

EVALUATION OF SIX ESSENTIAL OILS FOR CONTROLLING COTTON APHID AND POTENTIAL USE IN THE ORGANIC AGRICULTURE

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ABSTRACT

The cotton aphid, *Aphis gossypii* Glover (Hemiptera: Aphididae), is one of the most widespread pests worldwide on host plants, including fruits, vegetables, and ornamental plants, in open fields or under greenhouse conditions. Their damage is not only caused by sucking the juice from plant tissue but also by their ability to transmit many viruses. In this study, *A. gossypii* individuals were collected in the seasons of 2022 and 2023 in order to conduct a series of bioassay experiments to evaluate six essential oils, which were Cloves (*Syzygium aromaticum*), Thyme (*Thymus vulgaris*), Rosemary (*Salvia rosmarinus*), Lavender (*Lavandula coronopifolia*), Coriander (*Coriandrum sativum*), and Anise (*Pimpinella anisum*), toward *A. gossypii* adults in different concentrations under laboratory conditions. Results showed that all tested essential oils had varying effects on *A. gossypii* adults. The most effective essential oil was Cloves, with an LD50 of 2.98, followed by Thyme and Lavender, with LD50 at 3.28 and 4.40, respectively. While other essential oils, Rosemary, Coriander, and Anise, had fewer effects against *A. gossypii*. The results suggested that Clove, Thyme, and Lavender essential oils, at the corresponding doses, can be used as insecticides as a safe alternative to synthetic pesticides in both IPM and organic approach farms to manage *A. gossypii*.

Key words: cloves, thyme, lavender, rosemary, coriander, botanical insecticides, *Aphis gossypii*.



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INTRODUCTION

Arthropods are the most important global pests due to their direct and indirect effects on crop yields (Khalaf & Ahmed, 2025). The cotton aphid *Aphis gossypii* Glover (Hemiptera: Aphididae) is one of the most widespread pests that may play a fundamental role in reducing the yield of many crops such as cotton, watermelon, potatoes, eggplant, and others due to their direct feeding damage on tree, leaves and stems, or indirect by vectoring many viruses, for instance, cotton leaf stunting virus (Ali & Kamal, 2018; Heilsnis et al., 2023; Li et al., 2022). In this context, farmers mainly rely on the use of synthetic pesticides to control them (Isman, 2020b). However, the

widespread use of chemical pesticides of various types has led to many harmful effects on human health and mammals, as well as the emergence of resistance in new pests and soil and water pollution (Ali, 2017; Sabr, 2010). Its effects also include disrupting biological control of insect pests and increasing their resistance to pesticides (Ahmed & Ren, 2023; Ahmed et al., 2022; Isman, 2006). For instance, *A. gossypii* and *Myzus persicae* were very resistant to oxydemeton-methyl and pirimicarb insecticides in several countries (Blackman and 2000; Hadi, 2017). Moreover, in China, *A. gossypii* populations in cotton fields have developed high resistance to omethoate, cypermethrin, and deltamethrin

(Patima et al., 2019). Therefore, there is an urgent need to find safe alternatives to control pests (Ahmed & Ren, 2023; Ahmed et al., 2022). Essential oils are among the most promising natural alternatives produced by plants. It is also known as a secondary metabolite with a distinctive smell (Ahmed & Ren, 2023). Most contain natural antioxidants, antimicrobial agents, and insecticidal properties (Isman, 2006). Essential oils can be obtained using several methods, including mechanical pressure, distillation, and extraction (Bakkali et al., 2008). Essential oils are also characterized by being less toxic to humans and nature without leaving toxic residues. For instance, peppermint and spearmint essential oils declined by about 90% within 30 days in soil (Karamanoli et al., 2018). This gives them a preference to use organic farms as well. Various studies have indicated that plant essential oils are highly effective when applied by fumigation or in contact with controlling sucking insect pests, such as aphids, such as pennyroyal *Mentha pulegium* L., peppermint *M. piperita* L., and basil *Ocimum basilicum* L.), which showed high efficacy when applied in fumigation or contact treatment tested toward *M. persicae*, *Lipaphis pseudobrassicae*, and *A. gossypii* (Alim et al., 2015; Attia et al., 2016). At a commercial level, natural products are widely used for their effectiveness and economic importance; for instance, after neem oil, orange oil was the second most widely used for pest control in California (USA) in 2016 (Isman, 2020a). Furthermore, many studies have shown that limonene extracted from citrus peels is highly effective as an insecticide in Europe and North America (Isman, 2020b). In the same context, *M. longifolia* L., *Lavandula angustifolia*, and *Artemisia dracunculus* oils had fumigant and contact activities toward *A. craccivora* Koch, *Acyrtosiphon pisum*, *A. craccivora*, and *A. gossypii*. They affected their development and reproduction (Attia et al., 2016; Mousavi & Valizadegan, 2014; Saifi et al., 2023). Rapeseed oil significantly reduces damage caused by the black cherry aphid, *M. cerasi*, in sweet cherries. Tea tree oil was also used to

control *A. gossypii* on sweet pepper under glasshouse conditions (Ahmed, 2022). The objective of this study was to evaluate the insecticidal activity of six essential oils as follows: Cloves, Thyme, Rosemary, Lavender, Coriander, and Anise to control *A. gossypii* adults in different concentrations under laboratory conditions.

MATERIALS AND METHODS

Insect rearing: The colony of *A. gossypii* was obtained and collected from eggplant by taking the leaves of the plant that infected by the insect from Baghdad GPS Coordinate (Latitude, Longitude) shown below, in 2022: 33.187881; 43.995995; 33.198491, 43.981983; 33.194906, 44.007191; 33.197572, 43.994949; and in 2023: 33.237517, 43.961155; 33.216328, 43.955115; 33.237975, 43.950901; 33.201551, 44.004081. The colony was identified, established, and regularly maintained at the Department of Plant Protection, Agricultural Engineering Sciences, University of Baghdad, using individuals collected from eggplant fields (local cultivated varieties). Insects were reared in the climatic chamber (Percival Scientific, USA) (25 ± 2 °C, $65 \pm 10\%$ RH, photoperiod 16 L:8 D) in $40 \times 40 \times 90$ cm cages. The colony was fed eggplant leaves to replace them when needed. Adults were used individually in laboratory experiments.

Laboratory evaluation: After obtaining the required Essential oils from Green Fields Oils Company (Princess Raya 113; Amman 11910, Jordan), 90 mm Petri dishes, and qualitative filter paper with a diameter of 9.0cm were prepared. Ethyl alcohol was also prepared at a concentration of 99.9 % from CHEM-LAB (De Arend 2, 8210 Zedelgem, Belgium) in sealed 30 ml glass tubes. Twenty adult insects (aphids) were placed using a soft brush for each dish (BioQuip, CA, USA). Different concentrations (2.5, 5, 10, and 15%) of the essential oils under study (Anise, Rosemary, Thyme, Lavender, Clove, and Coriander) were prepared following (Ahmed et al., 2022), and 300 microliters of each concentration was added for each treatment, which was made in three replicates. Before placing the insects, holes were drilled into the Petri dish cover, the

cover was covered with light fabric mesh, and the dish was treated with the required concentrations after leaving it in the air for minutes to allow the solvent to evaporate. As for the control treatment, it was done with the solvent only. The number of dead aphids was counted at 1, 3, 6, 8, and 24 hours after treatment. The lethal dose values were calculated, and the death rate was corrected using the Abbott equation (Abbott, 1925).

Statistical analysis: The data obtained from the laboratory experiments were analyzed using a one-way ANOVA followed by an LSD test. The normality and homogeneity of variances were tested using the same procedure (Ahmed, 2022). The statistical analyses were performed using SPSS V.26.

RESULTS AND DISCUSSION

The results of the laboratory evaluation with Anise oil are reported in Figure 1. Where the significant differences were observed only after 24 h from the treatment ($p = 0.04$). Specifically, the highest percentage of dead insects was 21% at a 15% concentration, while other concentrations recorded lower death rates, reaching 6.6, 6.6, and 11.6% at 2.5, 5, and 10%, respectively. Moreover, the results for Rosemary oil Figure 2 showed no significant differences between the treatments. Furthermore, the results for Coriander oil reported in Figure 3 showed no significant differences between the treatments. The results for Thyme oil are reported in Figure 4, showing significant differences between the treatments at 1h, 3h, 6h, 8h, and 24h ($p = 0.001$). Specifically, the highest percentage of dead insects was 92% at a 15% concentration, while other concentrations recorded lower death rates, reaching 28.3%, 43.3%, and 81.6% at 2.5%, 5%, and 10%, respectively. However, the results for Clove oil (Figure 5) showed significant differences between the treatments at 1, 3, 6, 8, and 24 h ($p = 0.001$). Particularly, the highest percentage of dead insects was 95% at a 15% concentration, while other concentrations recorded lower death rates, reaching 31.6%, 50%, and 83.3% at 2.5%, 5%, and 10%, respectively. For the Lavender oil Figure (6), the results showed significant differences between the treatments

at 1h, 3h, 6h, 8h, and 24h ($p = 0.001$). The highest death rate was 88.3% at a 15% concentration, while lower concentrations showed lower mortality: 33.3%, 41.6%, and 65% at 2.5%, 5%, and 10%, respectively. While control treatments reached 13.3% mortality after 24h. Furthermore, the dose-response model of the three effective essential oils against *A. gossypii* is presented in Table 1, in the form of lethal doses at 25, 50, 75, and 90% (LD25, LD50, LD75, and LD90). The toxicity of Cloves (*S. aromaticum*), Thyme (*T. vulgaris*), and Lavender (*L. coronopifolia*) essential oils was varied. In particular, the bioassay indicated that Cloves (*S. aromaticum*) were most toxic, with an LD50 of 2.98 %, while Thyme (*T. vulgaris*) and Lavender (*L. coronopifolia*) had LD50s of 3.22 and 4.40 %, respectively. Finding alternatives to achieve comprehensive, effective IPM practices across multiple directions is key to increasing crop yield (Khalaf & Ahmed, 2025). In the last decade, interest in essential oils as biological products in agriculture has increased, providing alternative, safe resources for controlling pests, especially aphids. This is because the increasing use of synthetic chemical pesticides over the years has led to the emergence of resistance in many arthropod species, in addition to their high toxicity to living organisms and the environment (Rawat, 2021). In this study, we assessed the insecticidal activity of six essential oils (Cloves *S. aromaticum*, Thyme (*T. vulgaris*), Rosemary (*S. Rosmarinus*), Lavender (*L. coronopifolia*), Coriander (*C. sativum*), and Anise (*P. anisum*) against *A. gossypii* adults under laboratory conditions. The tested essential oil had varying effects on the adults of *A. gossypii*. The most effective essential oil was Cloves (LD50 = 2.98), followed by Thyme and Lavender, with LD50 at 3.28 and 4.40, respectively. While other essential oils, Rosemary, Coriander, and Anise, had fewer effects against *A. gossypii*. In general, plant essential oils can affect the development and survival of aphids due to the composition of their chemical profile, which differs in the qualitative and quantitative aspects of each essential oil with different modes of action; for

instance, *Tagetes minuta* L. essential oil significantly reduced the fecundity and development of *M. persicae*, *Aulacorthum solani* Kaltenbach, and *A. pisum* Harris (Tomova et al., 2005). Moreover, the effects of essential oil on the nervous system of insect pests were demonstrated in several studies, for instance, The exposure of *Trichoplusia ni* Hübner (Lepidoptera: Noctuidae),

Callosobruchus maculatus Fabricius (Coleoptera: Chrysomelidae) and *Bemisia tabaci* (Hemiptera: Aleyrodidae) to lemongrass essential oil in contact or fumigation has effect to nervous system thus, it negatively affected their growth and development (Al-Saidi et al., 2022; Castilhos et al., 2018), which support the finding of this study.

Table 1. A lethal dose of effective essential oils, Cloves (*Syzygium aromaticum*), Thyme (*Thymus vulgaris*), and Lavender (*Lavandula coronopifolia*) against *Aphis gossypii* after 24 h of exposure time.

Essential oil*	No. of insects	Estimated dose %	Lethal dose %	95% confidence -	Slope +se
Cloves (<i>Syzygium aromaticum</i>)	20	LD25	1.50	0.93 - 2.39	2.25 ± 0.1
	20	LD50	2.98	1.87 - 4.77	
	20	LD75	5.95	3.72 - 9.50	
	20	LD90	11.06	6.92 - 17.67	
Thyme (<i>Thymus vulgaris</i>)	20	LD25	1.48	0.88 - 2.48	1.95 ± 0.11
	20	LD50	3.28	1.96 -5.49	
	20	LD75	7.28	4.35 -12.15	
	20	LD90	14.88	8.91 - 24.86	
Lavender (<i>Lavandula coronopifolia</i>)	20	LD25	1.66	0.92 - 3.00	1.60 ± 0.13
	20	LD50	4.40	2.44 - 7.93	
	20	LD75	11.64	6.45 - 20. 98	
	20	LD90	27.93	15.49 - 50.33	

*Only the effective essential oils reported the lethal dose percentage in the table because other essential oils did not reach the LD50

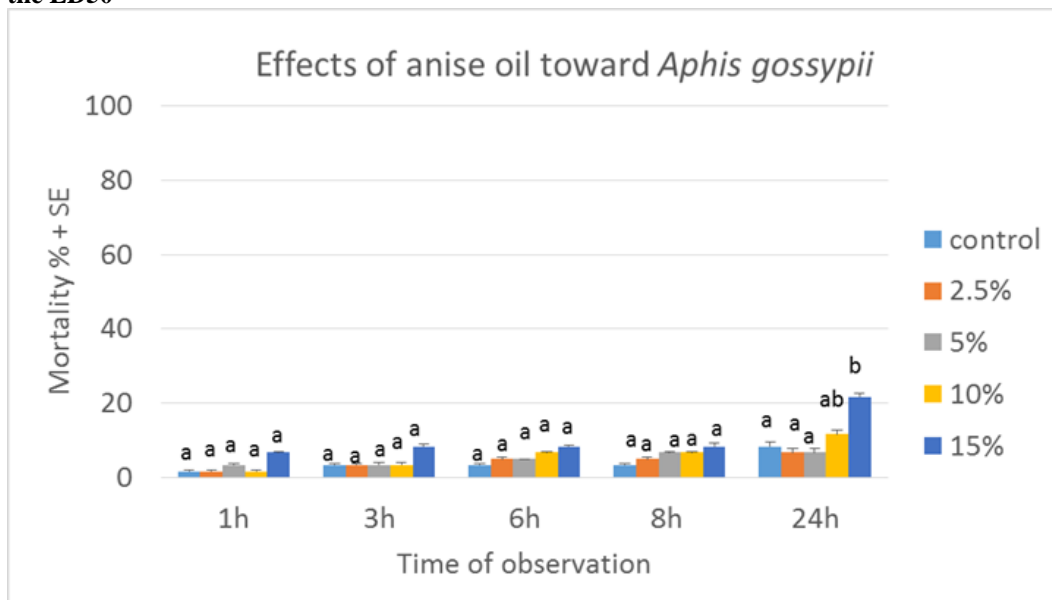


Figure 1. Mean ± SE percent *Aphis gossypii* individuals die after being treated with Anise oil. The letters indicate that values differ statistically at p < 0.05 (one-way ANOVA, followed by LSD).

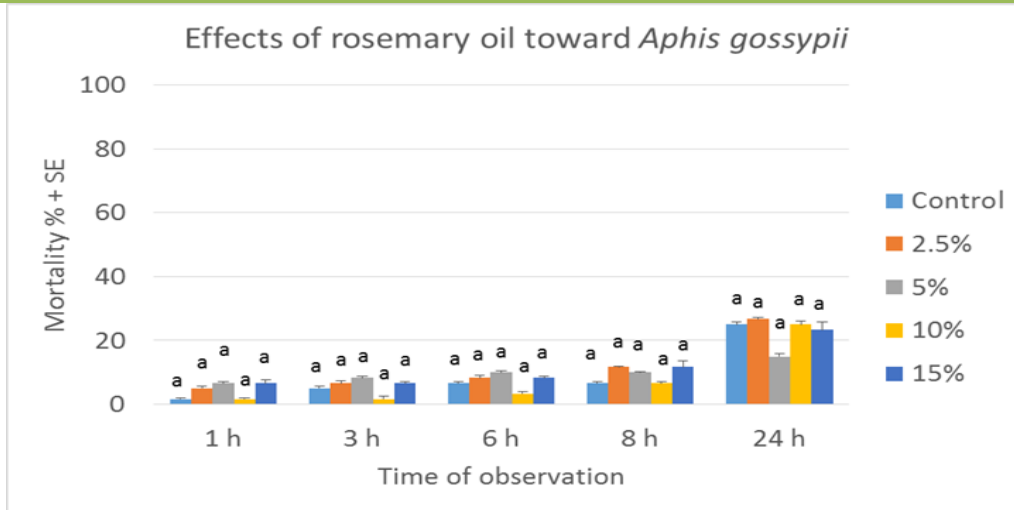


Figure 2. Mean \pm SE percent *Aphis gossypii* individuals die after being treated with Rosemary oil. The letters indicate that values differ statistically at $p < 0.05$ (one-way ANOVA, followed by LSD).

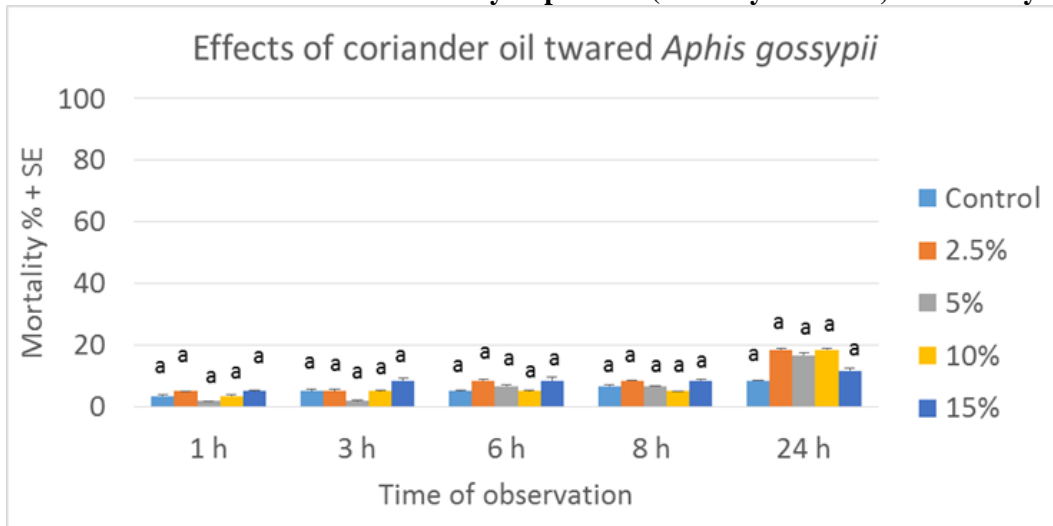


Figure 3. Mean \pm SE percent *Aphis gossypii* individuals died after being treated with Coriander oil. The letters indicate that values differ statistically at $p < 0.05$ (one-way ANOVA, followed by LSD).

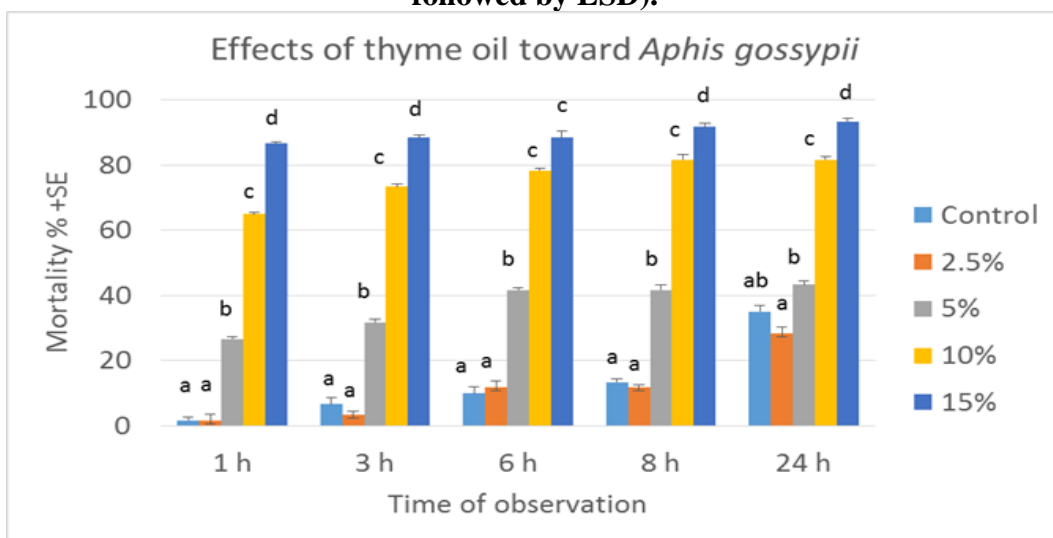


Figure 4. Mean \pm SE percent *Aphis gossypii* individuals die after being treated with Thyme oil. The letters indicate that values differ statistically at $p < 0.05$ (one-way ANOVA, followed by LSD).

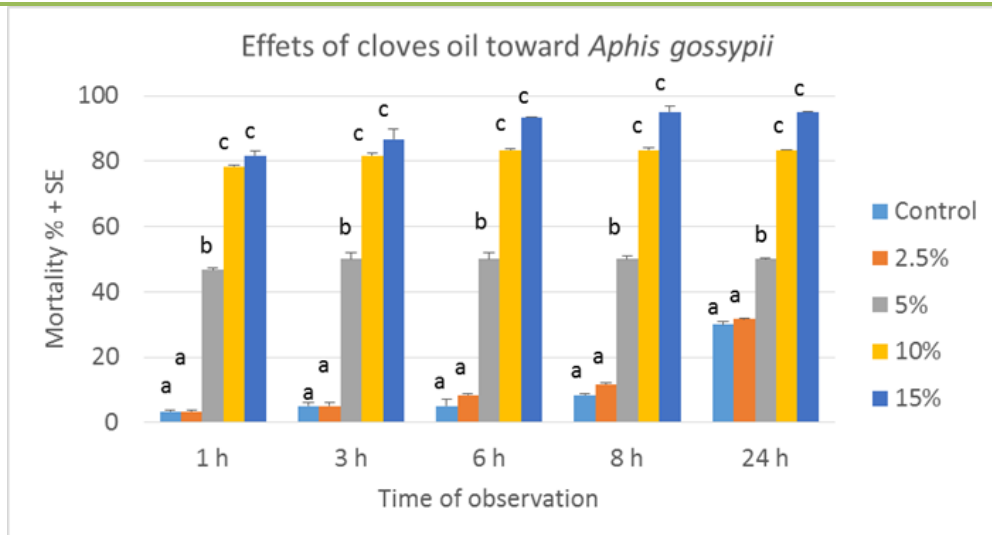


Figure 5. Mean \pm SE percent *Aphis gossypii* individuals die after being treated with Clove oil. The letters indicate that values differ statistically at $p < 0.05$ (one-way ANOVA, followed by LSD)

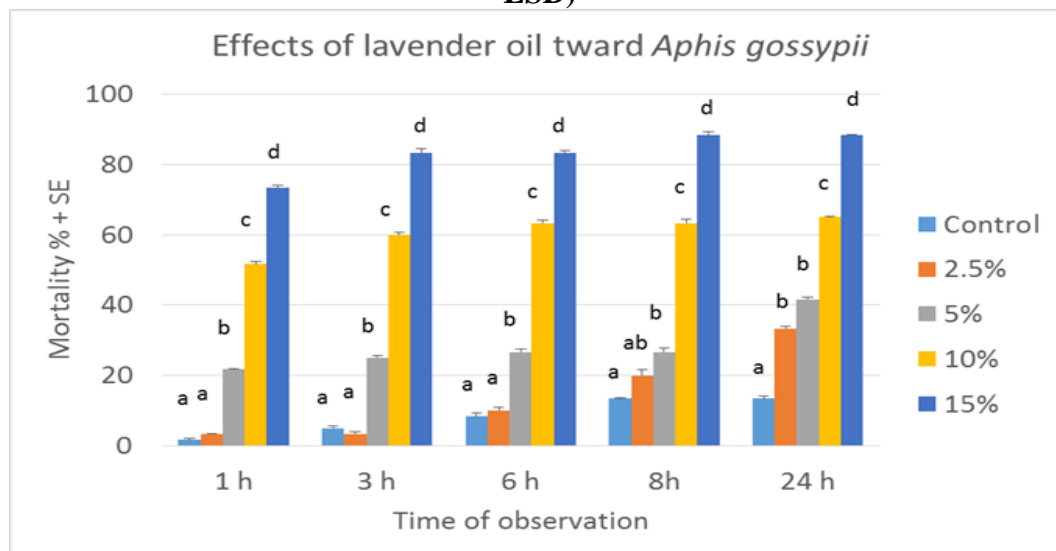


Figure 6. Mean \pm SE percent *Aphis gossypii* individuals die after being treated with Lavender oil. The letters indicate that values differ statistically at $p < 0.05$ (one-way ANOVA, followed by LSD)

The practical use of essential oils as insecticides may be due to their monoterpenes and sesquiterpenes (Nejad et al., 2013; Ahmed & Hermize, 2023). These compounds are lipophilic, usually volatile, and can rapidly penetrate insect bodies, thereby affecting their growth and physiological functions (Isman, 2006; Bakkali et al., 2008). Furthermore, not only do the quantity and quality of compounds determine the toxicity of essential oils, but even compounds that may appear in very small proportions may affect vital functions in insect activity, such as antagonism or synergism (Chiasson et al., 2001). The study found that Clove essential oil shows promise as a plant-

based insecticide because it contains compounds detected by GC-MS, such as eugenol (88.61%), eugenol acetate (8.89%), and β -caryophyllene. This represents 99.89% of its components and is also known for its insecticidal properties (Ahmed & Ren, 2023; Raed et al., 2022; Tian et al., 2015). Thyme (*T. vulgaris*) essential oil was also highly effective against aphids. This may be because its components contain thymol and carvacrol, which also have well-known pesticide properties against many insects (Dumra et al., 2024), for instance against aphid *M. persicae* and the larvae of lesser mealworm, *Alphitobius diaperinus* Panzer (Coleoptera: Tenebrionidae)

(Oulebsir-Mohandkaciet al., 2015; Szczepanik et al., 2012). Finally, Lavender (*L. coronopifolia*) also showed high effectiveness against *A. gossypii*. Lavender species are widely investigated as insect pests. For instance, *L. angustifolia* Mill has showed insecticidal activity against purple scum springtails *Hypogastrura vernalis* and pea aphid *A. pisum*, this activity due to the chemical composition, which was linalool with the most abundant component (38.57%), followed by linalyl acetate (29.95%), 1,8-cineole (13,66%), camphor (13,13%), alpha-pinene (3,14%) and terpinene-4-ol (1,54%) (Attia et al., 2016; Ahmed & Ren, 2023).

CONCLUSION

This study suggested the potential of using Clove, Thyme, and Lavender essential oils at the corresponding doses as insecticides. Essential oils can be applied as a safe alternative to synthetic pesticides in both IPM and organic approach farms to manage *A. gossypii*.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR/S DECLARATION

We confirm that all Figures and Tables in the manuscript are original to us. Additionally, any Figures and images that do not belong to us have been incorporated with the required permissions for re-publication, which are included with the manuscript.

Author/s signature on Ethical Approval Statement.

Ethical Clearance and Animal Welfare

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AUTHOR'S CONTRIBUTION STATEMENT

Conceptualization - Qasim and Alaa; Data curation - Qasim; Investigation - Qasim;

Methodology - Qasim and Alaa; Project administration - Qasim; Resources - Qasim and Alaa; Supervision - Qasim; Writing original draft - Alaa; Writing, reviewing, and editing - Qasim and Alaa. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Abbott, W. S. (1925). A method of computing the effectiveness of an insecticide. *Journal of Economic Entomology*, 18(2), 265–267.

Ahmed, Q. (2022). Evaluation of tea tree extract formulation for the control of the cotton aphid, *Aphis gossypii* (Homoptera: Aphididae) on *Capsicum annuum* in the glasshouse. *Journal of Biopesticides*, 15(1), 31–38.

<https://doi.org/10.57182/jbiopestic.15.1.31-38>

Ahmed, Q. H., & Ren, Y. (2023). Postharvest treatment of celery *Apium graveolens* using essential oils and cold treatment to control springtails *Hypogastrura vernalis* (Collembola: Hypogastruridae). *Anbar Journal of Agricultural Sciences*, 21(2), 298–308.

<https://doi.org/10.32649/ajas.2023.140838.1045>

Ahmed, Q., & Hermize, F. B. (2023). The Presence of Whitefly *Bemisia tabaci* and Thrips *Thrips tabaci* on Different Cucumber Plant Hybrid Varieties in the Field Conditions. In *IOP Conference Series: Earth and Environmental Science*, 1252 (1): 012009. IOP Publishing.

[https://doi.org/10.1088/1755-](https://doi.org/10.1088/1755-1315/1252/1/012009)

[1315/1252/1/012009](https://doi.org/10.1088/1755-1315/1252/1/012009).

Ahmed, Q., Agarwal, M., Al-Obaidi, R., Wang, P., & Ren, Y. (2021). Evaluation of aphicidal effect of essential oils and their synergistic effect against *Myzus persicae* (Sulzer)(Hemiptera: Aphididae). *Molecules*, 26(10), 3055.

<https://doi.org/10.3390/molecules26103055>

Ali, H. B. (2017). Seasonal population abundance of the *Chrysanthemum* aphids (Homoptera: Aphididae) in the middle of Iraq, with a pictorial key to species. *Bulletin of the Iraq Natural History Museum*, 14(4), 315–328.

<https://doi.org/10.26842/binhm.7.2017.14.4.0315>

- Ali, H. B., & Kamal, R. S. (2018). Faunistic review of the genus *Chaitophorus* Koch, 1854 (aphididae, chaitophorinae, chaitophorini) with new record species for Iraq aphid fauna. *Bulletin of the Iraq Natural History Museum*, 15(2), 145–151.
<https://doi.org/10.26842/binhm.7.2018.15.2.0145>
- Alim, M. A., Naher, H., Habib, A. S., & Islam, M. A. (2015). Integrated management of cotton aphid, *Aphis gossypii*, on roof-planted eggplant, *Solanum melongena*. *Bangladesh Journal of Zoology*, 43(1), 19–26.
<https://doi.org/10.3329/bjz.v43i1.26134>.
- AL–Jorany, R. S., Yousif, A. H., & Sadik, F. H. (2016). Population density and susceptibility of some varieties of potato to infested by aphid and thrips on spring plantation in the middle of Iraq. *Baghdad Science Journal*, 13(2), 4.
<https://doi.org/10.21123/bsj.2016.13.2.0234>.
- Al-Saidi, S. S., & Al-Obaidy, S. H. (2022). Induced resistance of cucumber *Cucumis Sativus* L. to whitefly *Bemisia Tabaci* by silicon. *International Journal of Agricultural and Statistical Sciences*, 18, 2147–2152.
<https://doi.org/10.03899/2022.18.2147>
- Attia, S., Lognay, G., Heuskin, S., & Hance, T. (2016). Insecticidal activity of *Lavandula angustifolia* Mill. against the pea aphid *Acyrtosiphum pisum*. *Journal of Entomology and Zoology Studies*, 4(1), 118–122.
<https://doi.org/10.2268/189996>
- Bakkali, F., Averbeck, S., Averbeck, D., & Idaomar, M. (2008). Biological effects of essential oils—a review. *Food and chemical toxicology*, 46(2), 446–475.
<https://doi.org/10.1016/j.fct.2007.09.106>.
- Blackman, R. L., & Eastop, V. F. (1984). *Aphids on the World's Crops. An identification and information guide* (No. Ed. 2). John Wiley and Sons Ltd. 466 P.
- Castilhos, R. V., Grützmaker, A. D., & Coats, J. R. (2018). Acute Toxicity and Sublethal Effects of Terpenoids and Essential Oils on the Predator *Chrysoperla externa* (Neuroptera: Chrysopidae). *Neotropical entomology*, 47(2), 311–317.
<https://doi.org/10.1007/s13744-017-0547-6>
- Chiasson, H., Bélanger, A., Bostanian, N., Vincent, C., & Poliquin, A. (2001). Acaricidal properties of *Artemisia absinthium* and *Tanacetum vulgare* (Asteraceae) essential oils obtained by three methods of extraction. *Journal of Economic Entomology*, 94(1), 167–171.
<https://doi.org/10.1603/0022-0493-94.1.167>
- Dumra, N., Rolania, K., Khalaf, L. K., Yadav, S. S., Mandhania, S., Sharma, Y. K., & Choudhary, A. (2024). Comparative evaluation of sublethal doses of different insecticides on the ovipositional behavior of whitefly (*Bemisia tabaci*) in Brinjal. *Journal of King Saud University-Science*, 36(2), 103070.
<https://doi.org/10.1016/j.jksus.2023.103070>.
- Hadi, F. A. (2017). Effect of microwave rays on nymphs of Green Peach: Homoptera 1776 (Sulzer)(*Myzus persicae* (Aphids Aphididae)). *Ibn AL-Haitham Journal for Pure and Applied Science*, 28(1), 253–260.
- Heilsnis, B., Mahas, J. B., Conner, K., Pandey, S., Clark, W., Koebernick, J., & Jacobson, A. L. (2023). Characterizing the vector competence of *Aphis gossypii*, *Myzus persicae*, and *Aphis craccivora* (Hemiptera: Aphididae) to transmit cotton leafroll dwarf virus to cotton in the United States. *Journal of Economic Entomology*, 116(3), 719–725.
<https://doi.org/10.1093/jee/toad080>
- Isman, M. B. (2000). Plant essential oils for pest and disease management. *Crop protection*, 19(8-10), 603–608.
[https://doi.org/10.1016/S0261-2194\(00\)00079-X](https://doi.org/10.1016/S0261-2194(00)00079-X)
- Isman, M. B. (2006). Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. *Annual review of entomology*, 51(1), 45–66.
<https://doi.org/10.1146/annurev.ento.51.110104.151146>.
- Isman, M.B. (2020a). Commercial development of plant essential oils and their constituents as active ingredients in bioinsecticides. *Phytochemistry Reviews*, 19: 235–241. <https://doi.org/10.1007/s11101-019-09653-9>.
- Isman, M.B. (2020b). Botanical Insecticides in the Twenty-first Century—Fulfilling Their

- Promise? Annual Review of Entomology, 65: 233–249. <https://doi.org/10.1146/annurev-ento-011019-025010>.
- Karamanoli, K., Ainalidou, A., Bouzoukla, F., & Vokou, D. (2018). Decomposition profiles of leaf essential oils in the soil environment. *Industrial Crops and Products*, 124, 397–401. <https://doi.org/10.1016/j.indcrop.2018.07.082>.
- Khalaf, A. S., & Ahmed, Q. H. (2025). The Insecticidal Activity of Essential Oils on Eggplant Cultivars Infested with the Cotton Aphid (*Aphis Gossypii* Glover (Hemiptera: Aphididae)) Under Greenhouse Conditions. *Anbar Journal of Agriculture Sciences*, 23(1): 173–184. <https://doi.org/10.32649/ajas.2024.152208.1349>.
- Li, R., Cheng, S., Chen, Z., Guo, T., Liang, P., Zhen, C., & Gao, X. (2022). Establishment of toxicity and susceptibility baseline of broflanilide for *Aphis gossypii* Glove. *Insects*, 13(11), 1033. <https://doi.org/10.3390/insects13111033>.
- Mousavi, M., & Valizadegan, O. (2014). Insecticidal effects of *Artemisia dracunculus* L. (Asteraceae) essential oil on adult of *Aphis gossypii* Glover (Hemiptera: Aphididae) under laboratory conditions. *Archives of Phytopathology and Plant Protection*, 47(14), 1737-1745. <https://doi.org/10.1080/03235408.2013.856098>.
- Nejad, F. Y., Radjabi, R., & Palvaneh, N. (2013). A review on evaluation of plant essential oils against pests in Iran. *Persian Gulf Crop Protection*, 2(4).
- Oulebsir-Mohandkaci, H., Ait Kaki, S., & Doumandji-Mitiche, B. (2015). Essential oils of two Algerian aromatic plants, *Thymus vulgaris* and *Eucalyptus globulus*, as bio-insecticides against aphid *Myzus persicae* (Homoptera: Aphididae). *Wulfenia journal*, 22(2), 185–197.
- Patima, W. M. E. H., Guo, P. P., Ma, S. J., Gao, X. W., Zhang, L. J., Zhang, S., & Ma, D. Y. (2019). Resistance of different field populations of *Aphis gossypii* to ten insecticides in Xinjiang. *Plant Protection*, 45(6), 273–278.
- Raed, A., Ahmed, Q., & Arif, M. A. (2022). Behavioural Response of Whitefly *Bemisia tabaci* (Hemiptera: Aleyrodidae) Towards Volatile Organic Compounds Emitted from Eggplant Leaves. *Al-Mustansiriyah Journal of Science*, 33(5), 95–100.
- Rawat, D. (2021). Essential oils in organic agriculture: A review of practices and potential. *Natural Volatiles & Essential Oils*, 8(2), 182–189.
- Sabr, S. H. (2010). Influence of the Surrounding Plants by Rapeseed Field on Population Density of Cabbage Aphid (*Brevicoryne brassicae* L.) and its Biological Enemies. *Baghdad Science Journal*, 7(1), 45. <https://doi.org/10.21123/bsj.2010.7.1.246-253>.
- Saifi, R., Saifi, H., Akca, İ., Benabadelkader, M., Askın, A. K., & Belghoul, M. (2023). Insecticidal and repellent effects of *Mentha longifolia* L. essential oil against *Aphis craccivora* Koch (Hemiptera: Aphididae). *Chemical and Biological Technologies in Agriculture*, 10(1), 18. <https://doi.org/10.1186/s40538-023-00395-7>.
- Szczepanik, M., Zawitowska, B., & Szumny, A. (2012). Insecticidal activities of *Thymus vulgaris* essential oil and its components (thymol and carvacrol) against larvae of lesser mealworm, *Alphitobius diaperinus* Panzer (Coleoptera: Tenebrionidae). *Allelopathy J*, 30(1), 129–142.
- Tian, B. L., Liu, Q. Z., Liu, Z. L., Li, P., & Wang, J. W. (2015). Insecticidal potential of clove essential oil and its constituents on *Cacopsylla chinensis* (Hemiptera: Psyllidae) in laboratory and field. *Journal of Economic Entomology*, 108(3), 957–961. <https://doi.org/10.1093/jee/tov075>.
- Tomova, B. S., Waterhouse, J. S., & Doberski, J. (2005). The effect of fractionated *Tagetes* oil volatiles on aphid reproduction. *Entomologia Experimentalis et Applicata*, 115(1), 153–159. <https://doi.org/10.1111/j.1570-7458.2005.00291.x>.

تقييم لسة أنواع من الزيوت لمكافحة حشرة من القطن واحتمالية استخدامها كمبيد في الزراعة العضوية

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المستخلص

يُعتبر حشرة من القطن، *Aphis gossypii* Glover (Hemiptera: Aphididae)، واحدة من أكثر الآفات انتشاراً على كثير من نباتات الفاكهة والخضروات ونباتات الزينة في الزراعة المكشوفة والمغطاة. اذ تسبب هذه الافة أضرار للنباتات عن طريق امتصاص العصارة النباتية، كما ولها القدرة على نقل العديد من الفيروسات النباتية. في هذه الدراسة، تم جمع افة من القطن في موسمي عام 2022 وعام 2023 لأجل إجراء سلسلة من التجارب الحيوية لتقييم سلة زيوت أساسية وهي القرنفل (*Syzygium aromaticum*)، الزعتر (*Thymus vulgaris*)، الإكليل (*Salvia Rosmarinus*)، اللافندر (*Lavandula coronopifolia*)، الكزبرة (*Coriandrum sativum*)، واليانسون (*Pimpinella anisum*) ومعرفة تأثيرها ضد افراد بالغات حشرة من القطن في تراكيز مختلفة تحت ظروف المختبر. أظهرت النتائج أن جميع الزيوت الأساسية المختبرة كان لها تأثيرات متفاوتة على البالغات من *A. gossypii*. كان أكثر الزيوت الأساسية فعالية هو القرنفل، LD50 2.98، يليه الزعتر، LD50 3.28 واللافندر، LD50 4.40. بينما كان للزيوت الأساسية الأخرى، الإكليل، الكزبرة، واليانسون، تأثيرات أقل على *A. gossypii*. أشارت النتائج إلى أن استخدام الزيوت الأساسية للقرنفل، الزعتر، واللافندر بالجرعة المقابلة كمبيد حشري يمكن تطبيقه كبديل آمن للمبيدات المصنعة في برامج إدارة الآفات المتكاملة في الزراعة العضوية للسيطرة على افة من القطن.

الكلمات المفتاحية: قرنفل، زعتر، لافندر، إكليل الجبل، كزبرة، مبيدات حشرية نباتية، *Aphis gossypii*.