



[Science Archives \(ISSN:2582-6697\)](http://www.sciencearchives.org)

Journal homepage: www.sciencearchives.org



<https://doi.org/10.47587/SA.2022.3312>



Research Article

Effect of peppermint and anise oil and pesticide SIVANTO in the control of *Culex pipiens* (Diptera: Culicidae) mosquitoes

Shahad Hamed Yousef ¹✉, Harith Ahmed Mustafa¹ and Liqaa Hussein Alwan²

¹Department of Biology, College of Education, University of Samarra, Samarra, Iraq

²Department of Chemistry, College of Education, University of Samarra, Samarra, Iraq

Received: Aug 30, 2022/ Revised: Sept 24, 2022/ Accepted: Sept 29, 2022

(✉) Corresponding Author: shahadalsamarrai429@gmail.com

Abstract

The study dealt with the effect of peppermint oil and anise oil and the pesticide SIVANTO in the control of *C. pipiens* mosquitoes, and the concentrations used for peppermint oil and anise oil and pesticide SIVANTO (0.5,1,1.5,2) the lowest killing rate for peppermint oil was 2.6% after 48 hours of treatment, and the highest killing rate was 4.6% after 48 hours. Of the treatment, while anise oil had the lowest killing rate of 3.3% after 48 hours of treatment, and the highest killing rate of 4.6% after 48 hours of treatment, and the lowest killing rate of SIVANTO was 8% after 48 hours of treatment, and the highest killing rate of 10% after treatment. 48 hours of treatment compared to the control treatment in which no homicide occurred.

Keywords: *Culex pipiens*, peppermint oil, anise oil, pesticide SIVANTO

Introduction

Mosquitoes are medically and veterinary important insects as they transmit several dangerous pathogens to humans and animals and are still one of the main threats to public health and economic growth in many countries (Bajwa et al, 2014). The mosquito family is a small blood-feeding Anthrophaga insect with piercing and absorbent mouthparts, which is harmful and annoying to humans (Benzina et al, 2018). Mosquito transmit many life-threatening diseases such as malaria, filariasis, dengue fever, West Nile fever, and yellow fever and are associated with millions of deaths each year worldwide (Kumar et al, 2020). Mint belongs to the oral family, and it is considered one of the large families in the plant kingdom, as it includes 200 genera and 2000-5000 species. The genus *Mentha* includes 25-30 species, and it is called in Arabic the green mint, mint or allam, and in French *Lamethe*, it contains Mint leaves containing a volatile oil called peppermint oil. This oil contains many substances, the most important of which is menthol compound by 50%, menthone compound, terpenes, tannins, flavonoids, soaps, resins, tanning materials, and esters, and the compounds

contained in mint vary in type and quantity depending on its source, the nature of the soil and environmental conditions (Ahmed et al, 2012; Al-Dajwi et al,1996). Anise is a herbaceous plant that reaches a height of about half a meter, the stem is thin polygonal, the leaves are serrated round in shape, and the end of the branches bears small oval flowers, and the fruits are small brown, and its seeds are widely used in folk medicine in Arab regions, including Iraq (Al-wendawi et al, 2021). Anise is one of the important plants because its seeds contain volatile oils that contain important compounds and have therapeutic effects, the most important of which are estragol, acetophenone, pinene, limonene, but the most important of which is anethole, which gives the seeds an aromatic flavor and to which most of the medicinal effects are attributed (Sun et al, 2019).

Materials and Methods

Mosquito breeding

Sites were selected from Salah al-Din Governorate, in which there are ponds, where *C. pipiens* mosquitoes abound because of the presence of organic matter in them. A long-arm ladle

was used for collection, and then it was placed in plastic containers prepared for this purpose, with a capacity of 2000 ml, containing 1000 ml of water similar to water in the wild environment. It is free of chlorine and transferred to the insect breeding room under laboratory conditions, with a temperature of 2 ± 25 , relative humidity of 5 ± 65 , and lighting period of 12 hours/day. The ground mouse is made of wheat, protein, and yellow corn in a ratio of 1:1:1 by 2 gm per basin (Soni & prakson, 2012).

Preparation of concentrations of peppermint oil, anise, and pesticide SIVANTO

The concentrations of peppermint and anise oil were prepared according to the dilution equation for Dalton $C1V1 = C2V2$, which is 0.5, 1,1.5, and 2 ml, and 50 ml of distilled water was added to each concentration, and then Twin 80 was added in the form of drops to the mixture (distilled water and oil) until it became the mixture is in a suspension form that is easy to mix and spray. As for SIVANTO, different concentrations of it were prepared, which are 0.5, 1,1.5, and 2 ml, and 50 ml of distilled water was added to each concentration, while the control was only distilled water.

Effect of peppermint and anise oil on the fourth larval age of *C. pipiens* mosquitoes

The concentrations of essential oils (0.5,1,1.5,2 ml) were placed in clean and sterilized plastic containers, and each concentration was in a bottle. 40 fourth instar larvae were taken and distributed on four plates. Then the larvae were sprayed superficially by a hand sprayer from a height of approximately 15 cm to ensure that all larvae were exposed to the concentrations of essential oils. The experiment was repeated three times for each concentration. As for the control treatment, it was sprayed with sterile distilled water only, after that the mortality rate was calculated after 24 hours and 48 hours of exposure.

Effect of SIVANTO on the fourth larval age of *C. pipiens* mosquitoes

Concentrations of SIVANTO (0.5,1,1.5,2 ml) were placed in clean, sterile plastic containers, and each concentration was a bottle, and 40 fourth instar larvae were taken and distributed on four plates. Then the larvae were sprayed superficially by a hand sprayer from a height of approximately 15 cm to ensure that all larvae were exposed to SIVANTO pesticide. The experiment was repeated three times for each concentration. As for the control treatment, it was sprayed with sterile distilled water only, then the mortality rate was calculated after 24 hours and 48 hours of exposure.

Results and discussion

Effect of peppermint oil on the fourth larval age of *C. pipiens* mosquitoes

The results of Table 1 showed that there were significant differences in the rates of killing for the interaction between the concentrations and the duration of exposure, as the highest killing rate of fourth instar larvae was 4.6% at concentrations 2% and 1.5% after 48 hours of treatment, while the lowest killing rate was 2.3% at concentration 5.0% after 24 hours of treatment, while the average killing rates by the effect of concentrations showed that the highest killing rate was at the 2% concentration, which amounted to 4.45%, while the lowest average killing rate at the 5.0% concentration was 2.45%, and the average killing rates by the effect of the duration of the killing were The highest killing rate after 48 hours was 37.3% and the lowest killing rate after 24 hours was 30.3%. Through the results, it was found that the killing rates of the fourth instar larvae increase with the increase in concentration as well as with the increase in the duration of treatment.

The effectiveness of mint is due to the presence of a terpenoid compound called Cavvone at 55% in peppermint oil, as the average lethal concentration was 50% for *Sitophilus zeames* and *T. castaneum* 2.76 and 1.96 mg/L, in addition to the mint extract containing menthol and flavonoids, including thymonine, cafei acid and terpenes.

The results of this study agree with the findings of (Othman, 2018) in achieving a medium effect of mint leaf extract in killing the hairy beetle, as the average kill was 26.67, 70.0% at the concentration of 4.1%, respectively, and also agreed with the study (Ahmed, 2021) in that Increasing the exposure time increases the killing rates of the third instar larvae of the red rust flour beetle *T. castaneum*, as the corrected killing rates reached 66.67% after 24 hours of treatment, and the percentage increased to reach 82.76 and 100% after 48 and 72 hours of treatment, respectively.

Effect of anise oil on the fourth larval life of *C. pipiens* mosquitoes

The results of Table 2 showed that there were significant differences in the killing rates for the interaction between the concentrations and the duration of exposure, as the highest killing rate of fourth instar larvae was 4.6% at 2% concentration after 48 hours of treatment, while the lowest killing rate was 3.0% at concentration 5.0% after 24 hours. From the treatment, while the average rates of killing by the effect of the concentrations showed that the highest killing rate was at the 2% concentration, which amounted to 4.45%, while the lowest average killing rate was at the 5% concentration, reaching 3.15%. 48 hours passed, and it reached 97.3%, and the lowest killing rate after 24 hours was 65.3%. Through the results, it was found that the killing rates

of the fourth instar larvae increase with increasing concentration and increasing the duration of treatment.

The results of the study agreed with what was concluded by (Ibrahim & Alahmadi, 2015) in treating the larvae of *Oryctes agamemnon* with clove oil, as the killing rate was 98.7% at a concentration of 5% of the larvae of this insect. The results of the study also agreed with (El-sayed et al, 2022) on the effect of anise oil in killing the spider mite *Tetranychus urticae*, and the deadly effect of this insect was recorded after 24, 48, and 72 hours of treatment, as the anise oil killed at a concentration of 40 µl/l 0.96 % of red spiders after 72 hours of treatment.

Effect of SIVANTO on the fourth larval age of *C. pipiens* mosquitoes

The results of Table 3 showed that there were significant differences in the rates of killing for the interaction between

the concentrations and the duration of exposure, as the highest killing rate of the fourth instar larvae was 10% at the concentrations 1.5% and 2% after 48 hours of treatment, while the lowest killing rate was 8% at the concentration of 5.0%. After 24 hours of treatment, while the average rates of killing by the effect of the concentrations showed that the highest killing rate was at the 2% concentration, it was 10%, while the lowest average killing rate was at the 0.5% concentration, it was 8%, and the average killing rates by the effect of the duration of the killing were the highest. It was killed after 48 hours and reached 25.9% and the lowest killing rate after 24 hours was 25.9%. Through the results, it was found that the killing rates of the fourth instar larvae increase with increasing concentration and increasing the duration of treatment.

Table 1. Effect of peppermint oil on the fourth larval instar

Average killing rate%	The killing rate%		Concentration
	48 hours	24 hours	
2.45 B	2.6 c	2.3 c	0.5
2.80 B	3.3 b	2.3 c	1
4.45 A	4.6 a	4.3 a	1.5
4.45 A	4.6 a	4.3 a	2
0 C	0 d	0 d	Treatment of control
	3.77 a	3.30 a	Average killing rate%

Table 2 Effect of anise oil on the fourth larval instar

Average killing rate%	The killing rate %		Concentration
	48 hours	24 hours	
3.15 D	3.3 c	3.0 c	0.5
3.65 C	4.0 b	3.3 c	1
4.00 B	4.0 b	4.0 b	1.5
4.45 A	4.6 a	4.3 ab	2
0 E	0 d	0 d	Treatment of control
	3.97 a	3.65 a	Average killing rate%

Table 3 Effect of SIVANTO on the fourth larval instar

Average killing rate%	The killing rate %		Concentration
	48 hours	24 hours	
8 A	8 a	8 a	0.5
9 A	9 a	9 a	1
10 A	10 a	10 a	1.5
10 A	10 a	10 a	2
0 B	0 b	0 b	Treatment of control
	9.25 a	9.25 a	Average killing rate%

The results of this study agree with (Al-Douri, 2014) when Dichlorvos was used to control *C. pipiens* larvae, that the highest killing rate of the pesticide in the fourth larval age was 100% at concentration 100 gfm and the lowest killing rate was 66.16% at concentration 10 gfm 24 hours after the transaction.

Conflict of Interest

The author hereby declares no conflict of interest

Consent for publication

The author declares that the work has consent for publication

Funding support

The author declares that they have no funding support for this study

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How to cite this article

Yousef, S.H., Mustafa, H.A., Alwan, I.H. (2022). Effect of peppermint and anise oil and pesticide SIVANTO in the control of *Culex pipiens* (Diptera:Culicidae) mosquitoes. *Science Archives*, Vol. 3(3), 220-223. <https://doi.org/10.47587/SA.2022.3312>

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