SUMMARY

Mosquito, the little pest is the world’s leading disease carrier transmitting diseases like malaria, filariasis, encephalitis, dengue, etc. If any one of the diseases is said to be endemic in any area or region means favourable environmental conditions are prevailing there for the particular species of the mosquito(es) which can spread the disease. Mayiladuthurai (Nagapattinam District, Tamil Nadu State) which is the study centre of the present investigation, is considered to be endemic for filariasis (elephantiasis) as evidenced by the report for the past 5 years given by Government Hospital, Mayiladuthurai, has been presented in the thesis. To find out a solution, from research point of view, for controlling the dreadful disease spreading mosquito population, the filarial vector *Culex quinquefasciatus* (Say, 1823) formerly known as *Culex fatigans* (Wiedemann) has been selected as the experimental animal for the present study.

From control point of view, an attempt has been made in two different angles; one by controlling method at larval stage and the other by controlling method at adult stage. As it is generally considered that an understanding of the bionomics and biology of any species is important before evolving any control strategy, breeding ecology of the
mosquito has been studied as the first part of the present study. The hydrological features in terms of chemical characteristics of the sewage water, where the larvae inhabit, had been studied with reference to pH, electrical conductivity, hardness of the water, salt contents and alkalinity. Then, the study was extended to tap water with which the larvae were reared under laboratory condition.

The filarial vector mosquito, *Culex quinquefasciatus* is said to be naturally an ubiquitous breeder and particularly it breeds in organic polluted water. To ascertain the above said view, an experiment was designed in such a way to know its order of preference for its selection of oviposition site. An organic polluted condition of the tap water was made by adding Baker's yeast pellets, since yeast material has been already reported to be one of the food materials of mosquito larvae in an aquatic system. The yeast medium was placed along with another container having tap water alone without yeast in an open condition. The wild forms of the gravid mosquitoes were observed to be preferring only the yeast medium for their oviposition, which was measured in terms of number of eggs laid. The present study has given the experimental evidence that no one animal preferred the tap water. So, it has been suggested from the present study that yeast is an attracting factor for their oviposition thereby it has been established that presence
of such an organic matter may be the reason for the preference of polluted water for their breeding purpose.

Moreover, it has been observed in the present study that the filarial vector preferred the medium, which is having higher amount of yeast material. It has also been observed that the gravid mosquito preferred even the distilled water for their breeding purpose only under a condition of having at least some amount of yeast material. In addition to the above, the mosquito larvae were observed to be having fast growth only in the yeast medium in which higher amount of yeast materials had been placed. Thereby, it has been suggested from the present study that yeast material not only in terms of quality but also in terms of quantity is playing a role in the breeding ecology of the filarial vector mosquito. In addition to the above observations, it was also found out that there was no difference in the rate of larval growth when hatched larvae were allowed to grow in two different yeast media (one with Baker’s yeast pellets and the other with Brewer’s yeast pellets) treated in identical conditions.

From control point of view, an attempt was made to disturb the osmo-ionic regulatory mechanism of the larvae by increasing the salt content of the environmental medium where they have to live.
mortality of the larvae within 24 hours was observed in the tap water medium wherein 1.5 g of common salt was added to 100 ml of tap water; whereas only 25% mortality occurred (within 24 hours) in 1.0 percent salt increased medium and 5% mortality for 24 hours in 0.5% salt increased medium. Addition of one neem kernel (as a larvicide and antifeedant) for every 100 ml of tap water did not give any encouraging result within 24 hours. When the neem kernel was added to 1.0% enhanced salt medium, it was not observed to be having any increased mortality to a remarkable level within 24 hours. The mortality rate (100% mortality in 1.5% enhanced salt medium for 24 hours and 50% mortality in 1.0% enhanced salt medium for 72 hours and 15% mortality in 0.5% enhanced salt medium for 48 hours) seems to be due to failure of the anal papillae in maintenance of the osmo-ionic regulation as evidenced by the shrinkage of the papillae with increasing salt content of the medium. So, from the present study it is suggested that application of salt and neem kernel is not only feasible but also sustainable to control mosquito population.

When a study was made at the adult stage, the filarial vector mosquito was observed to be an anautogenic form (an animal which needs blood-meal even for the production of first batch of eggs). The mosquito was observed to feed readily on third day after their
emergence. Vitellogenic process was observed for every 6 hours from
the time of blood feeding. The animals were observed to have matured
eggs (gravid stage) around 48 hours as evidenced by the micropyle cup
(floating unit) formation at the anterior end of eggs. The electrophoretic
protein profile of the homogenate of gravid staged ovary indicated
distinct protein profile having two bands only when compared to
protein pattern of newly emerged. Amino acid analysis was made by
ascending paper chromatography by using whole homogenate extract
of newly emerged, blood-fed and freshly-laid eggs. It is interesting to
note that the relative mobility (Rm) pattern of the amino acids
particularly the pattern between the freshly-laid eggs and the newly
emerged showed almost the same pattern. Presence of iso-leucine
(amino acid) is the unique and characteristic feature of the laid-eggs.

An attempt was given in the present study to control mosquito
population at the adult stage, by vaccine method, which is said to be a
novel and an alternative to chemical method. When a trial was given to
administer the antigen, prepared from whole homogenate extract from
gravid stage, through intramuscular and oral route for chicks with same
concentration. Surprisingly the immunogenic effect through oral route
was observed near to intramuscular administration. When the same
approach was given to rabbits, the same immunogenic effect was
observed for the oral route. The immunogenic effect was measured in terms of mortality in the mosquito population when they were allowed to feed on sensitized chicks or rabbits administered through both ways. Not only mortality was observed in the mosquito groups but also the fecundity of the mosquitoes was observed to be affected as evidenced by the reduced number of eggs per raft and membranous eggs.

Mortality and reduced fecundity was observed in the mosquito groups fed on rabbits treated with primary dose(s) prepared from different sources of the mosquito body by oral route. Among the different antigens (from different sources), the gravid extract gave better results of mortality effect when compared to other antigens from other sources of newly emerged, ovaries and freshly-laid eggs. So, based on the results of the present study, it may be suggested that oral administration of mosquito antigens, particularly vitellogenin (yolk protein) may be followed to control mosquito population. In this context, it is suggested that the modern ‘Recombinant DNA Technology’ may be highly useful for the production of antigens at a large scale. If this method is standardized, practical point of view, the administration of antigen would be so easy as that of polio drops or capsules for distribution to the public, thereby mosquito population may be controlled successfully.

6. SUMMARY