e-ISSN:2321-6190
p-ISSN:2347-2294

Research & Reviews: Journal of Zoological Sciences

Bauhinia Variegata L. and *Croton Sparsiflorus L.* Against the Larvae of *Aedes Aegypti L.*

Shanmugapriya R[1], Maheswaran R[1]* and Ignacimuthu S[2]

[1]*Department of Zoology, School of Life Sciences, Periyar University, Salem, Tamil Nadu, India, 636011.

[2]Entomology Research Institute, Loyola College, Chennai, Tamil Nadu, India, 600034

Research Article

Received date: 25/11/2015
Accepted date: 09/11/2015
Published date: 11/12/2015

***For Correspondence**

Maheswaran R, Department of Zoology, School of Life Sciences, Periyar University, Salem, Tamil Nadu, India-636011, Tel: +919443323186

E-mail: mahes1380@gmail.com

Keywords: *Croton sparsiflorus*, Bauhinia variegata, Aedes aegypti, Larvicidal activity.

ABSTRACT

The aim of the present study was to evaluate the larvicidal activity of plant powders of *Bauhinia variegata* and *Croton sparsiflorus* against the fourth instar larvae of *Aedes aegypti*. The macerated leaf powders of *B. variegata* and *C. sparsiflorus* were tested against the larvae of *A. aegypti* upto 24 hr exposure period with the concentrations of 100, 120, 140, 160, 180, and 200 mg/100 ml of tap water. The leaf powder of *C. sparsiflorus* had LC_{50} value of 122.73 mg/100 ml and LC_{90} value of 180.04 mg/100 ml followed by *B. variegata* with LC_{50} value of 142.47 mg/100 ml and LC_{90} value of 210.16 mg/100 ml respectively. The present investigation clearly demonstrates that *C. sparsiflorus* showed cent percent mortality followed by *B. variegata* against the larvae of *A. aegypti*. With further isolation and identification of bioactive molecules from *B. variegata* and *C. sparsiflorus* can be evaluated and developed novel biopesticide against mosquitoes as well as other insect pests.

INTRODUCTION

Mosquitoes are haematophagous insects and serve as vectors for spreading dreadful human diseases. Dengue fever is considered as a serious public health problem in the world. Dengue is endemic in all continents except Europe, and epidemic Dengue viruses, causative agents of dengue fever and more severe dengue haemorrhagic fever/dengue shock syndrome, infect over 100 million people every year. Dengue is the most common and widespread arboviral infection in the world today [1]. The excessive usage of synthetic organic pesticides during the last decade has resulted in environmental hazards and development of physiological resistance in vector mosquito species. Insecticides residual problem together with the insect resistance pose us in the environment to seek attention towards alternative methods [2]. This has necessitated the need of research and development on environmental safe, bio-degradable and indigenous method for vector control. Many herbal products have been evaluated and used as natural insecticides early before the use of synthetic insecticides [3]. The plant *B. variegata* is widely used in folklore medicine. Its bark, root, leaves, seeds and flowers are used for their medicinal properties. It has been used in dyspepsia, bronchitis, leprosy, ulcer, to prevent obesity, as an astringent, tonic and anthelmintic [4]. The phytochemical screening revealed that *B.* variegata contained terpenoids, flavonoids, tannins, saponins, reducing sugars, steroids and cardiac glycosides. Pharmacological studies showed that *B.* variegata exerted anticancer, antioxidant, hypolipidemic, antimicrobial, anti-inflammatory, nephroprotective, hepatoprotective, antiulcer, immunomodulating, molluscicidal, wound healing effects [5] and insecticidal activities [6-7]. Croton sparsiflorus leaves were used to treat antidiarrhoeal, insecticidal [8] and other ailments [9-10]; glycoside, saponins tannins, flavonides, terpenoids and alkaloids also reported [11-12]. The objective of this study was to investigate the larvicidal effect of leaf powders of Croton sparsiflorus and *Bauhinia variegata* against the larvae of *Aedes aegypti*.

MATERIALS AND METHODS

Plant material

Fresh and matured leaves of *Bauhinia variegate L*. **(Figure1)** and *Croton sparsiflorus L*. **(Figure 2)** were used for the research

e-ISSN:2321-6190
p-ISSN:2347-2294

work. They were collected from Periyar university campus, Salem, Tamil Nadu, India based on their abundance, availability, medicinal and insecticidal properties. The leaves were shade dried and macerated with electric blender and stored at the temperature of 4°C. The LC_{50} and LC_{90} values were calculated using EPA Probit analysis software.

Figure 1. *Bauhinia variegate*.

Figure 2. *Croton sparsiflorus.*

Mosquito culture

Aedes aegypti L. larvae were collected from stagnant water bodies in and around Periyar university campus, Salem, Tamil Nadu, India. They were colonized and maintained continuously for generations in the laboratory free of exposure to pathogens, insecticides or repellents. They were maintained at 27 ± 2°C, 75-85% RH under a photoperiod of 14:10 hr (light/dark) in the insectary. Larvae were fed on finely ground dog biscuit and yeast extract in the ratio of 3:1. Water was changed every day to avoid scum formation which might create toxicity. Pupae were transferred from the trays to a cup containing tap water and placed in screened cages (30 × 30 × 30 cm dimension) where the adults emerged. The adult mosquitoes were reared in the glass cages of 30 × 30 × 30 cm dimension. The adult colony was provided with 10% sucrose solution and was periodically blood-fed on restrained rats. After three days, ovitrap was kept in the cages and the eggs were collected and transferred to the enamel trays. Two developmental stages, larvae and adult, were continuously available for the experiments and were maintained at the same condition as mentioned above.

Larvicidal activity

Larvicidal activity was evaluated by using Patil et al. method [13]. Twenty five late third or early fourth instar larvae of *A. aegypti* were released in a 250 ml glass beaker containing 100 ml of dechlorinated tap water mixed with and desired plant powder concentration (mg). Five replicates of each concentration were run at a time. The experimental concentrations were 100, 120, 140, 160, 180 and 200 mg, respectively. The LC_{50} and LC_{90} values were calculated by EPA Probit analysis software.

RESULT AND DISCUSSION

The LC_{50} and LC_{90} value of *C. sparsiflorus* leaf extracts exhibited 122.73 and 180.04 mg/100 ml against *A. aegypti*. The *B. variegata* leaf powder exhibited the LC_{50} and LC_{90} value of 142.47 and 210.16 mg/100 ml against *A. aegypti*. Among the two plant powders *C. sparsiflorus* exhibited highest larvicidal activity against *A. aegypti* **(Table 1).** In the present investigation *C. sparsiflorus* showed cent percent mortality followed by *B. variegata* against the immatures of *A. aegypti*. Our results were coincides with earlier

findings of Santos et al.[14] fresh and stored oil from *C. rhamnifolioides* exhibited substantial larvicidal activities with LC_{50} values of 122.35 and 89.03 ppm, against *A. aegypti*. *Croton zambesicus* exhibited moderate larvicidal activity with LC_{50} value of 155.19 and LC_{90} value of 580.16 ppm against *Anopheles stephensi* [15]. The LC_{50} and LC_{90} values of *C.* macrostachyus exhibited 89.25 and 224.98 ppm, against *A. arabiensis* [16]. However, the ethylacetate extract of *B. racemose* showed lowest toxic effect against An. stephensi [17]. Kaushik and Saini [18] reported that *Bauhinia variegata* leaf extract showed moderated larvicidal activity with the LC_{50} value of 204.2 ppm against *A.* aegypti. Our result clearly demonstrates that the leaves of *C. sparsiflorus* were highly effective against *A. aegypti* followed by *B. variegata*. Powdered leaves of *C. sparsiflorus* and *B. variegata* may be a good source to control vector mosquitoes. With further isolation, purification and identification of active compound from *B. variegata* and *C. sparsiflorus* can be evaluated and developed novel biopesticide against mosquitoes.

Table 1. Larvicidal activity of *Bauhinia variegata* L. and *Croton sparsiflorus* L. against the larvae of *Aedes aegypti* L.

Bauhinia variegata												
Replication	**Control**	**Concentration (mg/100ml)**						**LC_{50}**	**95% Confidence limit**		**LC_{90}**	**95% Confidence limit**	
		200 mg	**180 mg**	**160 mg**	**140 mg**	**120 mg**	**100 mg**		**LCL**	**UCL**		**LCL**	**UCL**
1	0	23	20	15	12	10	6	142.18	136.67	147.39	211.54	201.36	225.18
2	0	23	19	15	12	9	6						
3	0	23	19	16	10	9	6						
4	0	22	18	14	12	8	5						
5	0	21	17	14	10	9	7						
Total	0	112	93	74	56	45	30						
S.D.	0	0.89	1.14	0.83	1.09	0.70	0.70						
% of mortality	0	89.6	74.4	59.2	44.8	36	24						
Croton sparsiflorus													
1	0	25	23	19	15	12	10	122.21	116.25	127.29	180.83	173.66	190.09
2	0	25	23	19	16	12	10						
3	0	25	22	18	14	10	10						
4	0	25	23	17	15	11	9						
5	0	25	22	18	15	13	9						
Total	0	125	113	91	75	58	48						
S.D.	0	0	0.54	0.83	0.70	1.14	0.54						
% of mortality	0	100	90.4	72.8	60	46.4	38.4						

Values are mean ±SD of five replicates.

ACKNOWLEDGEMENTS

The authors are grateful to the management of Periyar University, Salem, Tamil Nadu, India for supporting this work.

REFERENCES

1. Bandyopadhyay B, et al. A Comprehensive Study on the 2012 Dengue Fever Outbreak in Kolkata, India. 2013:ISRN Virol 1-5.
2. Macêdo ME, et al. Screening of Asteraceae (Compositae) plant extracts for larvicidal activity against *Aedes fluviatilis* (Diptera: Culicidae). Mem Inst Oswaldo Cruz. 1997: 92:565-570.
3. Mittal PK and Subbarao SK. Prospects of using herbal products in the control of mosquito vectors. 2003: ICMR Bulletin 33:1-10.
4. Banyal HS, et al. Antimalarial effect of *Ocimum sanctum* Linn. and *Bauhinia variegata* Linn. on *Plasmodium berghei*. IOSR J Pharm Bio Sci. 2015: 10: 70-72.
5. Al-Snafi AE. The Pharmacological Importance of *Bauhinia variegata*. A Review. Int J Pharma Sci Res. 2013: 4: 160-164.
6. Srivastava US, et al. Juvenoid activity in extracts of certain plants. Curr Sci. 1985: 12: 576-78.
7. Daud RD, et al. Mites (Acari: Arachnida) associated with *Bauhinia variegata* L. (Leguminosae) in northeast of State of SÃ£o Paulo, Brazil. Neotrop Entomol. 2007: 36: 322-5.
8. Tandon P and Sirohi A. A trail to minimize the impact of chemical insecticides and damage caused by *Raphidopalpa foveicollis Lucas*. Int J Sci Res Edu. 2015: 3: 4645-4649.
9. Yadav SK and Das S. Phytochemical screening and antidiarrhoeal activity of aqueous extracts of *Croton sparsiflorus* Morong. Int J Pharma Res Rev. 2013: 2: 12-16.
10. Abi Beaulah G, et al. *In vitro* antifungal activities of *Croton sparsiflorus*. J Chem Pharm Res. 2013: 5:136-141.

11. Okeke MI, et al. Evaluation of extracts the roots of *Landolphia owerrience* for antibacterial activity. J Ethnopharmacol. 2001: 78: 119- 127.

12. Shamala GS and Vasantha K. Phytochemical and comparative antibacterial studies on the crude hexane and aqueous extracts of the seed of *Harpullia arborea* Radlk. Plant Archives. 2009: 2: 903-904.

13. Patil PB, et al. Efficacy of natural product, *Clerodendron inerme* against dengue mosquito vector Aedes aegypti. Curr Sci. 2006: 90: 1064-1066.

14. Santos GKN, et al. Effects of *Croton rhamnifolioides* essential oil on *Aedes aegypti* oviposition, larval toxicity and trypsin activity. Molecules. 2014: 19:16573-16587.

15. Baranitharan M, et al. Larvicidal activity of Croton *sparciflorus Morong* (Euphorbiaceae) leaf extracts against three vector mosquitoes. Sci Park Res. 2014: J 1:1-7.

16. Karunamoorthi K and Ilango K. Larvicidal activity of *Cymbopogon citratus* (DC) Stapf. and *Croton macrostachyus* Del. against *Anopheles arabiensis* Patton, a potent malaria vector. Euro Rev Med Pharm Sci. 2010: 14: 57-62.

17. Malik BR, et al. Evaluation of larvicidal activity of the different extracts against important species of mosquito: *Anopheles stephensi*. J Parasitol Vector Biol. 2014: 6: 11-15.

18. Kaushik R and Saini P. Screening of some semi-arid region plants for larvicidal activity against *Aedes aegypti* mosquitoes. J Vector Borne Dis. 2009: 46: 244-246.