Hindawi
BioMed Research International
Volume 2020, Article ID 5830604, 12 pages
https://doi.org/10.1155/2020/5830604

Research Article

Naturally Occurring Microbiota in Dengue Vector Mosquito Breeding Habitats and Their Use as Diet Organisms by Developing Larvae in the Kandy District, Sri Lanka

H. A. K. Ranasinghe and L. D. Amarasinghe

Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Dalugama, Kelaniya, Sri Lanka GQ 11600

Correspondence should be addressed to L. D. Amarasinghe; deepika@kln.ac.lk

Received 1 May 2020; Revised 20 September 2020; Accepted 24 September 2020; Published 13 October 2020

Academic Editor: Denise Freire

Copyright © 2020 H. A. K. Ranasinghe and L. D. Amarasinghe. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Naturally occurring microbiota in mosquito larval habitats are among biotic factors which affect the population dynamics of developing larvae. Many microbiota species serve as food items for vector mosquito larvae, and food limitations within habitats adversely affect larval survival, developmental rate, adult fitness, and thereby vector competence. Therefore, identification of microbiota as associates with larvae reveals their relationship between each other as parasites, pathogens, epibionts, or diet organisms. Analysis of associated microbiota species in the dengue vector larval breeding habitats ($n = 40$) and the mosquito larval gut content were conducted in Kandy District in Sri Lanka. Study revealed that a total of 22 microbiota species belong to nine phyla (Amoebozoa, Bacillariophyta, Ciliophora, Chlorophyta, Sarcodina, Cyanobacteria/Cyanophyta, Euglenozoa, Ochrophyta/Heterokontophyta, and Rotifera) were encountered from different *Ae. aegypti* mosquito breeding habitats while 26 microbiota species that belonged to ten phyla were recorded from *Ae. albopictus* mosquito breeding habitats with one additional phylum Arthropoda. Considering *Ae. aegypti* breeding habitats, only *Philodina citrina* in low roof gutters existed as constant species. Considering *Aedes albopictus* breeding habitats, *Volvox aureus* in plastic containers, *Lecane luna* in coconut shells, *Phacus pleuronectes* in concrete slabs, and *Pinnularia* sp. in tree holes existed as constant species. The rest of the microbiota existed as common or accidental/rare species in a variety of habitat types. The Shannon-Weiner diversity (21.01 and 19.36) and gamma diversity (eight and eight) of the microbiota associated with *Ae. aegypti* and *Ae. albopictus* larvae, respectively, in ponds were found to be higher than other types of breeding habitats recorded during the study. Twelve microbiota species were recorded from larval gut analysis as food organisms of both species of mosquito larvae. However, the distribution of gut microbiota species differed between *Ae. aegypti* and *Ae. albopictus* (Chi − square = 21.294, $P = 0.002$). Identification of microbiota as food items of vector mosquito larvae led to a focus on larval food limitation by introducing food competitors, which could be a potential additional tool for integrated vector control approaches within the country.

1. Introduction

In terms of public health, mosquitoes are the most important vectors for diseases, and therefore, studying their ecological and environmental conditions influencing their abundance is important. Mosquito habitat ecology plays an important role to determine the larval densities and species assemblage in a particular breeding habitat [1, 2]. Different types of aquatic habitats are utilized by mosquitoes for oviposition, and many mosquito species tend to select both natural and artificial containers as breeding places [3, 4]. In Sri Lanka, dengue has become a significant socioeconomic and public health burden and *Aedes aegypti* and *Aedes albopictus* are widely adapted to urban and suburban environments, acting as vectors of dengue within the country [5]. Water-holding containers were found to be the main larval habitats for *Ae. aegypti* and *Ae. albopictus*. Chan et al. [6] have stated that *Ae. aegypti* breed in indoor-type breeding habitats such as earthenware jars, tin cans, ant traps, rubber tires, bowls, and drums. Immature forms of *Ae. albopictus* prefer artificial