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Research Article

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Evaluation of three mosquito larvicidal efficacy of root extracts of *Sphaeranthus indicus*

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ABSTRACT

The Root extract of Agavesisalana was tested as a larvicide against three vector mosquito species viz., Anopheles stephensi, Culex quinquefasciatus and Aedes aegypti of the Root extract at 2% dilution produced 100% mortality of III rd instar larvae of An. stephensi and 1% dilution produced 100% mortality in case of Cx. quinquefasciatus and Ae. aegypti. For further bioassays, the LC50 and LC90 value of methanol and petroleum ether extracts of Sphaeranthus indicus Roots were determined against instar larvae of An. stephensi, Cx. quinquefasciatus and Ae.aegypti and these values were 125, 62.5, 31.25, 15.62 & 7.81ppm respectively. The present study revealed that Sphaeranthus indicus Root extract possess larvicidal activity against Cx. quinquefasciatus, Ae. aegypti and An. stephensi and can be exploited for their control under integrated approach of vector control.

Keywords: *Sphaeranthus indicus. L, Plant* extract, Mosquito larvicide, *Cx. quinquefasciatus, Ae. aegypti and An. Stephensi.*

INTRODUCTION

During the last two decade, mosquito–borne diseases like dengue, chikungunya, malaria, filaria, and Japanese encephalitis etc. have re-emerged in India [1 and 2]. The methods used to control these vectors for the interruption of disease transmission include indoor residual spray (IRS) with synthetic organic chemical insecticides, larvicides and insecticides treated bed nets (ITBNs). Chemical insecticides have resulted in the problem of resistance and also these insecticides are harmful to environment and mankind [3, 4, 5, 6, 7, 8]. Vector-borne disease transmission depends on the degree of man-vector contact. For the protection against mosquitoes their population must be controlled by using effective methods. In recent years there has been much interest for natural insecticides derived from plants Various studies on the natural plant products as larvicides against mosquito vectors have been reported [9, 10]. But more environment friendly compounds are required for field use.

The aim of the present study was to evaluate the larvicidal activity of different extracts of *Sphaeranthus indicus*.L. It possesses pharmacological properties [11, 12]. The present communication reveals the mosquito larvicidal properties of *Sphaeranthus indicus*.L Root extract to test its role as a larvicide against three mosquito vectors species viz., *Anopheles stephensi, Culex quinquefasciatus and Aedes aegypt.*

EXPERIMENTAL SECTION

*Sphaeranthus indicus.*L Roots were collected from the plants located in different areas of Hyderabad. These Roots were washed with tap water, cleaned thoroughly, cut into small pieces and immediately ground using a pestle and mortar, filtered through a muslin cloth and filtrate was used for the experiments. An. stephensi, Cx. quinquefasciatus and Ae. Aegypti. For further bioassay, 260ml Root extract obtained from 143.35gram fresh roots of *Sphaeranthus indicus* after grinding, was divided in to two parts each part is 100ml). First part of the Root extract was dried to obtain 10gm dried crude extract which was used after making dilutions viz., 125, 62.5, 31.25, 15.62 and 7.81 ppm (mg 1/ml1) into methanol. The other parts of the Root extract was extracted times with 100 ml each of petroleum. The efficacy of crude methanol and petroleum ether extracts of *Sphaeranthus indicus* against instar larvae of three mosquito vector species was studied. Three replicates for each concentration and the control were used for larval bioassay as per WHO procedure [19]. The experiments were conducted at room temperature of 27±1^{o}C and 70% humidity. The larval mortality in each concentration and control was recorded after 24 hours of continuous exposure. In addition, mosquito larvae were also exposed to 125, 62.5, 31.25, 15.62 and 7.81 ppm of the Root extract to determine the probable toxicity of *Sphaeranthus indicus* Roots on these organisms. Fifty mosquito larvae were kept into 250 ml of each dilution in 500 ml capacity plastic bowl. Larvae were collected from aquatic habitats mainly ponds, pools and ditches in Khammam District. The average mortality percentage of three replicates were recorded and corrected by using Abbott's formula.

RESULTS AND DISCUSSION

Preliminary results showed 100% mortality of instar larvae of Cx. quinquefasciatus and Ae. aegypti with different dilution of the original solvent Root extract and 100% mortality of instars larvae of An. Stephensi, Cx. quinquefasciatus and Ae. Aegypti. The value of the Root Methanol extracts of *Sphaeranthus indicus* against instar larvae of An. stephensi, were 81.21,76.11,52.80,29.45 and16.09. Cx. Quinquefasciatus against instar larvae it was 88.07, 83.08, 60.68, 48.54, 26.20 and Ae. Aegypti were 94.20, 87.80, 74.68, 50.20 and 38.15 respectively. Pet ether solvent crude against An. Stephensi, Quinquefasciatus, Ae. aegypti and An. stephensi were 125, 62.5, 31.25, 15.62 & 7.81ppm and were almost same against all the three mosquito species. An. Stephensi were larvicidal bioassay Root extract of *Sphaeranthus indicus* against instar larvae of An. stephensi, were 87.49, 74.36, 50.29, 39.14, 13.87. Cx. Quinquefasciatus against instar larvae 91.60, 72.20, 61.12, 37.98, 15.67 and Ae. aegypti was 86.65, 75.46, 62.39, 28.97 and 15.12 respectively (Table 1). These results showed that the efficacy of dried crude extract was more or less same against all the species, while the efficacy of petroleum ether and methanol extracts was more against An. Stephensi than Cx. quinquefasciatus and Ae. aegypti. Plant root extract effect on Percent of mortality LC 50 and LC90 methonal contain An. Stephensi 21.32ppm, 79.49ppm. Cx. quinquefasciatus 22.96ppm and 83.03ppm and Ae. Aegypti 26.70ppm and 80.14ppm. root extract effect on Percent of mortality LC 50 and LC90 pet. Ether contains 30.07ppm, 70.05ppm. Cx. Quinquefasciatus 18.22ppm, 76.87ppm and Ae. Aegypti 17.43ppm and 83.14ppm results shows in (Table.2 and figure.1). All the fractions possessed larvicidal effect but the activity of different fractions differed. This may be due to the presence of different active moieties in the three fractions having different mode of action. Plants of the family Agavaceae are rich in secondary metabolites and have been found to have antimicrobial, immune boosting and anti-inflammatory properties in vitro [13]. Saponins are useful for soap making and have pharmacological importance [14]. It may be concluded that natural plant material products contain medicinal values and higher efficiency in reducing mosquito larvicidal bioassay.

Table: 1. Efficacy of different solvent extracts of Root against three Mosquito % of larvicidal Values are mean of three replicates of three trials ± standard deviation.

S.No	Con.c (ppm) mg/ml	Root Solvent Extracts	Dose response larvicidal effect of different solvents Mortality Rate (%)		
			An. stephensi	*Cx. quinquefasciatus*	*Ae. aegypti*
1	125	Methanol	81.21±0.4	88.07±0.3	94.20±0.3
		Pet. Ether	87.49±1.1	91.6±0.1	86.65±0.5
2	62.5	Methanol	76.11±0.5	83.08±0.5	87.80±0.3
		Pet. Ether	74.36±0.5	72.20±0.3	75.46±0.4
3	31.25	Methanol	52.80±1.0	60.68±0.3	74.65±0.1
		Pet. Ether	50.29±0.3	61.12±0.5	62.39±0.3
4	15.62	Methanol	29.45±1.0	48.54±0.2	50.20±0.1
		Pet. Ether	39.14±0.6	37.98±0.3	28.97±0.3
5	7.82	Methanol	16.09±0.5	26.20±0.3	38.15±0.2
		Pet. Ether	13.87±0.8	15.67±0.4	15.12±0.4

Table: 2. Efficacy of different solvent extracts of Root against three Mosquito % of larvicidal Values LC 50 and LC90 values

S.No	Name of Larvicidal	Methanol (% Mortality Rate) LC_{50}	Methanol (% Mortality Rate) LC_{90}	Pet .ether (% Mortality Rate) LC_{50}	Pet .ether (% Mortality Rate) LC_{90}
1	***An. stephensi***	21.32 ppm	79.49ppm	30.07ppm	70.05ppm
2	***Cx. quinquefasciatus***	22.96ppm	83.03ppm	18.22ppm	76.87ppm
3	***Ae. aegypti***	26.70ppm	80.14ppm	17.43ppm	83.14ppm

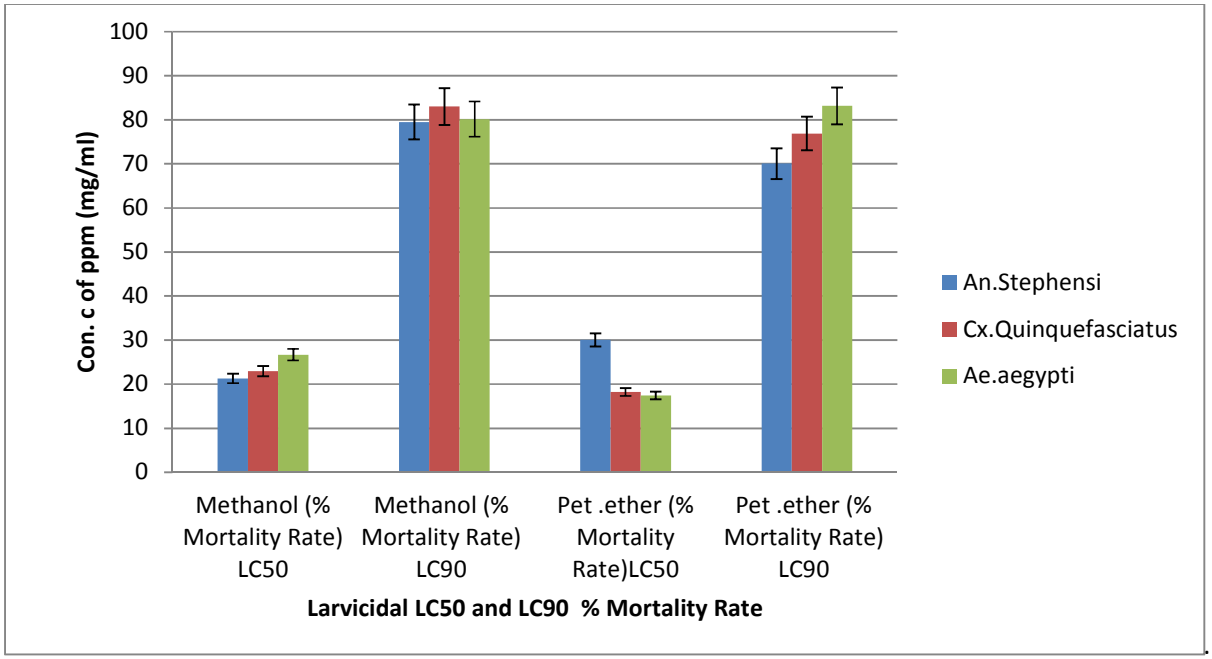

Figure:1. Larvicidal activity of Spaeranthus Indicus Root extract solvents against An. Stephensi, Cx. quinquefasciatus and Ae. Aegypti % of mortality LC_{50} and LC_{90}

CONCLUSION

Further studies are required for the identification of the active ingredients responsible for larvicidal activity. Root extract of *Sphaeranthus indicus* had no toxic action (zero mortality up to 24 hours observation) against non-target organism like Mesocyclops. The larvicidal action of the Root extract of *Sphaeranthus indicus* can be used for control of mosquitoes.

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