



Larvicidal and Pupicidal activities of *Triumfetta pentandra* Plant Extract Against Mosquito Vector of *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*

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ABSTRACTS

Larvicidal and pupicidal activities of plant extract of *Triumfetta pentandra* against *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*. The Plant extract in deferent solvent were prepared various concentrations for 50ppm, 100ppm, 150ppm and 200ppm tested against larvae and pupae of mosquito vector in *A. aegypti*, *A.stephensi* and *Cx. quinquefasciatu*. The maximum larval mortality values recorded in 81.34% of 200ppm ethyl acetate plant extract against *A. aegypti*. Among the 86.54% larval mortality were recorded in *A. stephensi* and *Cx. quinquefasciatus* mosquito maximum larval mortality in 93.44% at 24hours respectively. The maximum pupal mortality values were recorded in 88.31% of 200ppm ethyl acetate plant extract against *A. aegypti*. The 86.54% of pupal mortality values in *A. stephensi* and *Cx. quinquefasciatus* mosquito maximum pupal mortality in 91.64% at 24hours respectively. The future generation mosquitoes control to use for *Triumfetta pentandra* plant properties respectively.

Keywords: *Aedes aegypti*, *Anopheles stephensi*, *Culax quinquefasciatus*, Larvicidal activity, *Triumfetta pentandra* and Pupicidal activity

Introduction

Most important for mosquito vector borne diseases is caused by south East Asian and these insect on increasing the resistance to used present insecticides. Every year estimated at least 500 million of people in the world. They have challenging for control of different stages of mosquito life cycle¹. Mosquito's is medically important insect pests and all over the countries (African and 32 countries to caused 50% malaria diseases) in the world health organization.

Control in mosquito currently to used maximum chemical mosquitocidal properties affected in the problem of toxic, environmentally affected soil, water and plants¹⁻². Alternative search for the mosquito control method in medically important plant compounds or properties. These plants properties to use control in insect pest and then benefits in soil, less toxic, easily decomposed these compounds, only undesirable effects in non target organisms³⁻⁴.

Important plant based on the phytopesticides also reports that medically important plants occurred in primary and secondary metabolisms to produce a variety of therapeutic properties of compounds⁵. The current research to use plants extracts and as alternatively larvicidal, ovicidal and pupicidal because they are contain many phytochemicals only target insect killing of mosquitoes and other un targeted organisms without effect in environment and to be used an alternative to synthetic insecticides. The use of native plant based products to control the population of mosquitoes⁷⁻⁹.

These present study was mosquito control in program to selected species for *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*. Then most of the larvae feed with water food molecules and live in water all instar larvae. Among the selected plant of *Triumfetta pentandra* to available in insect control properties and these plant leaf extract already tested against *Spodoptera litura* and *Helicoverpa armigera* and report also published¹⁰. This study was tested against three different mosquitoes in *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*.

Materials and Methods

In present study, the selected plants were collected kolli hills, Namakkal, Tamilnadu, India and to prepare extract in various solvents like hexane, chloroform, ethyl acetate and water. The crude extracts were stored clean borosil vial at 4⁰c. The selected in different mosquitoes in *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus* were collected and reared in PG and Research department of zoology, Arignar Anna Government Arts College Namakkal, Tamilnadu, India. These laboratory reared larvae were used for larvicidal and pupicidal assay at room temperature 28±2⁰c, RH 75±5%.

Larvicidal bioassay

Larvicidal activity of *Triumfetta pentandra* plant leaf extract in various solvent (hexane, chloroform and ethyl acetate) and various concentrations on 50ppm, 100ppm, 150ppm and 200ppm tested against freshly molted 4th instar larvae of mosquito vector in *A. aegypti*, *A. stephensi* and *Cx. quinquefasciatus*. Twenty five larvae of each mosquito larvae introduced in 500ml plastic cups and filled with 250ml of water and required volume of plant extract were added in plastic cups. The complete experiment allowed after 24hours and observed larval mortality values was recorded and calculated in the formula by using Abbotts⁶

$$\text{corrected larval mortality} = \frac{\text{observed mortality in treatment} - \text{observed mortality in control}}{100 - \text{mortality in control}} \times 100$$

$$\text{Percentage of larval mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times 100$$

Pupicidal bioassay

Pupicidal activity of plant extract was assessed by the standard method as WHO (2005)^{14,15}. Pupicidal activity of *Triumfetta pentandra* plant leaf extract in various solvent (hexane, chloroform and ethyl acetate) and various concentrations on 50ppm, 100ppm, 150ppm and 200ppm tested against pupae of mosquito vector in *A. aegypti*, *A. stephensi* and *Cx. quinquefasciatus*. Twenty five pupae of each mosquito species introduced by 500ml plastic cups and filled with 250ml of water and required volume of plant extract were added in plastic cups. The complete experiment allowed after 48hours and observed pupal mortality values was recorded and calculated in the formula by using Abbotts⁶ and each experiment five replication were maintained.

$$\text{Percentage of larval mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times 100$$

Statistical analysis

Determination of lethal concentration LC₅₀ and LC₉₀ represent by 50 percentage of larval mortality and 90 percentage of larval and pupal mortality on *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*. LC₅₀ and LC₉₀ were calculated along with 95% confidence level by probit analysis using SPSS Software 16.00.

Results and Discussion

Larvicidal activity of *Triumfetta pentandra* plant leaf extracts against *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*.

Larvicidal activity of *Triumfetta pentandra* plant leaf extract in various solvent (hexane, chloroform and ethyl acetate) and various concentrations on 50ppm, 100ppm, 150ppm and 200ppm tested against freshly molted 4th instar larvae of mosquito vector in *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*. These *A. aegypti* larval mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of

Triumfetta pentandra (ethyl acetate) on larval mortality were 33.62, 49.54, 68.63, 81.34 and 87.23% and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then same concentration followed by the chloroform extract against *A. aegypti* larval mortality values in 15.53, 21.34, 30.42 and 41.34% and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then hexane extract against *A. aegypti* larval mortality values in 12.46, 20.28, 33.45 and 48.21 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively. Larvicidal activity of medicinal plant extracts tested against culex pipiens mosquito's by inhibition of enzyme activity in these plant extract maximum percentage larval mortality properties also available¹⁶. Larvicidal activity of *Saracaindica*, *Nyctanthes arbor-tristis*, and *Clitoria ternatea* plant extracts against mosquito vector and larval mortality of three mosquito species and a larvae on morphological changes and physiological activities moreover abnormalities among the larvae is died¹¹.

A. stephensi larval mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of *Triumfetta pentandra* (ethyl acetate) on larval mortality were 31.32, 48.43, 65.63 and 86.54 % and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then same concentration followed by the chloroform extract against *A. stephensi* larval mortality values in 18.57, 26.43, 39.52 and 51.34% and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then hexane extract against *A. stephensi* larval mortality values in 21.63, 32.43, 47.54 and 65.46% and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively.

Cx. quinquefasciatus larval mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of *Triumfetta pentandra* (ethyl acetate) on larval mortality were 41.52, 57.53, 78.33 and 93.44% and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then same concentration followed by the chloroform extract against *Cx. quinquefasciatus* larval mortality values in 19.77, 29.53, 48.34 and 61.63 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then hexane extract against *Cx. quinquefasciatus* larval mortality values in 24.73, 31.42, 48.68 and 67.66 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively. Larvicidal action of ethanolic extracts from fruit endocarps of *Melia azedarach* and *Azadirachta indica* against the dengue mosquito *Aedes aegypti*¹². Mosquitocidal properties of *Solanum trilobatum* L. (Solanaceae) leaf extracts against three important human vector mosquitoes (Diptera: Culicidae)¹³.

Pupicidal activity of *Triumfetta pentandra* plant leaf extract against *Aedes aegypti*, *Anopheles stephensi* and *Culax quinquefasciatus*.

Pupicidal activity of *Triumfetta pentandra* plant leaf extract in various solvent (hexane, chloroform and ethyl acetate) and various concentrations on 50ppm, 100ppm, 150ppm and 200ppm tested against pupae of mosquito vector in *A. aegypti*, *A. stephensi* and *Cx. quinquefasciatus*. These *A. aegypti* pupal mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of *Triumfetta pentandra* (ethyl acetate) on pupal mortality were 33.22, 51.53, 69.23, 88.31 and 20.33% and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095.

then same concentration followed by the chloroform extract against *A. aegypti* pupal mortality values in 20.33, 31.14, 53.45 and 76.43 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then hexane extract against *A. aegypti* pupal mortality values in 16.46, 22.38, 35.43 and 51.31 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively.

The *A. stephensi* pupal mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of *Triumfetta pentandra* (ethyl acetate) on pupal mortality were 37.35, 58.33, 71.26, 97.24 % and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then same concentration followed by the chloroform extract against *A. stephensi* pupal mortality values in 21.23, 30.42, 49.36 and 62.12 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095.

The hexane extract against *A. stephensi* pupal mortality values in 28.21, 41.23, 57.44 and 71.26 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively. These *Cx. quinquefasciatus* pupal mortality were recorded for 50ppm, 100ppm, 150ppm and 200ppm of plant extract of *Triumfetta pentandra* (ethyl acetate) on pupal mortality were 38.56, 55.13, 73.44 and 91.64 % and followed by the values of LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095.

followed by the chloroform extract against *Cx. quinquefasciatus* pupal mortality values in 20.57, 27.16, 47.23 and 68.62 % and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095. then hexane extract against *Cx. quinquefasciatus* pupal mortality values in 21.13, 37.22, 58.38 and 75.36% and the values also recorded in LC_{50} (LCL-UCL), LC_{90} (LCL-UCL) X^2 the values in 1.55 (1.12-191), 5.07 (4.40-6.13) 3.095 at 24hrs respectively. Mosquito fecundity was clearly decreased and infertility was increased by the plant properties of azadirachtin and after treatments of the fourth instar larvae and pupae and behavior activities also extended the duration of larval and pupal stages. These plant properties worked with the pupae and larvae larvicidal, and pupicidal activity of against properties available in *Gliricidia sepium*¹⁷.

Similar results of plant extracts on pupicidal activity was reported by the methanolic extract of *Atlantia monophylla* were used for pupicidal assay with LC₅₀ value of, 0.07, 0.07 and 0.05 (mg/l), respectively, against the pupae of mosquito species¹⁸.

Table 1. Larvicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Aedes aegypti*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	48.21±2.44	206.99 (183.00-248.82)	377.87 (315.36-500.6)	0.070
	150	33.45±3.60			
	100	20.28±6.31			
	50	12.46±5.42			
Chloroform	200	41.34±1.52	243.26 (202.86-340.82)	481.26 (370.94-773.05)	0.078
	150	30.42±5.21			
	100	21.34±2.45			
	50	15.53±2.56			
Ethyl acetate	200	81.34±3.58	98.51 (80.41-113.21)	242.66 (213.66-290.70)	0.094
	150	68.63±5.45			
	100	49.54±3.66			
	50	33.62±5.25			

Each experiment maintained 5 replication and the values on mean and stranded deviation

Table 2. Larvicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Anopheles stephensi*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	65.46±3.65	153.79 (137.38-175.04)	315.71 (270.58-397.03)	0.247
	150	47.54±7.43			
	100	32.43±2.14			
	50	21.63±3.56			
Chloroform	200	51.34±4.22	194.58 (169.50-240.35)	397.57 (322.87-559.22)	0.092
	150	39.52±4.36			
	100	26.43±7.23			
	50	18.57±6.57			
Ethyl acetate	200	86.54±4.74	101.88 (86.91-114.72)	226.72 (202.96-263.57)	1.035
	150	65.63±7.42			
	100	48.43±2.86			
	50	31.32±3.13			

Each experiment maintained 5 replication and the values on mean and stranded deviation

Table 3. Larvicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Culax quinquefasciatus*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	67.66±5.47	149.16 (132.72-169.81)	313.41 (268.28-395.11)	1.355
	150	48.68±4.73			
	100	31.42±4.26			
	50	24.73±5.46			
Chloroform	200	61.63±2.56	160.91 (144.05-183.87)	323.23 (276.43-408.08)	0.354
	150	48.34±2.44			
	100	29.53±3.21			
	50	19.77±6.53			
Ethyl acetate	200	93.44±3.72	75.42 (57.69-88.85)	190.34 (171.51-218.58)	1.243
	150	78.33±4.51			
	100	57.53±1.23			
	50	41.52±6.53			

Each experiment maintained 5 replication and the values on mean and stranded deviation

Table 4. Pupicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Aedes aegypti*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	51.31±4.24	200.23 (175.94-243.22)	385.42 (318.04-522.89)	0.522
	150	35.43±2.40			
	100	22.38±3.35			
	50	16.46±2.41			
Chloroform	200	76.43±5.23	137.87 (125.41-151.51)	259.77 (232.43-302.18)	1.293
	150	53.45±2.41			
	100	31.14±5.25			
	50	20.33±1.31			
Ethyl acetate	200	88.31±4.18	14.80 (79.24-107.63)	216.85 (194.61-250.96)	0.718
	150	69.23±5.45			
	100	51.53±2.45			
	50	33.22±4.21			

Each experiment maintained 5 replication and the values on mean and stranded deviation

Table 5. Pupicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Anopheles stephensi*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	71.26±4.24	126.65 (109.38-144.21)	294.17 (252.22-370.35)	0.030
	150	57.44±3.63			
	100	41.23±2.21			
	50	28.21±4.51			
Chloroform	200	62.12±1.34	158.22 (141.10-181.33)	325.38 (277.11-414.23)	0.448
	150	49.36±3.32			
	100	30.42±1.45			
	50	21.23±4.56			
Ethyl	200	97.24±3.42	79.84	175.61	2.902

acetate	150	78.90±5.14	(66.03-91.01)	(160.27-197.35)	
	100	58.33±4.26			
	50	37.35±4.17			

Each experiment maintained 5 replication and the values on mean and stranded deviation

Table 6. Pupicidal activity of plant extracts of *Triumfetta pentandra* against mosquito vector *Culex quinquefasciatus*

Solvent extract	Concentration (ppm)	Larval mortality	LC ₅₀ (LCL-UCL)	LC ₉₀ (LCL-UCL)	X ²
Hexane	200	75.36±2.17	130.74 (117.61-144.43)	258.69 (230.43-303.28)	0.048
	150	58.38±1.23			
	100	37.22±4.11			
	50	21.13±2.15			
Chloroform	200	68.62±2.21	153.60 (138.98-171.84)	295.66 (258.54-357.95)	1.845
	150	47.23±2.34			
	100	27.16±1.37			
	50	20.57±4.23			
Ethyl acetate	200	91.64±2.12	83.03 (65.88-96.36)	203.09 (182.44-234.58)	1.376
	150	73.44±4.54			
	100	55.13±5.25			
	50	38.56±4.57			

Each experiment maintained 5 replication and the values on mean and stranded deviation

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