

Chemical Constituents and Larvicidal Efficacy of *Melia azedarach* L Leaf Extract against Dengue Vector *Aedes aegypti* L (Diptera : Culicidae)

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ABSTRACT: The acetone leaf extract of *Melia azedarach* L. were extracted with acetone and was tested for larval mortality against I-IV instar larvae and pupae of *Aedes aegypti*. The mortality, LC₅₀ and LC₉₀ values revealed that the IV instar larvae were resist than I, II, III instar larval and pupal stages against the acetone extract of *M. azedarach*. Furthermore the preliminary phytochemical analysis showed the presence of alkaloid, carbohydrate, steroidal glycoside, saponin, tannin, phenol, chlorogenic acid, flavonoids and tannins. In addition 28 phytochemical constituents were listed with different retention time and molecular weight by GC-MS.

KEYWORDS: Larvicidal activity, *Melia azedarach*, LC₅₀, GC-MS.

I. INTRODUCTION

Vector-borne diseases are infectious diseases that are transmitted by organisms that include insects, snails and rodents. These diseases represent a heavy burden on people, their families and communities in developing countries. Mosquitoes transmit more diseases than any other group of arthropods and reported to affect millions of people throughout the world [1]. WHO (year) declared that mosquito is the “number one public enemy” because the mosquito is the principal vector of many of the vector-borne diseases affecting human beings and other animals. Mosquitoes constitute a major public health problem as vector of serious human diseases comprising approximately 3,500 species of mosquitoes are grouped into 41 genera and found beyond the tropical and subtropical region of the world with they are classically associated. Several species belong to genera *Aedes*, *Anopheles* and *Culex* are vectors for the pathogen of various diseases like dengue, chikungunya, malaria, yellow fever, West Nile Virus, Japanese encephalitis and filariasis [2].

A. aegypti mosquitoes are domestic in their habitats and found breeding almost entirely in the vicinity of dwellings and often found to breed profusely in rain water collections in discarded tires, tins, bottles and also in water storage containers such as cisterns, barrels, pots etc [3]. Female *A. aegypti* mosquitoes suck blood from vertebrates to obtain the necessary nutrition to lay their eggs in turn injected the pathogens into the host animal. *Aedes aegypti* is considered to be a vector of dengue fever, a disease endemic to South East Asia, Africa and the Americas [4]. In the absence of an effective vaccine/antiviral therapy, vector control is at present the only way to limit these mosquito-borne

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diseases [5]. Conventional pesticides such as malathian, DDT and pyrethroides that are generally used for mosquito control are known to cause the problems such as environmental effects, pollution, residual problems and resistance of mosquito species. This has necessitated the need for search and development of environmentally safer, low cost, indigenous methods for vector control. During the last decade, various studies on natural plant products against mosquito vectors indicate them as possible alternatives to synthetic chemical insecticides [6].

India has rich aromatic plant diversity with potential for development of natural insecticides and for control of mosquito and other pests. The Meliaceae plant family is known to contain a variety of compounds, which show insecticidal, antifeedent, growth regulating and development modifying properties [7-11]. *Melia azedarach* L. (Sapindales: Meliaceae), known as Chinaberry or Persian lilac tree, is a deciduous tree native to northwestern India and has long been recognized for its insecticidal properties but yet to be properly analyzed. This tree typically grows in the tropical and subtropical parts of Asia, but nowadays it is also cultivated in other warm regions of the world because of its considerable climatic tolerance. In addition to application as general toxicant against mosquito larvae, botanical insecticides also have potential uses as growth and reproduction inhibitors, repellents, ovicidal and oviposition deterrents [12]. The present investigation was undertaken to study the effect of *Melia azedarach* against the aquatic stages of *A. aegypti* and the phytochemicals which are responsible for larvicidal activity were evaluated by GC-MS.

II. MATERIALS AND METHODS

Eggs of *A. aegypti* were collected from the disease free standardized colony at National Communicable Diseases (NICD), Tamil Nadu and it was maintained in sterilized containers with unchlorinated tap water. The colony from this culture was used for further studies. The leaves of *M. azedarach* were collected from the field and chopped into small pieces with the help of a knife and dried under shade at room temperature ($27 \pm 2^\circ\text{C}$) for about 20 days. The completely dried leaves were powdered with an electrical blender and sieved to get fine powder. The powder was stored in airtight containers for further analysis. The plant powder was extracted with acetone by using Soxhlet apparatus for 8 hours. The extracts were concentrated using a vacuum evaporator at 45°C under low pressure. After complete evaporation of the solvent, the concentrated extract was collected and stored in glass vials at 4°C in refrigerator for further experiments.

One gram of concentrated extract was dissolved in 100 ml of the acetone, kept as a stock solution. This stock solution was used to prepare the desired concentrations of the extract for exposure of the mosquito larvae. The larvicidal bioassay was done using standard WHO Protocols [13]. Mortality in control was negligible in calculation. The percentage of larval and pupal mortality was corrected by Abbot's formula [14]. LC_{50} , LC_{90} were calculated from toxicity data by using probit analysis [15]. The extracts were subjected to preliminary phytochemicals tests to determine the groups of secondary metabolites present in the plant materials as follows alkaloids, carbohydrate, steroidal glycosides, saponin, tannin, phenol, chlorogenic acid, flavonoids, coumarin, anthocyanin and terpenoid [16].

PHYTOCHEMICAL ANALYSIS BY GC-MS (GAS CHROMATOGRAPHY-MASS SPECTROMETRY)

Plant extract was dissolved in acetone and analyzed using GC-MS SHIMADZUQP2010 instrument with GC-MS solution version 2.53SU3 software. The sample was analyzed with Elute DB-5M column. Initially oven temperature was maintained at 70°C for 2.0 min and the temperature was gradually increased up to 300°C at 10.0/35.0 min and 4.0 L of sample was injected for analysis. Helium gas 99.995% of purity was used as a carrier gas as well as eluent. The flow rate of helium gas was set to 1.5 mL/min. The sample injector temperature was maintained at 260°C a split ratio is 20 throughout the experiment periods. The ionization mass spectroscopic analysis was done with 70 eV. The mass spectrum was recorded across the range 40 1000 m/z for the duration of 35 minutes. Identification of components was based on comparison of their mass spectra. As the compounds were separated, they eluted from the column and entered a detector which was capable of creating an electronic signal. As individual compounds eluted from the Gas chromatographic column, they entered the electron ionization detector where they were bombarded with a stream of electrons causing them to break apart into fragments. The fragments were actually charged ions with a certain mass.

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III. RESULTS AND DISCUSSION

Natural pesticides, especially those derived from plants are more promising in vector control. Aromatic plants and their essential oils are very important sources of many compounds that are used in different respects. In the present study the leaf extract of *Melia azedarach* was extracted with acetone and evaluated for larvicidal effect on *A. aegypti*. Bioassay tests were conducted to find out the effect of *Melia azedarach* on the larvae (I, II, III and IV) and pupae of *A. aegypti* were treated with different concentrations (300-700ppm) for 24hours (Fig.1). In the present investigation the percentage of larvicidal and pupicidal activity was inversely proportional to the concentration of the extract. LC₅₀ values along with their 95% confidence limits, the regression equations and corresponding χ^2 values of larvicidal bioassays of the experimental plants against *A. aegypti* larvae are presented in Table 1. The larvicidal activity was noticed in the order of I>II>III>Pupae>IV instar larvae respectively. The observed LC₅₀ and LC₉₀ values of acetone extract of *Melia azedarach* were 488.945, 657.852 ppm for I-instar larvae; 515.360, 716.474 ppm for II-instar larvae; 531.397, 657.852 ppm for III-instar larvae; 587.832, 805.308 ppm for IV-instar larvae and 557.307, 781.159 ppm for pupae respectively.

Fig.1. Larvicidal and pupicidal effect of *Melia azedarach* leaf extract against *A. aegypti*

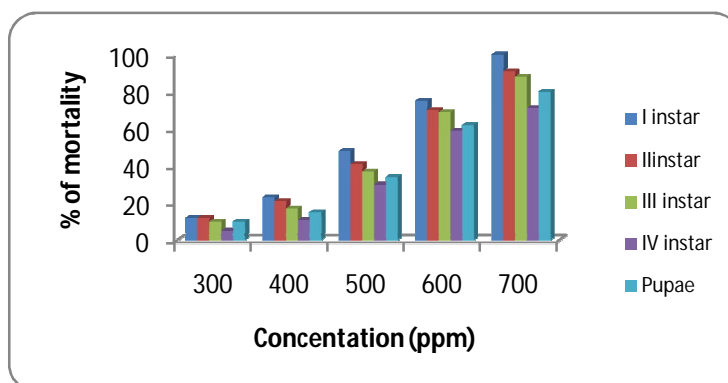


Table.1. LC₅₀ and LC₉₀/ 24 hours values of *Melia azedarach* leaf extract on developmental stages of *A. aegypti*.

Larval and pupal stages	LC ₅₀ (ppm) (LCL-UCL)	LC ₉₀ (ppm) (LCL-UCL)	Regression equation	Chi-Square (χ^2)
I – Instar	488.945 (426.424-551.872)	657.852 (586.021-824.597)	Y=-3.710+0.286X	11.502
II – Instar	515.360 (495.514-535.723)	716.474 (682.389-761.474)	Y=-3.284+0.265X	3.725
III – Instar	531.391 (511.610-552.070)	657.852 (586.021-824.597)	Y=-3.710+0.291X	4.314
IV – Instar	587.832 (565.723-612.391)	805.308 (696.012-777.030)	Y=-3.464+0.287X	2.751
Pupae	557.307 (535.447-581.200)	781.159 (738.699-838.776)	Y=-3.191+0.265X	2.790

LCL- Lower Confidential Limit; UCL- Upper Confidential Limit

The results of entomotoxicity of *M. azedarach* acetone extract were comparable with earlier reports. Coria *et al.* [17] proved that ethanolic leaf extract of *M. azedarach* is a strong larvicide on *A. aegypti* and all tested

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larvae died before pupation and significantly delayed development time. The Meliaceae plant family is used as growth regulator against many insect pests [18-24] (Table.4). Exposure of *Anopheles stephensi* larvae to sub-lethal doses of neem leaves extract in the laboratory prolonged larval development, reduced pupal weight and oviposition [25, 26]. In the field, delayed phenology of surviving larvae and reduced pupal weight are common occurrence after treatment with neem [27]. Undoubtedly, plant derived toxicants are valuable sources of potential insecticides. These and other naturally occurring insecticides may play a more prominent role in mosquito control programs [28].

In the present investigation the acetone extract of *Melia azedarach* was subjected to preliminary phytochemical analysis. The result showed the presence of alkaloid, glycosides, tannin, phenol, chlorogenic acid, flavonoid and terpenoid, carbohydrate, saponin, coumarin, anthocyanin were absent in acetone leaf extract of *Melia azedarach* (Table.3). In addition 28 phytochemical components were listed by GC-MS with different molecular weight and retention time (Table.3; Fig.2). Roots of the plant showed the presence of terpenoids and limonoids like 6-Acetoxy-7 α -hydroxy-3-oxo-14 β , 15 β -epoxymeliac-1.5-diene, 6-Acetoxy-3 β -hydroxy-7-oxo-14 β , 15 β -epoxymeliac-1,5-diene-3-0- β -D-glucopyranoside, Azecin-1, Azecin-2, Azecin-3, Azecin-4. Roots also contain flavanoids like Apigenin-5-O- β -D-galactopyranoside; Steroids like 24-Methylenecydoartanol, 24-Methylenecydoartanone, 4- Stigmastan-3-one, 4-Campestene-3-one β -Sitosterol, β -Sitosterol-B-D-glucoside; Acids like Trans-cinnamic acid, Vanillic acid (4-Hydroxy-3-methoxy benzoic acid. Stem bark contain terpenoids and limonoids like 7 α -Acetoxy-14 β , 15 β -epoxygedunanol- ene-3-O- β -D- glucopyranoside, 12-Acetoxyamoorastatin, Amoorastatin, Fraxinellone, 12-Hydroxyamoorastatin, 3-Hydroxy eupha-7,24-diene-21,16-olide, Kulactone, Kulinone, Kulolactone, Methylkulonate, α -Pinene, β -Pinene, α -Terpinene, α -Terpineol. They also contain flavonoids like 4', 5-Dihydroxy flavone-7-O-u-L-rhamnopyranosyl-(1-4)- β -D-glucopyranoside, Anthraquinone like 1,3,5,8-Tetrahydroxy-2-methyl anthraquinone; 8-Me ether, 3-O- α -L-rhamnopyranoside, 1,5-dihydroxy-8-methoxy-2-methyl-anthraquinone- 3-O- α -L-rhamnopyranoside, 1,8-dihydroxy-2-methyl anthraquinone-3-O- β -D, galactopyranoside. Stem wood contain terpenoids and limonoids like Melianin-A, Melianin-B Seeds contain terpenoids and limonoids like 3 β , 7 α -Dihydroxy-21 ,23-epoxy-apotirucalla-14,24-diene-21-one, Meldenin. They also contain steroids like Campesterol, Cholesterol, Stigmasterol and acids like Linoleic acid, Linolenic acid, Oleic acid (9-octadecenoic acid) [29].

Many triterpenoids present in plants at the *Meliaceae* family are described as showing insecticidal activity. Bohnenstengel *et al.* [30] reported the isolation of three meliacarpin derivatives from *M. azedarach* leaves. The activity of meliacarpin derivatives were tested on larvae of the polyphagous pest insect *Spodoptera littoralis* by incorporating it into artificial diet to larvae in a chronic feeding bioassay. *M. azedarach* insecticidal activity was comparable with the well known lipopesticide azadirachtin found in neem tree. The crude ethanolic seed extract of Brazilian *M. azedarach* showed both phagoinhibitory and antimoulting activities to the homophagous insect *Rhynchius prolixes*, one of the vectors of changes disease [31]. In the phytochemistry analysis of *M. azedarach* ethanol extracts it related the presence of triterpenoids and steroids, alkaloids and condensed tannins. These compounds are able to inhibit development or insect feeding and also display ovicidal and insecticidal activity in insect [32]. The effect of fruit extract from *M. azedarach* on juvenile hormone titer and protein content in the hemolymph of two species of lepidopteran larvae was investigated [33] which indicated a promising future of *M. azedarach* fruit extract as good stomach poison insecticide for the insect pest. Several investigators have concentrated on constituents of *M. azedarach* as a feasible biopesticides against plant sap sucking insect such as Aphids and whitefly [34].

Undoubtedly, plant derived toxicants are valuable source of potential insecticides. These and other naturally occurring insecticide play more prominent role in mosquito control programs in future. The result of this study would concentration to a great reduction in the application of synthetic insecticides, which in turn increase the opportunity for natural control of various medicinally important pest by botanical pesticides. Since these are often active against a limited number of species including specific target insect, less expensive, easily biodegradable to non toxic products and potentially suitable for use in mosquito control program [35]. This could lead to development of new classes of possible safer insect control agents plant allelic chemicals might be quite useful in increasing the efficacy of biological control agents because plants



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produce a large variety of compounds that increase their resistance to insect attack [25, 36-37]. The intensive use of pesticides produces side effects on many beneficial insect and also pose both acute and chronic effect to the mosquitoes [38]. Recently, bio pesticides with plant origins are given transmitted vectors, based on the fact that compounds of plant origin are safer in usage, without toxic properties and also leave no scum in the environment [20, 37, 39]. The present study clearly proved efficacy of *M. azedarach* extract on larvae, and pupae of *A. aegypti* further studies such as mode of action, synergism with the biocides under field conditions are needed.

Table.4. Insecticidal activity of Meliaceae plant species against insect pests.

S. No	Plant species	Plant parts used	Solvent used for extraction	Target mosquito species	Lethal concentration/biological activity	References
1.	<i>Azadirachta indica</i>	Leaf	Water Methyl-tert-butylether/water	<i>Ae. Aegypti</i>	80T5% pupal– adult intermediates mortality and 3% pupal – adult intermediates exhibited protruding wing-sheath and mouthparts	Zebitz (1984)[40]
2.	<i>Melia azadirachta</i>	Different parts	Steam distillation	<i>An. Stephensi</i>	Larvicidal activity with the LC50 88.5	Kumar and Dutta (1987) [41]
3.	<i>Melia volkensii</i>	Fruit	Hexane: Ethyl aetate fraction (1:1)	<i>Ae. Aegypti</i>	100% mortality during molting and 100% reduced emergence	Mwangi and Rembold (1988)[42]
4.	<i>Melia volkensii</i>	Fruit kernel	Methanol: water (80:20)	<i>An. arabiensis</i>	100% reduced emergence and 100% Mortality	Mwangi and Mukiyama (1988) [43]
5.	<i>Melia azedarach</i>	Seed	Acetone	<i>Cx. pipiens molestus</i>	Larvicidal activity, 94% reduction in adult emergence	Al-Sharook <i>et al.</i> (1991) [44]
6.	<i>Azadirachto indica</i> <i>Melia azedarach</i>	Neem oil	Oils from crushed seeds	<i>Ae. aegypti</i> <i>Cx. quinquefasciatus</i>	Treated larvae developed to pupae but failed to emerge	Sinniah <i>et al.</i> (1994)[45]
7.	<i>Azadirachta indica</i>	Leaf	Water	<i>Ae. Aegypti</i> <i>Cx. uinquefasciatus</i>	Larvicidal activity	Monzon <i>et al.</i> (1994)[96]
8.	<i>Azadirachto indica</i>	Seeds	Oils from crushed seeds	<i>An. stephensi</i>	No pupation occurred and growth completely inhibited, 80% reduction in emergence	Murugan <i>et al.</i> , 1996 [25]
9.	<i>Azadirachta indica</i>	Azad wettable powder WP10, Azad emulsifiable concentrate EC4.5, Technically pure azadirachtin	-	<i>Cx. tarsalis</i> <i>x. quinquefasciatus</i>	100% mortality against freshly laid eggs after 4 h, 90–100% mortality against freshly laid eggs after 4 h 97–99% mortality against freshly laid eggs after 4 h	Su and Mulla (1998) [26]
10.	<i>Khaya senegalensis</i>	Leaf	Hexane	<i>Cx. annulirostris</i>	LC50 value was 5.86 mg/l	Shaan <i>et al</i> (2005) [47]
11.	<i>Melia azedarach</i>	Leaf, Seed	Methanol	<i>An. stephensi</i>	The extract showed strong larvicidal, pupicidal, adulticidal, antiovipositional activity, repellency and biting deterrence.	Senthil Nathan <i>et al</i> (2005) [38]
12.	<i>Dysoxylum malabaricum</i>	Leaf	Methanol	<i>An. Stephensi</i>	4% concentration of leaf extract killed more than 97% of first instars, 92% of fifth instars, 93% of pupae and 91% of adults	Senthil Nathan <i>et al</i> (2006) [11]

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13.	<i>Dysoxylum Malabaricum</i>	Leaf	Ethyl acetate	<i>An.stephensi</i>	Fourth instar were more susceptible to the extract when compared with pupae and Adults	Senthil Nathan <i>et al</i> (2008) [48]
14.	<i>Azadirachta indica</i>	Azadirachtin	Purified compound	<i>C. pipiens</i>	Larvicidal, Fecundity, sterility, larval pupal duration effect was noticed with Azadirachtin	Alouani <i>et al.</i> , (2009)[49]
15.	<i>Azadirechta indica</i>	Leaf	Ethanol	<i>Ae. Aegypti</i>	LC50 value is 8.32 mg/ml	Mgbemena (2010)[50]
16.	<i>Melia azedarach</i>	Seed	Direct effect	<i>An. arabiensis</i>	Larvicidal activity by seed powder was added to the larval containers at three treatment levels: 5 g m-2, 10 g m-2 and 20 g m-2, with 100 individual larvae	Ryan E Trudel and Arne Bomblies, (2011) [51]
17.	<i>Melia azedarach</i>	Leaf and fruit	80% ethanol	<i>An. stephensi</i> , <i>Cu.quinquefasciatus</i> and <i>A. aegypti</i>	Larval mortality was noticed against i-IV instar larvae of three mosquito species	Selvaraj and Mosses, (2011)[52]
18.	<i>Azadirachta indica</i>	Leaf	Aqueous	<i>Cu. pipiens fatigans</i>	Larval mortality and ecdysis inhibition effect were noticed	Misbah Rashid and Aftab Ahmad, (2013) [53]
19.	<i>Azadirachta indica</i> <i>Melia dubia</i>	Leaf	Petroleum ether, ethyl acetate, ethano, water	<i>Cu.quinquefasciatus.</i>	Larval mortality was observed at the concentration of 250- 1000ppm	Narendhiran <i>et al.</i> , 2014 [54]
20.	<i>Melia azedarach</i>	Leaf	Acetone, Methanol, Ethanol, Ethyl acetate, and Chloroform	<i>Cu.quinquefasciatus.</i>	Larvicidal property and analysis of secondary metabolites	Ravichandran <i>et al.</i> , 2014 [55]
21.	<i>Melia azedarach</i>	Fruits	Hexane and methanol	<i>Spilosoma obliqua</i> (Walker)	Insecticidal and antifeedant activity	Tarkeshwar <i>et al.</i> , 2014 [56]

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**Table 2: Preliminary phytochemicals analysis of acetone leaf extract in
*M. azedarach***

S. No	Phytochemical Constituents	Name of the Test	Plant extract
1	Alkaloid	Mayer's test	+
		Dragendroff's test	+
		Wagner Test	+
2	Carbohydrate	Molish Test	+
		Fehling Test	-
		Benedicts Test	-
3	Steroidal Glycosides	Liebermann's test	+
		Salkowaski test	+
4	Saponin	Foam Test	-
5	Tannin	Lead Acetate	+
6	Phenol	Phenol reagent	+
7	Chlorogenic acid	Ammonia test	+
8	Flavonoids	Ammonia test	+
9	Coumarin	Sodium chloride test	-
10	Anthocyanin	H ₂ SO ₄ test	-
11	Terpenoid	Borntrager's test	+

+ Present of compounds - Absent of compounds

Table : 3. GC-MS Analysis acetone leaf extract of *M. azedarach*

Peak No	R.Time	I. Time	F.Time	Area%	Height%	A/H	Name of the chemical constituents
1	9.808	9.650	9.808	0.20	0.00	3.34	Carbonic acid, ethyl-,methyl ester \$\$ Ethoxya
2	13.295	13.225	13.383	2.22	3.53	3.48	3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris
3	15.218	15.158	15.292	1.48	2.43	3.37	1,2-Benzenedicarboxylic acid, Die
4	15.977	15.925	16.033	1.02	2.46	2.31	Benzeneacetic acid, Alpha., 3,4-Tri
5	16.477	16.417	16.542	0.58	0.99	3.21	sulfurous acid, cyclohexylmethyl heptyl ester
6	16.970	16.875	17.050	0.47	0.78	3.39	4-Undecanol, 7-ethyl-2-methyl-\$
7	18.058	18.017	18.108	0.68	1.72	2.21	Heptasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13
8	18.346	18.292	18.392	3.10	7.41	2.32	2-hexadecen-1-ol, 3,7,11,15-tetrame
9	18.445	18.392	18.500	0.99	1.83	3.00	2-Pentadecanone, 6,10,14-trimethyl-\$ hexal
10	18.640	18.500	18.700	0.98	1.80	3.03	3,7,11,15-Tetramethyl-2-hexadecen-1-ol\$\$2-
11	18.858	18.700	18.908	1.86	3.57	2.88	Cyclopropanenonanoic acid, 2-[(2-butylcyclop
12	19.108	19.000	19.250	4.36	2.19	11.02	1,6,10,14,18,22-Tetracosahexaen-3-ol, 2,6,10,
13	19.355	19.250	19.442	1.38	1.26	6.06	cyclopentanetridecanoic acis, M
14	19.752	19.683	19.900	13.72	16.13	4.72	n-Hexadecanoic acid \$\$ Hexadecanoic acid \$\$
15	19.925	19.900	19.975	1.24	1.99	3.44	1,2-Benzenedicarboxylic acid, dipropyl ester \$
16	21.400	21.283	21.558	10.10	15.50	3.61	2-hexadecen-1-OL,3,7.11.15-TETRAME
17	21.701	21.558	21.792	9.56	6.14	8.63	3-Tetradecyn-1-ol
18	21.838	21.792	22.017	12.28	8.57	7.95	Octadecanoic acid \$\$ Stearic acid \$\$ n-Octadecanic
19	22.125	22.017	22.183	6.31	3.76	9.30	7-Hexadecenal, (Z) -\$ (Z) -7- Hexadecenal \$\$
20	22.247	22.183	22.425	8.13	3.47	12.98	Ergost-25-ebe-3,5,6,12-tetrol, (3.beta., 5.alpha.
21	22.490	22.425	22.642	5.21	2.76	10.49	5,5-Diethylpentadecane
22	22.778	22.642	22.833	3.02	2.37	7.08	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13
23	22.959	22.892	23.008	1.31	1.62	4.50	Chlorfenapyr \$\$ 4-Bromo-2-(4-chlorophenyl)-
24	24.436	24.250	24.500	1.83	1.51	6.72	Silicone oil \$\$ silikonfett SE30 (GF
25	25.853	25.800	25.925	1.62	1.73	5.22	Eicosane \$\$ n-Eicosane \$\$ Icosane # \$\$ n-Icosane
26	26.602	26.542	26.717	1.40	1.64	4.75	Hexasiloxane, tetradecamethyl-\$ Tetradecan
27	29.419	29.217	29.617	3.38	1.29	14.57	2-Thiopheneacetic acid, octyl ester \$\$ Octyl 2
28	29.865	29.775	29.967	1.55	1.57	5.49	Tetrapentacontane

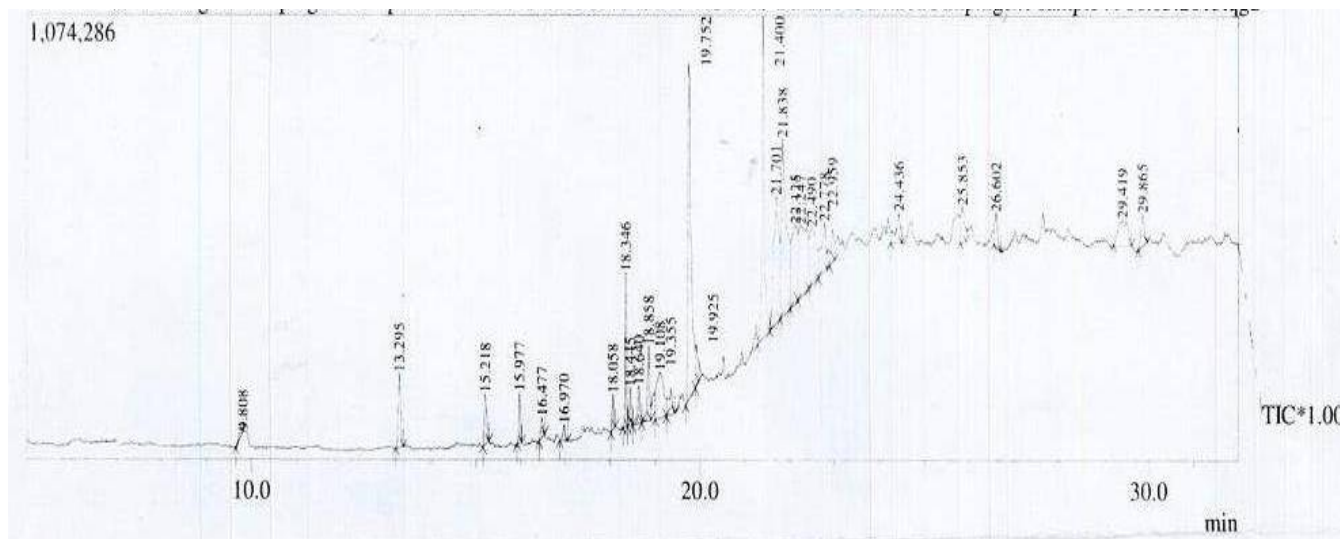


Fig. 2. Gas Chromatogram of Acetone leaf extract of *M. azedarach*

CONCLUSION

India is endemic to mosquito-borne diseases due to favorable ecological conditions. Dengue fever (DF), dengue hemorrhagic fever and dengue shock syndrome are public health problems in Tamil Nadu, South India. Dengue fever is caused by four distinct but closely related dengue viruses called serotypes (DEN-1, DEN-2, DEN-3, and DEN-4) and transmitted to humans through the bites of infected mosquitoes (*Aedes aegypti* is the primary vector). *Aedes aegypti* (L) a vector of dengue and *Chickungunya* is widely distributed in the tropical and subtropical zones. There is no vaccine to prevent mosquito borne diseases, so vector control is the most commonly chosen solution available for reducing morbidity. There are many methods used for mosquito control depending on the station, source reduction, biocontrol, larviciding (control of larvae) and adulticiding (control of adults). Mosquitoes in the larval stage are attractive targets for pesticides because mosquitoes breed in water and thus it is easy to control them in this habit. Among the various control measures for mosquitoes, the synthetic insecticide is still the most convenient and indispensable method all over the world. In early historical time man used plant extracts and concentrated compounds to control certain pests and disease causing insects. Plants are rich source of bioactive organic chemicals and synthesize a number of secondary metabolites that serve as insecticides, antifeedent, oviposition deterrents, adulticides, repellents, growth inhibitors. Many plant extracts have been reported to suppress mosquito larval populations at high concentrations and suggested to be advantageous for field use in mosquito control programmes. In the present study acetone leaf extract of *M. azedarach* possess the larvicidal activity against the dengue vector *A. aegypti* with various concentrations. Compared to previous results the *M. azedarach* plant extract and plant parts exhibit wide range of insecticidal activity against different species of insects. The phytochemicals which are present in the acetone extract of *M. azedarach* may individually or synergistically possess the larvicidal activity against the developmental stages of *A. aegypti*. The phytochemicals responsible for larvicidal activity were documented by Gas Chromatography Mass Spectrometry.

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