Introduction
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Mosquitoes are the oldest human enemy and have been responsible for the transmission of several dreadful diseases, (malaria, filariasis, dengue and Japanese encephalitis), which indirectly are an impediment for the economic development not only for India but also for the entire world. Malaria is by far the most important insect transmitted disease, remaining a major health problem in many parts of the world and is responsible for high childhood mortality and morbidity in Africa and Asia. Africa faces its greatest impact. The other hard hit tropical areas include East Asia, China and India. In India, the current annual incidence of malaria is about 2-3 million cases as per National Anti Malaria Programme (NAMP) of Government of India (Sharma, 2003).

Malaria is transmitted from man to man by female anopheles mosquito, one of the most capable vectors of human disease. Various species have been found to be the vectors in different parts of the world. Nearly 48 species of anopheles mosquito have been found in India, out of which 8 are vectors of malaria. Among the Anopheles species Anopheles stephensi is recognized as a major vector of urban malaria in India (Mittal et al., 2005). This species prefers to breed in wells, over head or ground level water tanks, cisterns, coolers, roofgulteres and artificial containers is responsible for frequent out breaks of malaria, particularly at construction sites in urban areas (Herrel et al., 2001).
The genes *Anopheles* transmit the four protozoan parasites (*Plasmodium falciparum*, *P. vivax*, *P. malariae* and *P. ovale*) that cause human malaria which breed in the *Anopheles* intestines. The parasites kill red blood cells and cripple the liver. Every year it kills between one and two million people, with as many as 300-500 million people being infected. It is estimated that nearly half the world population is at risk, with total rates being extremely high among young children below 5 years of age. Experts estimated that as many as 40% of India’s malaria cases is caused by *P. falciparum*. The deadly diseases carried by these insects and the annoyance they cause is likely to have encouraged the discovery of methods of personal protection (Moore *et al.*, 2002).

Mosquito control is one of the major problems of the world today in view of its vector nature. But in recent years, one of the main reasons for the failure of the mosquito control by using synthetic chemicals, because of insecticide resistance, increased public concern over environmental pollution necessitate a continued search for alternatives, cheaper vector control methods, which require little or no sophisticated technology but give excellent results (Naznin Ara Khatune *et al.*, 2001). In view of this, the botanical insecticides and microbial pesticides are highly effective, safe and ecologically acceptable.

Insecticides of biological origin are increasingly being used for the control of insect pest. The discovery of bacteria like *Bacillus sphaericus* and *Bacillus thuringiensis* subsp. *israelensis*, which are highly toxic to dipteran larvae opened up the possibility of the use of these biolarvicides in mosquito eradication programmes (Goldberg and Margalit 1977; Kalfon *et al.*, 1983). These bacilli have some advantages over conventional insecticides in mosquito control operations. They are safe for non-target organisms including humans and they are not deleterious to the environment.
Bacillus thuringiensis subsp. israelensis is a gram-positive aerobic bacterium, produces a parasporal protein inclusion. Upon ingestion by susceptible insects, this inclusion is solubilized in the alkaline and proteolytic conditions present in the midgut, giving rise to a number of toxins. The solubilized toxins cause the insect midgut epithelial cells to swell and lyse (Singh et al., 1986). In addition to the insect midgut epithelial cells, a variety of other cell types are also lysed by these solubilized toxins. These toxins have also been reported to disrupt the functioning of the insect muscular and nervous system (Chilcott et al., 1984).

A number of protein toxins are present in parasporal inclusions of Bacillus thuringiensis subsp. israelensis. Of these, the 25 - kilo dalton (kDa) protein, which is a proteolytically cleaved product of the 28-kDa protein present in the inclusion, is thought to be primarily responsible for the hemolytic action of B. thuringiensis subsp. israelensis (Armstrong et al., 1985). However, due to rapid development of resistance of mosquitoes to Bacillus thuringiensis toxin alternate mosquito control measures are needed. Therefore integrated vector control, which combines microbial pesticides and botanicals, is becoming preferred approach (Murugan et al., 2003).

Plants may be an alternative source of mosquito larval control agents because they constitute a rich source of bioactive chemicals. Much effort has, therefore, been focused on plant extract or phytochemicals as potential sources of commercial mosquito-control agents. The phytochemicals hampers the evolution of resistance varieties of the vectors due to multifunctional selective pressure. The most promising botanical mosquito control agents are in the families Aseteraceae, Cladophoraceae, Labiatae, Meliaceae, Oocystaceae and Rutaceae (Sukumar et al., 1991). Hence in the present thesis an attempt has been
made to screen and evaluate the larvicidal and repellent properties of three botanicals of tribal origin, Maruthamalai Hills, Western Ghats, Southern India such as *Glycosmis pentaphylla* (Rutaceae), *Albizzia amara* (Fabaceae / Mimosaceae) and *Ocimum basilicum* (Labiatae). All the three plants showed considerable bioactivities on malarial vector, *A. stephensi*. Hence, in present investigation an in-depth study has been made to combine *G. pentaphylla, A. amara* and *O. basilicum* with *B. thuringiensis* for the successful control of malarial vector.

*Glycosmis pentaphylla* belongs to the family, Rutaceae. It is thorn less shrub or small tree that is native to southeastern Asia and northeastern Australia. The genus *Glycosmis* contains a wide variety of compounds with potential biological activity. These include terpenoids, amides, imides, alkaloïdes, coumarins and flavonoïdes exhibiting antifungal and insecticidal activities. (Greger *et al.*, 1996). The plant has multiple medicinal values and the extracts of the plant showed very high larval mortality and induced developmental deformities in larvae of mosquitoes. Besides, leaves of this plant are used to keep insects away from sweets and other edible items by natives in India, South Africa and Australia (Chopra *et al.*, 1956).

*Albizzia amara* (Lallei) belongs to the family, Fabaceae / Mimosaceae. It is perennial small tree that habited throughout south India in dry forest, this plant mainly used for treat amnesia, sore throat and insomnia. The active constituents of *Albizzia* are saponins and tannins. Specifically it contains albitocin, b- sitosterol, amyrin, quercetrin and isoquercetrin (flavonol glycosides). The dried leaves are used as substitute of soap and the extracts of the plant leaves showed considerable larval mortality and high repellent activity against *Aedes aegypti* mosquito (Murugan *et al.*, 2005).
Ocimum basilicum (sweet basil) belongs to the family, Labiatae. It is annual, aromatic, branched herb that is native to far eastern countries of India, Pakistan and Thailand. The plant has been used for medicinal purposes as a digestive stimulant and for treatment of insomnia and constipation. Other uses are burn springs of basil on the barbecue to deter mosquitoes and flies. O. basilicum leaves which contain more than sixty-eight active chemical components such as (limonene, myrcene, thymol, methyl chavicol, linalool, methyl eugenol and methyl cinnamate, etc.). Limonene, myrcene and thymol are some of the compounds present in the oils are responsible for repellent activity. Eugenol and methyl chavicol may be responsible for the larvicidal activity (Chopra et al., 1982).

In view of the above fact, an attempt has been made to evaluate the combined effect of G. pentaphylla, A. amara and O. basilicum with bacterial larvicide, B. thuringiensis subsp. israelensis on the mosquitocidal activity for the control of malarial vector, A. stephensi.