

## LARVICIDAL AND ANTIMICROBIAL PROPERTIES OF SELECTED PLANTS FROM UPPER KUTTANAD; AN ECOLOGICALLY FRAGILE AREA OF SOUTH INDIA

### **ABSTRACT**

#### **LARVICIDAL ACTIVITY**

Mosquitoes are well known arthropod vectors of medical importance as they may transmit many dreadful diseases among human population which not only affect the health of the people but also the economy of the Nation. To certain extent, such vectors are controlled by synthetic chemicals available in the market. But synthetic chemicals may cause serious problems such as environmental pollutions, bio magnification, insecticide resistance, adverse effect on non-target populations etc. Therefore, there is an urgent need to find a natural remedy for controlling mosquitoes in an environmentally safe manner. Previous studies have shown that plant based chemicals are the only natural remedy to overcome the above said adverse effects of synthetic larvicides. Hence, in this investigation, an attempt was made to evaluate the larvicidal activities of twenty five plants, collected from the Upper Kuttanad of Alappuzha District of Kerala state. The selected plants and their parts were screened for detecting their larvicidal property against 3<sup>rd</sup> and 4<sup>th</sup> instar larvae of *Aedes* mosquito using standard procedures. The whole plants or their parts were extracted in different solvents such as petroleum ether, acetone, methanol and water to assess their larvicidal activity.

The results of the larvicidal study showed that the methanol extracts of the tested plants had significant larvicidal activity than other extracts. Out of the twenty five plants studied, about twelve of them showed slight or moderate activity. However, three plants; flowers of *Ipomoea cairica*, whole plant of *Sida acuta* and whole plant of *Asystasia gangetica* showed highest and

promising larvicidal activity. Among them, the flowers of *Ipomoea cairica* were active against the tested 3<sup>rd</sup> and 4<sup>th</sup> instar larvae of *Aedes* mosquito even at smaller concentrations; 0.2 mg/ml (95% larvicidal activity) and 0.1 mg/ml (83% larvicidal activity). The extract of *Sida acuta* with a concentration of 0.2 mg/ml was very effective to kill 93% of the tested larvae. However, 0.2 mg/ml of the extract of *Asystasia gangetica* was effective to kill only 86.5% of tested larvae which is also a promising result. Therefore, the present study suggests that these three plants; *Ipomoea cairica*, *Sida acuta* and *Asystasia gangetica* possess effective larvicidal activity against the larvae of *Aedes* mosquito. Hence, they can be considered for isolating their active larvicidal principles for selecting them as larvicidal agents.

### **ANTIBACTERIAL ACTIVITY**

The above twenty five plants were also tested for determining their antibacterial activity against standard MTCC bacterial strains. The methodology adopted for screening the antibacterial activity was disc diffusion method. The activity was also compared with standard antibiotics using antibiotic susceptibility test. Petroleum ether, acetone, methanol and aqueous extracts of whole plant or their parts were taken for the study. The results of the study revealed that the only methanol extracts of eleven of them showed considerable activity than other extracts. Among the active methanol extracts, the whole plant extract of *Ludwigia parviflora* with a crude concentration of 10 mg/disc was very active against all the tested strains. Its activity was higher than the activity of Tetracycline 30 mcg against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Escherichia coli*. The extract also showed slightly higher activity than the Gentamicin 10 mcg against the *Pseudomonas aeruginosa*. Therefore, the present study can be concluded that the crude methanol extract of whole plant of *Ludwigia parviflora* with a concentration of 10 mg/disc is equivalent to Gentamicin and is more powerful than Tetracycline.

Hence, the methanol extract of *Ludwigia parviflora* can be taken as a natural alternative to Tetracycline and Gentamicin that are commonly used against the infection caused by *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Escherichia coli*. Its MIC study revealed that a concentration of 3mg/ml was the MIC against *Staphylococcus aureus*. The MIC result is also a promising one in the field of antibacterial studies. Hence, the present study suggests that the methanol extract of whole plant of *Ludwigia parviflora* can be used for isolating the active principles to develop a new broad spectrum antibiotic against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Escherichia coli*.

The other plant extracts were active against one or two tested bacterial strains only. Among them, the methanol extracts of *Pouzolzia zeylanica* (10 mg/disc) was active against *Staphylococcus aureus* only. Its activity was equivalent to that of Tetracycline 30 mcg. Similarly, the crude methanol extract (10 mg/disc) of leaf of *Gliricidia sepium* was also active against two strains such as *Klebsiella pneumoniae* and *Escherichia coli*. Their activity was equivalent to the activity of Tetracycline 30 mcg. The crude methanol extract of leaf of *Cerbera odollam* was also effective to inhibit the growth of *Escherichia coli*. Its activity was also equivalent to the activity of Tetracycline 30 mcg. Hence, the present study concluded that the extracts of *Pouzolzia zeylanica*, *Gliricidia sepium* and *Cerbera odollam* can be utilized for developing natural alternative for Tetracycline 30 mcg, a common antibiotic available in the market.

**Key Words:** Larvicidal activities, Mosquito, vectors, *Aedes aegypti*, *Ipomoea cairica*, *Sida acuta*, *Asystasia gangetica*, antibacterial activity, antimicrobial activity, antibiotics, Gentamicin, Tetracycline, bacterial strains, *Ludwigia parviflora*, *Pouzolzia zeylanica*, *Gliricidia sepium* and *Cerbera odollam*.