Leaf litter decay process and the growth performance of *Aedes albopictus* larvae (Diptera: Culicidae)

Hamady Dieng, Charles Mwandawiro, Michael Boots, Ronald Morales, Tomomitsu Satho, Nobuko Tuno, Yoshio Tsuda, and Masahiro Takagi

Department of Medical Entomology, Institute of Tropical Medicine, 1-12-4, Sakamoto, 852-8523 Nagasaki, Japan

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ABSTRACT: Larvae of the mosquito *Ae. albopictus* typically develop in small aquatic sites such as tree holes and artificial containers. Organic detritus, in particular decaying leaves, is therefore their major carbon source. Here we demonstrate the importance of leaf characteristics, and in particular their rates of decay, in determining the development and survivorship of larvae. We compared the effects of a rapidly decaying leaf, the maple *Acer buergerianum* (Angiospermae: Aceraceae) and a slowly decaying leaf, the camphor *Cinnamomum japonicum* (Angiospermae: Lauraceae), on the larval development of *Ae. albopictus* at different larval densities in laboratory microcosms. Overall, the maple leaves provided a better substrate and the observed growth patterns could be explained on the basis of a difference in nutritive and chemical contents of the two leaf types. At the highest population density, the duration of the larval period was much shorter in maple litter microcosms. Larval mortality gradually increased with population density in the camphor treatment. In contrast in the rapidly decaying leaf litter microcosms, mortality remained low even as densities increased. Mean pupal size was greater in the individuals fed on the rapidly decaying leaf litter as well as at lower density. Size is likely to be correlated with fitness in the field. In general, rapidly decaying leaf litter will favor mosquito growth resulting in quicker development and higher population sizes. This work emphasizes the importance of the local environment on the development of vector mosquitoes and has important implications for control. ***Journal of Vector Ecology* 27(1): 31-38. 2002.**

Keyword Index: Leaf litter, decay, tree hole, performance, microcosm.

INTRODUCTION

Mosquito population dynamics largely depend on biological and environmental conditions (Tsuda et al. 1991). However, the interactions between the various population parameters and the environment are so complex that it is still problematic to fully understand the dynamics of some vectors. In view of this complexity, it is instructive to examine individual responses in controlled laboratory conditions. Here we examine the role that different types of leaf litter play in the performance of the important vector mosquito *Ae. albopictus*.

Mosquito larvae use allochthonous leaf detritus as food (Walker et al. 1997) by browsing on the associated microbial fauna (Cummins and Klug 1979, Fish and Carpenter 1982). *Aedes* mosquitoes of the subgenus *Stegomyia* use various aquatic sites including phytotelmata and artificial containers (Sota et al. 1992) that provide the same general nature of food, principally comprised of detritus (Clements 1992). Among these, *Ae. albopictus*, a known vector of dengue in Southern Asia (Chan et al. 1971, Jumali et al. 1979), is expanding its distribution throughout the world (Rai 1991, Reiter 1998). The adults occur in both forested and urban areas while the larvae breed in tree holes and various artificial containers (Makiya 1968, Eshita and Kurihara 1978, and Hawley 1988).

In recent years, much effort has been directed towards understanding the invasive properties of *Ae. albopictus* from forested areas, where it originates, as well as from indigenous to non-indigenous countries (Reiter 1998). In particular, there has been a substantial body of work looking at the response of environmental conditions of both the larvae and the adults. Density has been shown to have a negative effect and food level a positive effect on immature survival, duration of development, and size at emergence (Mori 1979, Lord 1998). Habitat food level has also been previously documented to influence the susceptibility to parasite