



Application of Botanical Insecticides (*Terminalia Arjuna* and *Withania Somnifera* Leaf Extract) for the Control of Dengue Vector *Aedes Aegypti* (Listion)

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ABSTRACT

Plant materials offer not only mosquito control agents, but also promise to be environmentally safe. Plant allelochemical may be quite useful in increasing the efficacy of biological control agents because plants produce a large variety of compounds that increase their resistance to insect attack. Now a day's growing use of phytochemical for control of the insects may be attributed to the fact the populations throughout the world are coming to see the dangers inherent is conventional insecticides. Natural botanicals have provided numerous sources of phytochemicals utilized in the development of effective mosquito control agents of plant materials offer not only effective mousquito contol agents, but also promise to be environmentally safe.

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Introduction

Mosquitoes are one of the most medically significant vectors and they transmit parasites and pathogens, which continue to have devastating impact on human beings. The vector borne diseases caused by mosquitoes are one of the major health problems in many countries. Malaria, Dengue, Yellow fever, filariasis and chikungunya are some of the deadly diseases spread by mosquitoes (Mittal *et al.*, 1995)

A recent estimate shows that more than 50 million people are at risk of dengue virus exposure worldwide. Annually, there are 2 million infections, 5, 00,000, cases of dengue hemorrhagic fever, and 12,000 deaths (Guha-Sapir and Schimme, 2005). *Aedes aegypti* is generally known as a vector for an arbo-virus responsible for dengue fever, which is endemic to Southeast Asia, the Pacific island area, Africa, and America. This mosquito also acts as a vector of yellow fever in Central and South America and West Africa. However, Dengue fever has become an important public health problem as the number of reported cases continues to increase, especially with more severe forms of the disease, dengue hemorrhagic fever, and dengue shock syndrome, or with unusual manifestations such as central nervous system involvement (Pancharoen *et al.*, 2002).

In the present study an attempt has been made to evaluate the interactive effect of plant extract such as *Terminalia arjuna* and *Withania somnifera* extracts on the larvicidal, pupicidal, for the control of dengue vector *Aedes aegypti*.

Materials and Methods

Colonization of *Aedes aegypti*, Collection of eggs, Maintenance of larva, pupae and adult, Blood feeding of adult *Aedes aegypti* and egg laying, Collection of plant materials, Preparation of plant extracts, Preparation of required plant extracts concentration.

Result

The use of herbal products is one of the best alternatives for mosquito control. The search for herbal preparations that do not produce any adverse effects in the non-target organisms and are easily biodegradable remains atop research issue for scientists associated with alternative vector control (Chowdhury, N.et al ., 2008). Many plants species are known to possess biological activity that is frequently assigned to the secondary metabolites. Among these, essential oils and their constituents have received considerable attention in the search for new bio pesticides. Many of them have been found to possess an array of properties, including insecticidal activity, repellence, feeding deterrence, reproduction retraction and insect growth regulation against various mosquito species.

Table1 illustrate the larval mortality of *Aedes aegypti* (I to IV instars) after the treatment of acetone *Terminalia arjuna* leaf extract is shown in table1. 19% mortality was noted at. Ist instar larvae by the treatment at 2% concentration whereas it has been increased to 90% at 10 % concentration of *Terminalia arjuna* leaf extract. The LC₅₀ and LC₉₀ values were represent as follows LC₅₀ value Ist instar was 5.60 %, IInd instar was 5.93 %, IIIrd instar was 6.23% and IVth instar was 6.57 %. LC₉₀ value of Ist instar was 10.57 %, IInd instar was 10.92 %, IIIrd instar was 11.46 % and IVth instar was 11.76 %, respectively. The LC₅₀ value of pupae was 5.06% and LC₉₀ value of pupae was 18.01 % respectively. The LC₅₀ value of pupae was 5.06 % and LC₉₀ value of pupae 18.01 % respectively.

Table 2 provides the considerable larval and pupal mortality of *Aedes aegypti* (I to IV instars and pupae) after the treatment of acetone extract of *Withania somnifera* leaf extract at different concentration (2 to 10% concentration).

Table 1. Larval Toxicity effect of *Terminalia arjuna* (acetone) Leaf extract On Dengue vector *Aedes aegypti*

Stage		Mortality Concentration (%)								
		2	4	6	8	10	LC50	LC90	Regression	Chi Squire
Larva	1	19 ^c	37 ^g	51 ^{ij}	64 ^l	94 ^q	5.60	10.57	X= 0.2 Y=-144	9.40
	2	16 ^{bc}	36 ^{fg}	47 ^{hi}	61 ^{kl}	92 ^{pq}	5.39	10.92	X=0.26 Y= -1.52	9.49
	3	16 ^b	34 ^f	42 ^h	59 ^k	89 ^p	6.23	11.46	X= 0.24 Y=- 1.53	8.37
	4	12 ^b	32 ^{ef}	41 ^g	57 ^{jk}	85 ^p	6.57	11.76	X= 0.25 Y= -1.62	5.72
Pupa		32 ^f	51 ⁱ	58 ^k	62 ^l	65 ^l	5.06	18.01	X=0.10 Y= -0.50	4.07

Within a column means followed by the same letter (s) are not significantly different at 5% level by DMRT.

Table 2. Larval Toxicity effect of *Withania somnifera* (acetone) leaf extract On Dengue vector *Aedes aegypti*

Stage		Mortality Concentration (%)								
		2	4	6	8	10	LC50	LC90	Regression	Chi Squire
Larva	1	16 ^{bc}	32 ^f	43 ^h	65 ^l	83 ^p	6.28	11.70	X= 0.24 Y= -1.48	1.35
	2	14 ^h	29 ^e	41 ^g	60 ^p	82 ^p	6.61	11.99	X= 0.24 Y= -1.58	1.61
	3	13 ^b	27 ^e	25 ^d	52 ^j	76 ^{no}	7.56	13.42	X=0.22 Y= -1.65	9.43
	4	10 ^g	21 ^{cd}	20 ^c	47 ^{hi}	75 ⁿ	8.01	13.37	X= 0.24 Y= 1.92	10.67

Within a column means followed by the same letter (s) are not significantly different at 5% level by DMRT.

16% mortality was noted at *Withania somnifera* leaf extract treatment. The LC₅₀ and LC₉₀ values were represent as follows: LC₅₀ value Ist instar was 6.28 %, IInd instar was 6.61%, IIIrd instar was 7.56% and IVth instar was 8.01% respectively. LC₉₀ value of Ist instar was 11.70%, IInd instar was 11.99%, IIIrd instar was 13.42% and IV instar was 13.37%, respectively.

Discussion

According to Bowers *et al.* (1995) the screening of locally available medicinal plants for mosquito control would generate local employment, reduce dependence on expensive imported products and stimulate local efforts to enhance public health. The biological activity of the plant extract might be due to the various compound including phenolics, terpenoids and alkaloids exist in plant and these compounds may jointly or independently contribute to produce larvicidal activity against *Aedes aegypti*. So one of this was a new agent (*Terminalia arjuna*) having a potential activity against eggs of insects, larva, beetles insect and pests and aphid as same as synthetic insecticides (Kabaru and Gichia 2001). Effect of an insecticide and acetone leaf extracts of *Withania somnifera* and *Argemone mexicana* against *Anopheles stephensi*, *Culex quinquefasciatus* and *Aedes aegypti* was studied. The insecticide effectively checked all mosquitos' population. Both *W. somifera* and *A. mexicana* were found to be more effective in controlling the mosquito's population. The early larval instars were highly susceptible to plant extracts than later stages. When the effects of two extracts were compared, it was discernible that the leaf extract of *W. somifera* was more effective in controlling the population of *A. aegypti* that

the leaf extract of *A. mexicana* (Uma *et al.*, 2003). In this study also indicated the same results. The first instar larvae were highly susceptible to *Terminalia arjuna* and *withania somnifera* than the later stages.

Conclusion

Nowadays synthetic insecticides or pesticides having a nature of chemical origin such as organophosphorus, carbaryl, mercurial etc., compounds are mostly used for agricultural pest control and management so the insects developed resistance against this chemical compounds so it was harmful for environmental and human beings and disease. So this is why we have to choose a natural insecticides i.e. pyrethrines, azardirectines, nicotine's, etc. having the potential source of insects killing and growth control. In the combined effect of *Terminalia arjuna* leaf and *Withania somnifera* leaf extract had much high significant effect on various larval instars and pupae of *Aedes aegypti* since *Terminalia arjuna* and *Withania somnifera* had effect on the gut of insects and brought out larval, pupal mortality. Combined effect of plant extracts not only affect the larva but also inhibited the growth of pupa and the treated mosquitoes did not emergency from the pupa as adults.

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