosquito breeding. Therefore, emphasis should be placed on regular water supply and the containers should be covered properly. This will prevent the breeding of Aedes mosquitoes. Vector control activities along with IEC/ BCC activities should be increased especially in the slum areas.

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