

P2.23. Biological control of yellow fever mosquito (*Aedes aegypti* Linn.) using leaf extract of Chan (*Hyptis suaveolens* (L.) Poit) and Hedge Flower (*Lantana camara* Linn.)

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Yellow fever mosquito *Aedes aegypti* (L.) is one of the most widespread and serious medical insect pests. Control of these mosquito larvae is frequently dependent on continuing applications of organophosphates such as temphos and fenthion and insect growth regulators such as difluzenzuron and methoprene. However, the repeated use of these pesticides has disrupted natural biological control systems leading to outbreaks of new insect species, which sometimes resulted in the development of resistance. The use of these pesticides also has undesirable effects on non-target organisms and causes environmental and human health concerns. These problems have highlighted the need for the development of new strategies for selective mosquito larval control. Plants may be an alternative source of insecticidal agents because they constitute rich sources of bioactive chemicals. Much effort has been focused on plant extracts or phytochemicals as potential sources of commercial mosquito control agents or bioactive chemical compounds. In the present study, the larvicidal activity of Chan (*Hyptis suaveolens* (L.) Poit) and Hedge Flower (*Lantana camara* Linn.) was studied on 2nd instar larvae of *Aedes aegypti*. The results indicated that the essential oil of *Hyptis suaveolens* demonstrated high larvicidal activity than that of *Lantana camara*. The most active being the leaf essential oil of *H. suaveolens*, with a $LC_{50} = 20.79\%$ followed by the leaf essential oil of *L. camara*, with a $LC_{50} = 73.04\%$, which could cause 100% mortality of *A. aegypti*. The synergistic effect was also observed when using the mixture of *H. suaveolens* and *L. camara* at the ratio 40:60 (by %concentration), which led to 100% mortality of 2nd instar larvae of *A. aegypti*. The results obtained from this study suggest that the leaf essential oil of *H. suaveolens* and *L. camara* are promising as larvicides against *A. aegypti* larvae and could be useful in the search for new natural larvicidal compounds.





Biological Control of *Aedes aegypti* Linn. Using Leaf Extracts of Chan (*Hyptis suaveolens* (L.) Poit.) and Hedge Flower (*Lantana camara* Linn.)

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Introduction

Mosquitoes are the major vectors of many diseases such as dengue fever, yellow fever, malaria, filariavirus, Japanese encephalitis and other fevers (Service, 1983). *Aedes aegypti* L. is one of the most important mosquitoes. It serves as the vector of dengue virus causing dengue fever and yellow fever in human. Annually, there are an estimated 50-100 million cases of dengue fever (DF), and 250,000 to 500,000 cases of dengue haemorrhagic fever (DHF) in the world (Rigau-Pérez et al., 1998). Mosquito control can be achieved by various ways, including water management, biological control agents, and insecticides. The effectiveness of control is the control of larvae (larvicides) or adult mosquitoes (adulticides). However, mosquitoes are able to resist to chemically synthetic pesticides, which jeopardize human health and environment. In this study, the biological control of *Ae. aegypti* by the extracts from *H. suaveolens* (L.) Poit and *L. camara* was performed in separation and combination.

Methods

H. suaveolens (L.) Poit and *L. camara* were collected in Suranaree University of Technology, dried, and extracted in water 100 g. dry leaf : 500 ml. H₂O in Soxhlet apparatus for 24 hours. Two hundred and fifty milliliter of final extraction was considered as 100% crude extract. Crude extract were used to control *Ae. aegypti* larva, 2nd instar, by dipping Method. Percent mortality and LC₅₀ were calculated, at 48-hours treatment.



Figure 1 *Aedes aegypti* L. [A], *H. suaveolens* (L.) Poit [B] and *L. camara* [C]

Results

H. suaveolens crude extract showed higher mosquito larva killing over *L. camara* crude extract about 2-3 fold. LC₅₀ of *H. suaveolens* treatment on the 2nd instar larva of mosquitoes was 19.99% and LC₅₀ of *L. camara* is 74.86% The synergistic effects of the crude extract combination was high at lower dilution. At higher concentration of extract combination, extract of *H. suaveolens* enhanced the mortality effect of *L. camara* extract, or on the contrary, *L. camara* extract did not enhanced the effects of *H. suaveolens* extracts.

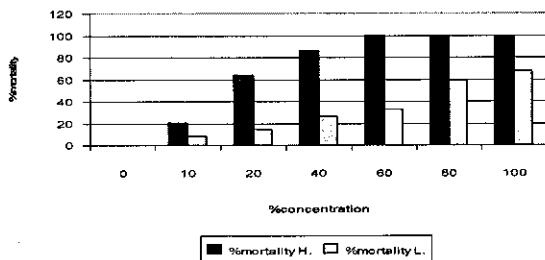


Figure 2 The effects of *H. suaveolens* (L.) Poit extract and *L. camara* extract on the 2nd instar larva of *Ae. aegypti*. The extracts were serially diluted with water. The mortality of the larva was observed at 48 hours of treatment.

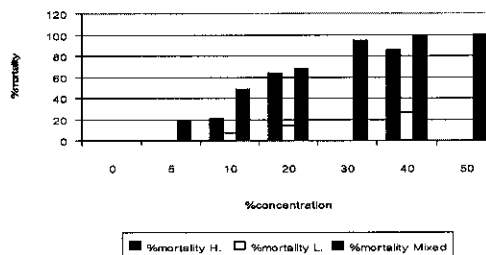


Figure 3 The effects of the combination of crude extracts at ration 1 : 1 (V : V). The mixtures were then diluted and applied to the 2nd instar larva of *Ae. aegypti*. The mortality of the larva was observed at 48 hours. The results of 10%, 20% and 40% of extracts (1 : 1), the mortality effects of separate treatments of *H. suaveolens* and *L. camara* are shown as comparison.

Table 1. The synergistic/enhanced effects of *H. suaveolens* and *L. camara* crude extracts.

Combination of crude extract (1 : 1, %)	Synergistic effects (Folt)	
	<i>H. suaveolens</i>	<i>L. camara</i>
10 : 10	2.35	6.08
20 : 20	1.06	4.64
40 : 40	1.16	3.85

Conclusions

H. suaveolens -leave extract was more potent in controlling mosquito larva than *L. camara* -leave extract. It also enhanced the potential of the extract of *L. camara*. On the contrary, *L. camara* -leave extract seemed to lower the effect of *H. suaveolens* 's potential a little. Both plants show high potent in killing *Ae. aegypti*, the larva of the mosquitoes which are the viral vector of yellow fever. Hence, *H. suaveolens* and *L. camara* are potentially applicable in mosquito controlling.

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