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Mynumathi Maragatham
Department of Microbiology,
Dr. N.G.P. Arts and Science
College, Coimbatore,
Tamil Nadu, India

Devakumar Joseph
Department of Microbiology,
Dr. N.G.P. Arts and Science
College, Coimbatore,
Tamil Nadu, India

Larvicidal evaluation of aged and fresh leaf extract of *Solanum lycopersicum esculentum*

Mynumathi Maragatham and Devakumar Joseph

Abstract

Aim: Analysis as a mosquito repellent property of *Solanum lycopersicum* leaf extract on the larva of different mosquito species.

Methodology: The plant sample was collected, dried, ground and the crude extract was prepared by soxhlet apparatus using hydroethanol (1:2) as a solvent. Stock solutions were prepared with aged and fresh crude leaf extract in various concentrations such as 50, 100,150, 200, 250 ppm from the stock and mortality of larva were observed within 24 hours.

Result: Complete mortality was observed in 200 ppm within 18-19 hours. The result of present study reveals that, *Solanum lycopersicum esculentum* crude leaf extract to assassination of mosquitos with a lower amount of plant extract.

Keywords: *Solanum lycopersicum essculantum* leaf extract, mosquito repellent, larvicidal activity, mosquito species

1. Introduction

In the earth there are about ca 374,000 number of accepted plant species, approximately 308,312 are vascular plants, in 295,383 of flowering plants, are present^[1]. In which 90% are considered as medicinally valuable. Various Phytochemicals, bioactive compounds (alkaloids, flavonoids, steroids, phenols etc) are present in all parts of plants^[2]. These reveal a potential effect on pathogens, which leads to the production of antibiotics and various drugs in the treatment of dreadful diseases in pharmaceutical interest^[3]. *Solanum lycopersicum essculantum* (Tomato) naturally contains important Phytochemicals, especially the leaves contain glycoalkaloids (Tomatine, α -solanine) phenols, flavonoids^[4] in elevated level. Even though it considered as a poison upon human consumption in higher concentration, Which possesses antimicrobial, antifungal, and insecticidal activity^[5]. From ancient days (2600) B.C) numerous drugs were created, utilized and acting as a sole source from plants and derivatives of plants in various countries of the world against a minor to major illness and diseases^[6]. All kind of plants have multiple metabolites with various applications on causatives of human and animal disease, those are preferred for protection as well as curing without side-effects. Especially on mosquito eradication process most plant such as *eucalyptus spp.*, *Ocimum spp.*, and *Cymbopogon spp.*, are mostly cited for the essential oil extraction^[7]. People throughout the world reported with Insect-borne diseases which are several million dead and hundreds of million cases per year of which most important insect is mosquito which causes millions of death every year^[8]. In 2015, 43000 deaths occurred by a malarial parasitic infection which was transmitted by Anopheles mosquito species^[9]. Similarly, chikungunya, zika virus, dengue, west Nile virus disease are caused by *Aedes*, *Culex*, mosquito spp. with sever rate of mortality globally. WHO reported that vector-borne diseases account for over 17% of all infectious disease worldwide^[10]. Control of mosquito-spread is concerned widely by way of synthetic insecticides, mosquito repellents such as N, N- dimethyl phthalate (DMP), diethyl mandelic acid amide (DEM) as well as plant borne molecules^[11]. A Recently novel method of mosquito control was performed in WBF of the larvae and adult mosquitoes of *Aedes aegypti* with the parameters such as temperature, body size, age^[12]. Though numerous strategies coined to silence the mosquito-borne diseases, upon all the products with Molecules derived from plant metabolites active and effective against mosquitoes in minimum concentrations (parts per million), also being a natural source to produce products in vast

Corresponding Author:
Devakumar Joseph
Department of Microbiology,
Dr. N.G.P. Arts and Science
College, Coimbatore,
Tamil Nadu, India

amount with low investment [13]. In some cases, environmental management and control of mosquito larvae were performed by exposing larvae into fish tanks and consumption rate observed upto 93% in a short duration which revealed the ability of certain fish types to eliminate the mosquito species [14]. To control Malaria causing vector were treated with light spectrum in different interval times and motility were determined in order to conclude the efficacy of light rays on the mosquito larvae also act as a control measure for the mosquito diseases [15]. Even though various measures, methods, experiments performed against the mosquito borne diseases those are all not gave satisfactory outcome and prevention. Usually (*Solanum lycopersicum esculantum*) leaves are cropped to waste at end of harvesting of tomato. Because of stability under any environmental conditions, it can be brought in to play for 2-3 years. Extract of this plant leaves may be used along with preservatives may bring the eradication of mosquitos, which is the major vector in causing highly contagious diseases in humans. With this above information, the present study was aimed to evaluate the effect of (*Solanum lycopersicum esculantum*) leaf extract on various mosquito spp.

2. Materials and methods

2.1 Plant Sample collection

The plant leaves of *Solanum lycopersicum esculantum* were collected from a garden, Coimbatore in April. Collected plant material was identified and authenticated (BSI/SRC/5/23/2018/Tech./1508) at Botanical Survey of India (South Zone) Coimbatore and the voucher specimen was deposited in the Department of Microbiology, Dr. N.G.P. Arts and Science College, (autonomous) Coimbatore.

2.2 Preparation of plant extract

Dried plant leaves are minced to fine quality, 10 gram were weighted and added with 100ml of hydroethanolic prepared in 2:1 Ratio. Then it was extracted by (soxhlet apparatus) hot continuous extraction at 60 °C for 4 hours [16]. By the completion of the process 50ml of the extract was obtained. The crude extract was concentrated by rotatory vacuum evaporator and stored at 4 °C for further use.

2.3 Collection, culture and identification of Larva

The larva was collected from the drainage at Dr. N.G.P Arts and Science College, kalappatti Road, Coimbatore, Tamil Nadu, India. Instantly transported to a laboratory in a sterile plastic container covered with aluminium sheet, and species wise larva was selected and segregated by using a microscope. The collected larva was transferred to dechlorinated water then, cultured in plastic containers fed with brewer's yeast, biscuit powder as a diet [17]. Recommended humidity, temperature and atmospheric condition were maintained to identify by observing their morphology, structure, appearance and motility under a microscope using 4X, 10X objectives [18].

2.4 Evaluation of larvicidal activity

The larvicidal activity of *Solanum lycopersicum esculantum* crude leaf extract was evaluated [19]. A stock solution was prepared from both aged and fresh leaf extracts by, 0.1gm of plant extract added with 10 ml of DMSO followed by, 90ml of distilled water was added. This was serially diluted and various concentrations were made at

50,100,150,200, 250 ppm in 200ml chlorinated distilled water [19]. Dilutions were formulated with 2ml of glycerine and 3ml of rose water. Six to seven larvae of *Culex* and *Aedes* sp was exposed to a wide range of test concentrations and control. The mortality rate was observed up to 24 hours at regular intervals. Mortality range was calculated using standard formula [20] and the results were interpreted.

Formula

$$\text{Percentage of mortality} = \frac{\text{Number of died larva}}{\text{number of larva introduced}} \times 100$$

$$\text{Control mortality} = \frac{1-n \text{ in T after treatment}}{n \text{ int C after treatment}} \times 100$$

Where, n is the number of larvae, T: treated, and C: control

3. Results

The microscopic observation of collected larva samples was identified by their morphological characteristics such as head, body, tail, gills and brush. Based on these features collected larvae were identified as *Culex* sp, *Aedes* sp of mosquitos. These are exposed to *Solanum lycopersicum esculantum* leaves extract. Larvicidal activity was assessed with aged and freshly prepared crude extract, along with preservatives and cologne in various concentrations from 50-250ppm showed high mortality within 18-19 hours and results were interpreted (Table1-3) using mortality range (low, minimum, maximum, very high). This is calculated using formula from the data obtained as, number of larvae died and survived after the incubation period in each concentration of both extracts as well as in control. Compare with other concentrations Mortality range occurred in 200ppm, 250 ppm concentrations were very high in aged and freshly prepared extracts along with preservative, cologne. Which showing a level of sensitivity of mosquito larva to plant extract. The projected output of this work will be useful for the development of repellent products from *Solanum lycopersicum esculantum* leaves extract.

Table 1: Effect of aged *Solanum lycopersicum esculantum* leaf extract on *Culex* and *Aedes* species

S. No	Concentration (ppm)	Mortality Range	Mortality (%)
1	50	Low	42.85
2	100	Minimum	57.14
3	150	Maximum	85.71
4	200	Maximum	85.71
5	250	Very high	100
6	50-250(c)	Nil	0

Table 2: Effect of fresh *Solanum lycopersicum esculantum* leaf extract on *Culex* and *Aedes* species

S. No	Concentrations (ppm)	Mortality Range	Mortality (%)
1	50	Minimum	66.6
2	100	Maximum	71.42
3	150	Maximum	85.71
4	200	Very high	100
5	250	Very high	100
6	50-250 (c)	Nil	0

Table 3: Effect of Formulated extract *Solanum lycopersicum esculentum* on *Culex* and *Aedes* species

S. No	Concentrations (ppm)	Mortality Range	Mortality (%)
1	50	Minimum	60
2	100	Average	70
3	150	Maximum	90
4	200	Very high	100
5	250	Very high	100
6	50-250 (c)	Nil	0

ppm- parts per million C- Control

4. Discussion

Upon the addition of very low concentrations of the leaf extract were shown high mortality on tested mosquito larva species within 18-20 hours. To produce a result with a maximum activity of the extract without vast chemical substances, hydroethanol employed as a solvent for extraction. From this we can confirm, mosquitos are sensitive to the compounds present in *Solanum lycopersicum esculentum* leaves that leads to death of larva within a short period of exposure in minimum concentrations. Previous studies stated about medicinal plants (neem^[21], odomos, citronella etc.) efficacy to kill the mosquito with diverse concentrations and provided an acceptable solution. Even though previous works are done on the larvicidal activity using different plants such as *Acalypha indica*, *Ricinus communis* with organic solvents^[22-24] shown good results. But those are not bringing a satisfied outcome for this mosquito borne-illness issue as a permanent cure to the society. Though existing measures holding synthetic chemicals, resembling mosquito repellents^[25], insecticides^[26], plant-derived molecules on the prevention and control of the spread of mosquito-borne diseases gave the impression to boost up by way of nature-derived alternates in soared quality and quantity. End of this study showed that a mixture of compounds present in the plant leaves actively subsiding survival of larva in initial concentrations diminutively. Here no chemically derived agents are used for any kind of property. Usually, repellent having an ingredient that is chemically derived and produced preservatives are not said to be good for a natural solution from biota. Nowadays creating a completely natural product against some diseases (which should be economically affordable by poor people) is the major task in science and technology. This tries out may bring a solution to the problems and risks by mosquitoes with proper usage and applications in future. This try out adds economical importance of waste to wealth property, novelty, reduce risk to the environment, purity for human usage and so on.

5. Conclusion

From this work, the activity of *Solanum lycopersicum esculentum* leaf extract against different mosquito species was found to be significant antilarvicidal. This will serve as a good result and solution for the production of mosquito repellent and related products against mosquito which is effective than existing products. Usually, tomato leaves are considered as waste after the cultivation of tomatoes, by utilizing that to make a solution for a serious problem is the unique quality of this work

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