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INSECTICIDAL ACTIVITY OF OLDENLANDIA CORYMBOSA (L) ON THE LARVAE AND PUPAE OF ANOPHELES STEPHENSI (L)

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Abstract:

A preliminary study was conducted in which the methanol extracts of Oldenlandia corymbosa L. leaf were tested for their larvicidal and pupicidal activities against Anopheles stephensi L under the laboratory conditions. Larvicidal activity of the crude extract or phytochemicals against different cases of vector has been studied extensively when compared to other related aspects. The 50 ppm plant extract exhibited the larval mortality of about 44.50% in the 1st instar larvae and it was reduced to 35.76%, 17.26% and 17.26% in the 2nd, 3rd and 4th instar respectively. The pupal mortality in the case of Anopheles stephensi L. was ranging from 17.26% to 78.58% after having treated with 50 to 300 ppm over the period of 24h. The present study evidents that, the higher concentration of plant products promoted high degree of mortality in the case of larvae and pupae of Anopheles stephensi L after 24h treatment. And the results suggests that the methanol extract of Oldenlandia corymbosa L. have a good potential as larvicidal and pupicidal agent against Anopheles stephensi L. As naturally occurring insecticides, these plant derived materials could be useful as an alternative for synthetic insecticides controlling field populations of mosquitoes.

Key Words: Oldenlandia Corymbosa L, Anopheles Stephensi L, Methanol Extract & Mortality

1. Introduction:

Mosquitoes are great nuisance to human beings and are vectors of etiologic agents of malaria, Japanese encephalitis, yellow fever, dengue haemorrhagic fever and fliariasis that still cause thousands of deaths per year. *Anopheles stephensi L.* (Diptera) is the primary vector of malaria in India and other West American countries, and improved methods of control are urgently needed (Burfield and Reekie, 2005). In the absence of effective vaccine and drugs, the disease prevention and control programs depends upon the vector control. Since ancient time, plant products were used in various aspects especially in the insect control. The repellent properties of plants to mosquitoes and other pest insects were prominent before the advent of synthetic chemicals. However, their usage against pests gradually declined as the chemical control methods turned to result in speedy action and ease of application. But prolonged use of synthetic insecticides has drastically resulted in the disruption of natural biological systems and led to resurgences in mosquito populations. It has also resulted in the development of resistance (Brown, 1986), undesirable effects on non – target organisms, and fostered environmental and human health concerns.

Even though, biological control has an important role to play in modern vector control programs, it lacks in the provision of complete solution by itself. Irrespective of the less harmful and ecofriendly methods suggested and used in control programmes, there is still need to depend upon the chemical control methods in situations of epidemic outbreak and sudden increase of adult mosquitoes. And thus, insecticides are known as an effective control during epidemics ensuring speedy action. Nonetheless,

they are preferred as effective control agent to reduce the mosquito population irrespective of their side effects.

Recent studies stimulated the investigation of insecticidal properties of chemicals derived from plant material and concluded that they are environmentally safe, degradable, and target specific (Senthil Nathan and Kalaivani, 2005). The Phyto-chemicals derived from plant sources can act as larvicides, insect growth regulators, repellents and ovipositional attractants and have deterrent activities observed by many researches (Babu and Murugan, 1998). And hence, they have revolutionized the fields of vector control as they posses different bioactive components and can be used as toxicants against various larval stages of the mosquito (Sharma et al., 2004; Mohan et al., 2005). Therefore, an attempt has been made in the present study to evaluate the role of *Oldenlandia corymbosa L.* leaf extract against the *Anopheles stephensi L.*

2. Materials and Methods:

2.1 Selection of Plant Species:

The plant species *Oldenlandia corymbosa L.* belongs to Rubiaceae family and is widely found in the Coimbatore District, Tamil Nadu, India. It was collected from the foot hills of Maruthamalai, Coimbatore District, Tamil Nadu and was authenticated by Botanical survey of India (BSI), Coimbatore, India.

2.2 Laboratory Rearing of Mosquitoes:

Anopheles stephensi L larvae were obtained from National Institute of Communicable Diseases, Mettupalayam, Coimbatore, Tamil Nadu. To start the colony the larvae were reared in the plastic and enamel trays containing tap water. Larvae were fed a diet of Brewer's yeast, dog biscuits and algae in the ratio of 3:1:1 respectively. Pupae were transformed from the trays to a cup containing tap water and were maintained in our insect cage (45x45x40 cm) where adult emerged.

Adults were maintained in glass cages and were provide continuously with 10% sucrose solution in a jar with a cotton wick. On day 5 adults were given a blood meal from chicks placed in cages overnight for blood feeding by females. Glass Petri dishes with 50 ml of tap water with filter paper was kept inside the cage for oviposition.

2.3 Preparation of Oldenlandia Corymbosa L. Extract:

The leaves, stem and the flowers of *Oldanlandia corymbosa L.* plant were shade dried at room temperature and powdered coarsely by using electric grinder. The 20 g of *Oldenlandia corymbosa L* powder was placed in the pouch made of Whatmann No.1 filter paper and placed in the soxlet's apparatus and mixed with 250 ml of 80% methanol and soxlet's for 6 h. The concentrated extract was kept in wide mouth glass petridiscs and evaporated to dryness at room temperature. The dried material was weighed and dissolved by using the suitable emulsifying agent. The stock solution was prepared by dissolving 1.00 gm of dried material with 1 ml of emulsifier (1000 ppm). Different concentrations of plant extract were prepared from the stock solution by using distilled water. The concentration of 50, 100, 150, 200, 250 and 300 ppm were selected on the basis of killing range minimum to maximum larval mortality after 12 h duration.

2.4 Bioassay:

Larvicidal activity was evaluated by the following WHO method (1996) with slight modifications. 30 numbers of 1st, 2nd, 3rd and 4th instars of *Anopheles stephensi L* were placed in a separate 500 ml petri disc with 249 ml of dechlorinated water and 1.0 ml of the desired plant extract concentrations. Five replicates for each concentration were run at a time. Each crude extract was dissolved in water with 0.15 of emulsifier to get the experimental concentrations of 50, 100, 150, 200, 250 and 300 ppm respectively. Mortality survival rate was recorded after 24 h of the exposure period. The

mortality was calculated by Abbot's method (1925) for computing effectiveness of an insecticide.

Pupal mortality was evaluated by the following WHO method. 30 numbers of Pupae of *Anopheles stephensi L* were placed in a separate 500ml petri disc with 249ml of dechlorinated water and 1.0 ml of the desired plant extract concentrations. Five replicates were maintained for each concentration. Mortality rate was observed at 24h of the exposure time. The mortality was calculated by Abbot's method for computing effectiveness of an insecticide.

3. Results and Discussion:

The results of the larvicidal and pupicidal activity of *Anopheles stephensi L.* larvae which was treated with the extract of *Oldanlandia corymbosa L.* was presented in the table 1. The methanol extract of *Oldanlandia corymbosa L*. exhibited 44.50 percentage larval mortality in the I – instar larvae of *Anopheles stephensi L.* over a period of 24h. Moreover, it was increased to 55.60 %, 55.60%, 66.70%, 77.80% and 77.80% when treated with the respective connection of 50, 100 150, 200, 250 and 300 ppm extracts. Likewise, the observed larval mortality in the II-instar larva of *Anopheles stephensi L.* was 35.76% and increased upto to 78.58% after treatment with 300 ppm extracts. Similar pattern of mortality was recorded in the pupal stage that was ranging from 17.26% to 78.58% when they are treated with different concentrations of plant extracts. The present study exhibited that the larval mortality was significantly reduced from 44.50% to 17.26% when the larval aged was increased. And the study reveals that, the I and II instar larvae were highly sensitive when compared with III and IV instar larvae. Thus the higher concentration of plant products promoted high degree of mortality in the case of larvae and pupae of *Anopheles stephensi L.* after 24h treatment. Thus, such products can be used as economically viable form of protection against mosquito vector. Moreover, these kind of plant derived product does not cause any ill-effect to other beneficial organisms. (Murugan, 2004). The mode of action, effect of non target organisms and the field trails are presently needed under investigation. Further analysis to isolate the active compounds responsible for repellent activity must be carried out so as it could result in control of different mosquito species in future.

Table 1: Effect of methanol extract of *Oldanlandia corymbosa L.* on the larvae and pupae of *Anopheles stephensi L.* after 24 h

S.No	Concentration of plant extract (ppm)	Number of Larvae / Pupae used	Percentage Mortality				
			Larval Stages				
			I	II	III	IV	Pupae
1.	50	30	44.50	35.76	17.26	17.26	17.26
2.	100	30	55.60	46.46	27.61	17.26	27.61
3.	150	30	55.60	46.46	37.95	27.61	37.95
4.	200	30	66.70	57.17	48.63	48.29	58.63
5.	250	30	77.80	67.88	68.97	58.63	68.97
6.	300	30	77.80	78.58	68.97	68.97	78.58
LC50			58.49	100.71	-	-	-

Note: The values are the mean of 5 replications
Computed as C-T/c 100, where, T = % damage in treatment; C = % damage in the Control.

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