BIONOMICS OF MANSONIOIDES MOSQUITOES IN RELATION TO COMMUNITY STRUCTURE OF HYDROPHYTES/ BREEDING HABITATS IN CHERTHALA, KERALA

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ABSTRACT

Three species of *Mansonioides* vectors viz., *Ma.annulifera*, *Ma.uniformis* and *Ma.indiana* were found in Cherthala taluk, Kerala which is one of the endemic areas due to *B. malayi*. The immatures of *Mansonioides* thrive mainly in association with macrophytic hydrophytes such as *P.stratiotes*, *S. molesta* and *E.crassipes* in perennial habitats (ponds, channels / canals etc.,) and *I.miliaceae* in seasonal habitats (fallow lands etc.). Breeding potential was higher (130.19) in clean ponds with *P. stratiotes*, compared to that of polluted ones (40.69). However, the polluted habitats infested with the same host plants were found to be the most productive for *Ma.annulifera*, with an average daily adult emergence rate of 601 / 100 sq.m.). The clean habitats played a major role in the contribution of *Ma.uniformis*, where *S. molesta* in the perennial habitats and *I. miliaceae* in the seasonal fallow lands were the favourable plants contributing a daily output of 12.5 / 100 sq.m and 221.81 / 100 sq.m. respectively. *E.crassipes* infested polluted habitats formed the major source for *Ma.indiana*, the emergence rate being 13.89 / 100 sq.m. The perennial habitats supported mainly the breeding of *Ma. annulifera* (70.82%), whereas the seasonal habitats contributed the major chunk of *Ma. uniformis* (92.54%) and *Ma. indiana* (71.43%). The bionomics of *Mansonioides* mosquitoes are thus shown to be greatly influenced by the community structure of hydrophytes and also the nature of breeding habitats.

KEY WORDS : Bionomics, *Mansonioides*, Hydrophytes

INTRODUCTION

Mosquitoes of the genus *Mansonia* are the main vectors of Brugian filariasis in India and other South-east Asian countries (1). The unique feature of *Mansonioides* is that the adults lay their eggs on the undersurface of floating leaves of aquatic weeds and the larvae and pupae attach themselves to the roots of these plants (2). The extent of breeding of *Mansonioides* is thus determined by the prevalence of host plants and their distribution, which varies in different habitats. Cherthala (population: 4,50,000) in Alappuzha district, Kerala is reported to be one of the high endemic areas due to *Brugia malayi* for several decades, where a study was initiated on the bionomics of *Mansonioides* mosquitoes in relation to

community structure of hydrophytes and the nature of breeding habitats

The Cherthala taluk is highly water logged with numerous water bodies. Ponds, channels and canals constitute the perennial vector breeding habitats, while paddy fields, fallow lands and lake shoreline are seasonal ones. Almost 30 % of the total ponds are polluted on account of retting coconut husk for coir-making which is the major cottage industry. All these water bodies support the growth and proliferation of different types of hydrophytes, providing a total surface of about 7.39 sq.km. for the breeding of *Mansonioides* mosquitoes. The immatures of *Mansonioides* thrive mainly in association with macrophytic hydrophytes such as *Pistia stratiotes*, *Salvinia molesta* and *Eichhornia crassipes* in perennial habitats and *Isachne miliaceae* in seasonal habitats.

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HOST PLANT PREFERENCE FOR OVIPOSITION AND LARVAL ATTACHMENT

Host plant preference for oviposition by the adult mosquitoes was studied by examining the number of egg clusters in different hydrophytes in ponds, infested with mixed vegetation where the adults have the choice for selecting their host plant for oviposition. The average number of egg clusters per plant was found to be maximum in *P. stratiotes* plants in both clean (0.0091) and polluted (0.0459) habitats. In *S. molesta* plants it was found to be 22 to 30 times less than that of *P. stratiotes*. Only one egg cluster was obtained out of 1,639 *E. crassipes* examined from ponds infested with mixed vegetation.

Similarly, host plant preference by immatures for attachment was studied in ponds with mixed vegetation. In polluted ponds, density of larvae was found to be more on *P. stratiotes* (35.27 / dip) followed by *E. crassipes* (27.56 / dip) and *S. molesta* (15.44 / dip). Test of significance showed that the density was significantly different between *P. stratiotes* and *S. molesta* ($T = 1.90$; $P = 0.03$), but it was not so between *P. stratiotes* and *E. crassipes* ($T = 0.77$; $P = 0.44$).

IMMATURE DISTRIBUTION AND INDEX OF ASSOCIATION

The number of *Mansonioides* larvae recorded from the samples collected near the pond margin ranged from 1 to 233, with a mean of 45.74 per dip, while it was 1 to 299 with a mean of 47.5 from the centre of the pond. Statistical analysis (one way variance test) showed that the per dip density did not differ significantly ($P > 0.05$) between the density recorded near the margin and centre of the pond, indicating a uniform distribution of larvae in the pond habitat.

Index of Association between the two most prevalent *Mansonioides* mosquitoes was studied following the method described by Service (3). A high degree of association between *Ma. annulifera* and *Ma. uniformis* was noticed in ponds (CAB value 0.3273 ± 0.044) as well as fallow lands (CAB value $= 0.8760 \pm 0.083$). However, the association was relatively higher in fallow lands when compared to the ponds. A similar degree of association between these two species was also found from the values of Index of Association (I) in both the habitats [(I) value for ponds = 0.055;

fallow lands = 0.873]. In fallow lands the value was found to be more than 15 times higher when compared to pond habitat. This is because of the prevalence of a wide range of host plants in fallow lands than in pond habitat, and relatively a higher incidence and intensity of *M. uniformis* breeding in fallow lands, as they are less restricted to their choice of host plants.

PRODUCTIVITY INDEX AND BREEDING POTENTIAL

Productivity Index and Breeding Potential of different breeding habitats were assessed in relation to their nature and type of hydrophytes prevalence, following the procedure adopted by Cairncross et al (4). Among the different breeding habitats, relatively a higher Productivity Index (PI) was recorded for the fallow lands (1.288) and ponds (0.386), when compared to channels (0.0266) paddy fields (0.0289), canals (0.0004) and lake (0.0004). The mean number of pupae recorded from fallow land and ponds were 0.718 and 0.272 per dip respectively. The percentage of dips positive for pupae was found to be maximum in fallow lands (17.95%) followed by ponds (14.19%).

The Breeding Potential (BP) was estimated to be 1829.81 for fallow lands, 1431.69 for ponds, 31.12 for channels, 15.03 for paddy fields, 0.16 for lake and 0.07 for canals. The prevalence of hydrophytes in fallow lands for a restricted period (post-monsoon months: Sep.- Dec.) makes it seasonal, whereas ponds remain perennial and therefore the major breeding habitat in the contribution of *Mansonioides* in the study area. Fallow lands ranked as the second most important habitat, though it is seasonal.

Analysis on the Productivity Index and Breeding Potential of pond habitat in relation to the type of hydrophytes showed that polluted pond habitat infested with mixed vegetation recorded the maximum values of PI (45.1) and BP (3242.19). Clean ponds with mixed vegetation ranked second in their contribution of *Mansonioides* (PI = 16.41; BP = 1332.86). Though the Productivity Index of polluted ponds with *P. stratiotes* was nearly three fold of that recorded in clean ponds with *P. stratiotes*, the Breeding Potential was three times higher in the latter. Thus, among the pond habitat, polluted ponds infested with mixed vegetation was estimated to contribute the maximum production of *Mansonioides*.

ADULT EMERGENCE POTENTIAL

The adult emergence potential of different hydrophytes in various habitats was studied, through different seasons using emergence traps. The polluted habitats infested with *P. stratiotes* were found to be the most productive for *Ma. annulifera* (average daily emergence rate: 601/100 sq.m.). However, the clean habitats played a major role in the contribution of *Ma. uniformis*. *S. molesta*, in the perennial habitats and *I. miliaceae*, in the seasonal fallow lands were the preferred plants of *Ma. uniformis* with an average daily emergence rate of 12.5 / 100 sq.m and 221.81 / 100 sq.m respectively. *E. crassipes* infested polluted habitats formed the major source for *Ma. indiana*, the average daily emergence rate being 13.89/100 sq.m. 70.82% of

the total population of *Ma. annulifera* was contributed by the perennial habitats. 92.54 % of *Ma. uniformis* and 71.43 % of *Ma. indiana* population were produced by seasonal habitats. This coincides with the seasonal prevalence of these species reported earlier (5).

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