Biochem. Cell. Arch. Vol. 21, No. 2, pp. 4785-4788, 2021	www.connectjournals.com/bca	*ISSN 0972-5075*
DocID: https://connectjournals.com/03896.2021.21.4785		*eISSN 0976-1772*

THE EFFECT OF DIFFERENT CONCENTRATIONS OF SOME MEDICINAL PLANTS ON THE KILLING RATE OF MOSQUITO LARVAE *CULEX* SP AND ITS COMPARISON WITH ICON PESTICIDE UNDER SEMI-FIELD CONDITIONS

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(Received 28 March 2021, Revised 21 May 2021, Accepted 31 May 2021)

ABSTRACT : A semi-field experiment was conducted to study the efficiency evaluation of some plant oils and comparing it with Public health pesticides against local mosquito larvae *Culex* sp in Hit in Anbar province, Western Iraq. The results of the total effect of oils (eucalyptus, thyme, peppermint) showed that the highest killing rate was (97, 94 and 94%) after 72 hours respectively compared to the Icon pesticide, which gave the highest killing rate of 100% after 20 hours. The highest killing rates (74, 78 and 80%) were reached for the concentrations of the oil (first, second and third) respectively (Regardless of the effect of the substance) after 72 hours. The results of overlap between the total effect of the material and the concentrations of the oils (eucalyptus, thyme, peppermint) showed that the highest killing rate reached 100% with the third concentration for each one after (20, 48, 48) hours respectively, compared with the Icon pesticide, which gave the highest killing percentage by concentration 3 reached 100% after 5 hours of treatment.

Key words : Medicinal plants, Icon pesticide, *Culex* sp, killing rate.

How to cite : Waad H. Al-Obaydi, Hiba Hashim Younes and Dhurgham D. Farhan (2021) The effect of different concentrations of some medicinal plants on the killing rate of mosquito larvae *Culex* sp and its comparison with Icon pesticide under semi-field conditions. *Biochem. Cell. Arch.* **21**, 4785-4788. DocID: https://connectjournals.com/03896.2021.21.4785

INTRODUCTION

Medical insects, including the sp Culex mosquito, are one of the most important disease-transmitting species in the world and Iraq (Sulayman, 2012), as it is responsible for transmitting many diseases, including yellow fever, malaria and West Nile fever (Muhanna and Naji, 2003).

Increasing the temperatures and humidity play an important role in increasing the reproduction and spread of mosquitoes, as well as the openings, ponds, open water tanks and rills are among the most important places for mosquitoes to spread, and the best spread times for them are at the beginning of the March and April until the end of September of the year (Sharma and Ansari, 1994).

Various methods have been used to control mosquitoes, including methods used widely such as chemical methods and insect growth regulators which gave satisfactory results in controlling the adult and immature stages of mosquitoes (Govere *et al*, 2000). As well as, bacterium Bacillus Thuringiensis as Biological methods, were used at the limited level in several studies to assess its effectiveness and results were fairly good (Paul *et al*, 2005). Medicinal plant oils (Aromatic oils) were used in many studies, such as thyme oil, olive oil and others (Barasa *et al*, 2002; Agnihotri *et al*, 2016).

For modern methods, using irradiation in male sterility has been invented in some developed countries, while in Iraq, traditional methods are still used, which are evening fogging operations near mosquito breeding areas through mobile teams affiliated to the health and environment departments in some areas to the west, south and center of Iraq. For academic studies, orientation toward finding a safe and effective way to control the spread of mosquitoes.

This study aimed to use environmentally safe vegetable oils for humans, their domestic animals, fish and other aquatic organisms, inexpensive, easy to use and available in the local market, and to compare their effectiveness with a public health pesticide in controlling *Culex* mosquitoes, which are abundant in all Anbar regions in general and the West in particular, due to their harm on

the human being health in those areas.

MATERIALS AND METHODS

The insects were breeding using glass basins with dimensions of 50 × 150 × 60 cm, with water inside and left for a period from 15/1 to 1/3/2019. The basins left exposed to attract female mosquitoes to laying eggs, after the insects reproduced and produced several generations, the insect farm became ready. The second and third age of larvae were used in the experience.

Materials

1. British origin Icon pesticide in three concentrations (0.25, 0.50 and 1) ml / 100 ml water

2. Eucalyptus oil in three concentrations (0.10, 0.20 and 0.30) ml / 100 ml water

3. Thyme oil in three concentrations (0.10, 0.20 and 0.30) ml / 100 ml water

4. Peppermint oil in three concentrations (0.10, 0.20 and 0.30) ml / 100 ml water

Experimental units

Total 250ml transparent mineral water cans were used, 100 ml of water were placed in each container with 3 replicates for each concentration and 10 larvae were included per replicate.

The larvae were introduced into the cans using a small metal clip and the concentrations of the materials were added to it using 1 ml medical syringe for each replicate. The control treatment was left without any addition. Readings were taken after (1, 5, 10, 15, 20, 24, 36, 48 and 72 hours). Dead larvae were excluded at each reading in order not to affect death rates in subsequent readings.

Statistical analysis

The experiment was designed using (RCBD). The results were analyzed statistically according to the Duncan multiple range test at a 5% probability level and using (S.A.S) program.

RESULTS AND DISCUSSION

The effect of chemical pesticides and oils, regardless of concentrations

The results of Table 1 showed that the total effect of the pesticide Icon and vegetable oils such as (Eucalyptus, Thyme, Peppermint), regardless of their concentrations, affected the percentage of mosquito larvae *Culex* sp killing. The pesticide Icon gave the highest killing rate of 100% after 20 hours, followed by Eucalyptus oil, with a killing rate of 80% and then peppermint oil 61%. Also, the highest pesticide killing rates appeared after 36 hours, reached 100%, without a significant difference, compared to Eucalyptus oil, which gave a killing rate of 91%, followed by Peppermint oil, with a killing rate of 87%, and without a significant difference between them, compared to the control treatment that gave a killing rate of 0%. After 72 hour, the killing rate increased to 94, 97, 94%, respectively without significant difference between them and without a significant difference from the Icon pesticide. While the killing rate for the control treatment reached 0%.

The reason for the effectiveness of these oils in comparison with the control treatment may be due to the presence of aromatic toxic substances to mosquito larvae, in addition to the physical effect of the oil, which form a layer that impedes the respiration of the larvae.

The effect of chemical pesticide concentrations and vegetable oils (Eucalyptus, Thyme, Peppermint) on the percentage of killing the mosquito larvae *Culex* sp, regardless of the effect of the substance itself

The results of Table 2 showed that there were significant differences between the concentrations of the pesticide Icon and plant oils (Eucalyptus, Thyme, Peppermint) in the killing rate of the mosquito larvae *Culex* sp. The concentration of third treatment which reached 80% surpassed the other concentrations, without a significant difference from second concentration. While, the first treatment gave the lowest killing rate of 74%,

Table 1 : The total effect of Icon and plant oils (Eucalyptus, Thyme and Peppermint) concentrations in killing rate of mosquito larvae *Culex* sp.

Treatments	Killing rate % after (1) hour	Killing rate % after (5) hour	Killing rate % after (10) hour	Killing rate % after (15) hour	Killing rate % after (20) hour	Killing rate % after (24) hour	Killing rate % after (36) hour	Killing rate % after (48) hour	Killing rate % after (72) hour
Icon	50 A	87 A	98 A	98 A	100 A	100 A	100 A	100 A	100 A
Eucalyptus oil	0 B	8.8 B	37 B	63 B	80 B	86 B	91 AB	93 AB	94 A
Thyme oil	0 B	5.5 BC	13 C	20 D	28 D	34 D	60 C	82 C	97 A
Peppermint oil	0 B	1.1 BC	15 C	32 C	61 C	77 C	87 B	91 B	94 A
Control	0 B	0 C	0 D	0 E	0 E	0 E	0 D	0 D	0 B

• Treatments with the same letter have not significant differences depending on Duncan test with 5% probability.

Table 2 : The effect of concentration on the Killing rate of mosquito larvae Culex sp, regardless of the effect of the substance.

Treatments	Killing rate % after (1) hour	Killing rate % after (5) hour	Killing rate % after (10) hour	Killing rate % after (15) hour	Killing rate % after (20) hour	Killing rate % after (24) hour	Killing rate % after (36) hour	Killing rate % after (48) hour	Killing rate % after (72) hour
First concentration	6.6 B	15 B	23 B	31 C	44.6 C	49 C	59 B	66 C	74 B
Second concentration	10 A	21 A	34 A	43 B	53 B	60 B	69 A	74 B	78 AB
Third concentration	12 A	25 A	42 A	54 A	64 A	69 A	74 A	80 A	80 A

• Treatments with the same letter have not significant differences depending on Duncan test with 5% probability.

Table 3 : The overlap between the total effect of the materials used and the effect of the concentrations used of the pesticide Icon and plant oils (Eucalyptus, Thyme and Peppermint) on the killing rates of mosquito larvae.

Treatments	Killing rate % after (1) hour	Killing rate % after (5) hour	Killing rate % after (10) hour	Killing rate % after (15) hour	Killing rate % after (20) hour	Killing rate % after (24) hour	Killing rate % after (36) hour	Killing rate % after (48) hour	Killing rate % after (72) hour
A1B1	33 C	73 B	96 A	96 A	100 A	100 A	100 A	100 A	100 A
A1B2	53 B	90 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A
A1B3	63 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A	100 A
A2B1	0 D	3.3 C	13 D-F	30 C-E	56 BC	66 CD	80 BC	86 AB	86 B
A2B2	0 D	13 C	46 BC	73 B	86 A	93 A	93 AB	93 AB	96 A
A2B3	0 D	10 C	53 B	86 AB	96 A	100 A	100 A	100 A	100 A
A3B1	0 D	0 C	3.3 F	10 EF	10 DE	10 F	33 D	60 C	93 AB
A3B2	0 D	3.3 C	6.6 EF	13 EF	23 D	33 E	66 C	86 AB	100 A
A3B3	0 D	13 C	30 CD	36 CD	53 C	60 D	80 BC	100 A	100 A
A4B1	0 D	0 C	3.3 F	20 D-F	56 BC	70 CD	83 A-C	83 B	90 AB
A4B2	0 D	0 C	16 D-F	30 C-E	56 BC	76 BC	86 AB	90 AB	93 AB
A4B3	0 D	3.3 C	26.6 C-E	46 C	70 B	86 AB	93 AB	100 A	100 A
A5B1	0 D	0 C	0 F	0 F	0 E	0 F	0 E	0 D	0 C
A5B2	0 D	0 C	0 F	0 F	0 E	0 F	0 E	0 D	0 C
A5B3	0 D	0 C	0 F	0 F	0 E	0 F	0 E	0 D	0 C

* The letter A symbolizes the type of substance used (A1: Icon pesticide, A2: Eucalyptus oil, A3: Thyme oil, A4: Peppermint oil, A5 control treatment)

** The letter B symbolizes the concentration (B1: first concentration, B2: second concentration, B3: third concentration)

• *** Treatments with the same letter have not significant differences depending on Duncan test with 5% probability.

with a significant difference from the first and second concentrations.

The interaction between the total effect of the materials used and the effect of the concentrations of the pesticide Icon and plant oils (Eucalyptus, Thyme, Peppermint) on the killing rates of mosquito larvae *Culex* sp.

The results of Table 3 showed that the superiority of the treatment of the pesticide Icon after (5) hours over the rest of the materials at the three concentrations, as the rate of killing larvae reached (100, 90, 73%) for the first, second and third concentrations, respectively. The Icon pesticide was superior at three concentrations after 10 hours, followed by the third concentration of Eucalyptus oil, which gave a killing rate of 53%.

The results also showed, after 24 hours of treatment, the pesticide was superior for the three concentrations, with the third concentration of Eucalyptus oil without significant difference, with a killing rate of 100% for each of them, followed by the second concentration of Eucalyptus oil, with a killing rate of 93% and without a significant difference from the third concentration of Peppermint oil, with a killing rate of 86%. Perhaps the reason for the superiority of Eucalyptus oil over the rest of the oils used is the presence of (citronellal, citronellol, citronelly1 acetate, p-cymene, eucamalol, allocimene and aromadendrene), which are considered to have a toxic effect that kills or repels insects (Watanabe *et al*, 1993;

Liu *et al*, 2008).

The killing percentage after 36 hours of treatment was 100% for each of the pesticide Icon and Eucalyptus oil at the third concentration. Followed by the second concentration of Eucalyptus oil by a killing rate of 93%, without a significant difference from the second and third concentrations of peppermint oil, with a killing rate of (93 and 86%) for each, respectively.

The results showed that the killing rate, after 48 hours of treatment, reached 100% for each of the pesticide Icon with the three concentrations and the third concentration of each of Eucalyptus

Oil, thyme and peppermint, followed by the second and first concentrations of Eucalyptus oil at a killing rate of 86 and 93%, respectively, then the second concentration of peppermint oil, with a killing rate of 90%, without a significant difference to the second concentration of thyme oil, with a killing rate of 86%. On the other hand, after 72 hours of treatment, the killing rate reached 100% for each of the pesticides, at three concentrations with third concentrations of Eucalyptus oil, and the second and third concentrations of thyme oil. The reason for the high killing rate of thyme oil may be due to the presence of Thymol and Carvacrol, which is poisonous to insects and this is consistent with what was mentioned by Chol *et al* (2002). In addition to, In addition to the third concentration of Peppermint oil, without significant differences for all concentrations was used, except of the first concentration of Eucalyptus oil which reached 86%, with a very large significant difference compared with a control treatment which reached a 0% killing rate, for all the studied readings.

From the results between the effect of the pesticide Icon and the oils on the caloric content of mosquito larvae, the cause of the killing is due to the presence of aromatic oils toxic to the mosquito larvae, including thymol and carvacrol for thyme oil and citronellal and citronellol for Eucalyptus oil, as well as the presence of resveratrol that found in Eucalyptus trees in addition to Menthon, Menthol and limonene in peppermint oil.

CONCLUSION

The results of the total effect of oils (eucalyptus, thyme, peppermint) showed that the highest killing rate after 72 hours respectively compared to the Icon pesticide, which gave the highest killing rate of 100% after 20 hours. The highest killing rates were reached for the concentrations of the oil (first, second and third) respectively (Regardless of the effect of the substance) after 72 hours. The results of overlap between the total effect of the material and the concentrations of the oils (eucalyptus, thyme, peppermint) showed that the highest killing rate reached 100% with the third concentration for each one after 20, 48, 48 hours respectively, compared with the Icon pesticide, which gave the highest killing percentage by concentration 3 reached 100% after 5 hours of treatment.

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