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EFFECT OF DIFFERENT CONCENTRATIONS OF NANO-MAGNESIUM AND NANO-TITANIUM OXIDE ON THE CUMULATIVE MORTALITY OF LARVAE OF TWO SPECIES OF CUCURBIT FRUIT FLY AFFILIATED WITH THE DACUS IN IRAQ

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Abstract: The study deals with studying the effect of various concentrations of magnesium oxide and nanium titanium on the increasing death rate of the larvae related to two kinds of cucurbit fruit Dacus ciliatus and Dacus frontalis, where three concentrations of both ingredients are used: 0.125, 0.250 and 0.500 ml / L after mixing them with (1) ml of the insecticide malathion and (1) liters of distilled water in addition to the concentration (0.00), which denotes (1) ml of pesticide malathion with one liter of distilled water for the purpose of comparison and knowledge of the effect of the nanomaterial on the increasing death rate of the larvae of the two species, and the results indicated statistical analysis that the highest percentage of larval decay in both species when using Nano-magnetic oxide is at a concentration of 0.500 ml / liter which is 92% and 82% respectively, while using titanium oxide for the same concentration the highest percentage is equal to 90% and 85% respectively , the concentration gave increasing death rate for the larvae of both kinds ranging between 65-55%, and the rate of exclusion of the larvae after combat and in both kinds has reached only 10% of the total combat samples against a death rate of about 90%, and this is proof of the effect. The great t for the two nanostructures on the larval role of the two species.

Keywords: Nano-Magnesium, Nano-Titanium Oxide, Cucurbit Fruit Fly, Dacus sp.

1. Introduction

Considered of gourd family crops, such as cucumbers, cucumbers, and squash, with its various kinds (zucchini, honey and anni), melon and watermelon and fodder are among the economic crops that have a great importance in Iraq [1], and the fruits of this family are affected by various kinds of insect pests that resulted in avery large economic damages Dacus sp. [2], particularly pumpkin fly and cucumber Dacus ciliatus (Loew) and major melon fruit fly kind Dacus frontalis (Beker). These species of insects related to the Tephritidae family, bilaterally Wings Diptera.

The seriousness of this kind of insect pests represented by laying its eggs inside the fruit causing twisting and shortening, besides its larvae feeds on the pebbles and leaving very many holes in the fruits after their release to the end, leading to the stiffness, rot and damage of these fruits [3], has Judgment of this kind of insect is dignoised for the first time in Iraq in 1988, specifically in Isit and Maysan by governorates at the Research Center and Museum of Natural History / University of Baghdad as a fly of cucurbits [4], that one of the advantages of this kind of insect is its quick reproduction and high susceptibility to its immature role in hiding in the pulp of fruits and soil to escape from its natural enemies, which makes the use of chemical pesticides is now wide spread in its combat has no much benefit in reducing infection rates to such extent [5]. Numerous studies and researches are performed to discovery the most suitable methods to combat this kind of insect pest and to reach good results in reducing their economic and environmental damage in very large proportions.

One of these methods is the use of integrated combat of this insect by studying the factors affecting the dormancy process has a light period, and temperature [6]. In recent years, many researchers have tended to prepare studies and scientific research for the first goal, and most important of them is to find modern methods to combat this kind of insect pest. One of these methods is the use of chemicals with a bearing It is very important for her various life roles to be the most used methods in future for integrated pest combat programs. These methods largely depend on the use of Nano-materials with regular pesticides, and these supplies are small particles whose size ranges between 100-1 nm It is widely used in insect pest combat to find out the percentage of insect killing in the case of its combat [6], and a number of field and laboratory experiments are conducted to assess its negative and positive effects on plants, animals and humans before depending them to combat insects [7], that nanotechnology is a promising field for multidisciplinary field research for it brings lots of opportunities in several scientific and applied specializations such as pesticides, medicine, medicine, horticulture and agriculture besides the great benefits of their use including combat insect pests through combat the structures and rules of insecticides in the case of their use with those pesticides. In common, the key reason for this represented by the use of pesticides has harmful influences on humans and animals, besides sometimes causing soil fertility [8].

One of the most important nanomaterials used nowadays to combat numerous insect pests after mixing them with ordinary insecticides and certain concentrations TiO2, MgO, Ag, ZnOThe nanoparticles of CdS and Nanoimida and others that possess antimicrobial activity and plant and animal pathogens in addition to being non-toxic or harmful to humans and animals alike [9], [10] that conducting combat measures using nanomaterials genes responsible for the flight process, fertility, or reproduction of studied insects by studying the molecular genetic variation between the insect genes before and after conducting the combat process using those materials [11].

2. Materials and Methods

In this study, two nanoparticles, magnesium oxide and titanium oxide are used to know their effect on the rate of cumulative decimate larvae of D. ciliatus and D. frontalis. Samples of the D. ciliatus and D. frontalis are obtained from the laboratories of the Agricultural Research Department of the Ministry of Science and Technology, with 10 samples for each species and are reared in the insect breeding laboratory of the Department of Life Sciences / College of Education for Pure Sciences / University of Diyala, at a temperature of 28 ± 2 m º and relative humidity ranges between 70-60% and by placing them in organic glass boxes (Perseplex) with dimensions of 50 x 50 x 50 installed in an aluminum frame of dimensions 51 x 51 x 51 covered from the top with a piece of very transparent tulle A circular aperture of 20 cm in diameter is made in which a piece of cloth is fixed in a sleeve of 40 cm in length for the purpose of inserting and excreting the food medium according to [12] with some modifications on it.

The floor of the boxes is also spread with material like cornmeal for the purpose of the larvae not being able to [13], then a number of pumpkin fruits are placed in the boxes for the purpose of feeding the adults and in order to be a place for the growth of larvae, after that the boxes are monitored to reach the goal of the third generation of the two species, and after the completion of the growth of the adult larval phase of the third generation in both kinds, the larvae are withdrawn and placed 25 larvae each Kind in 5 transparent plastic boxes with a perforated lid for the purpose of allowing air to breathe the larvae, and each box contains a piece of medical cotton for the purpose of frying the larvae, then each box is sprayed with MgO and TiO2 materials for each kind after mixing them with (1) ml of the insecticide melathion and one liter of Distilled water for both substances separately and then the combat larvae are observed in the cans and for each nanomaterial to record the results and statistically analyze them.

The results of this study Statistical analysis used the ANOVA and Duncan tests at the possibility level (P <0.05) of cumulative death for the adult or final larval role of two kinds of cucurbit fly, D. ciliatus and D. frontalis, treated with three various concentrations with materials MgO and TiO2 nanoparticles (0.125, 0.250 and 0.500

ml/L) and a fourth concentration (0.00) of the insecticide malathion represented the combat for the purpose of comparison of its effect with the effect of the nanomaterials used on the larvae of the two species.

3. Results and Discussion

Figure (1) shows the cumulative death of the larvae Kind D. ciliatus, as similar characters at the top of the graphical columns for each concentration illustrated that there are no substantial differences between the effect of the first and second concentrations and the combat factor (0.00) according to the Duncan test at the possibility level ($P < 0.05$), while there are substantial moral differences between it and the third concentration (0.500 ml/ L), as the percentage of damage for this concentration reached 92%, while the rates of damage for the first and second concentrations and the concentration of combat are 69, 55 and 60%, respectively, and it has discovered that the value of concentration in the killer row LC50 in this analysis is equal to 0.091.

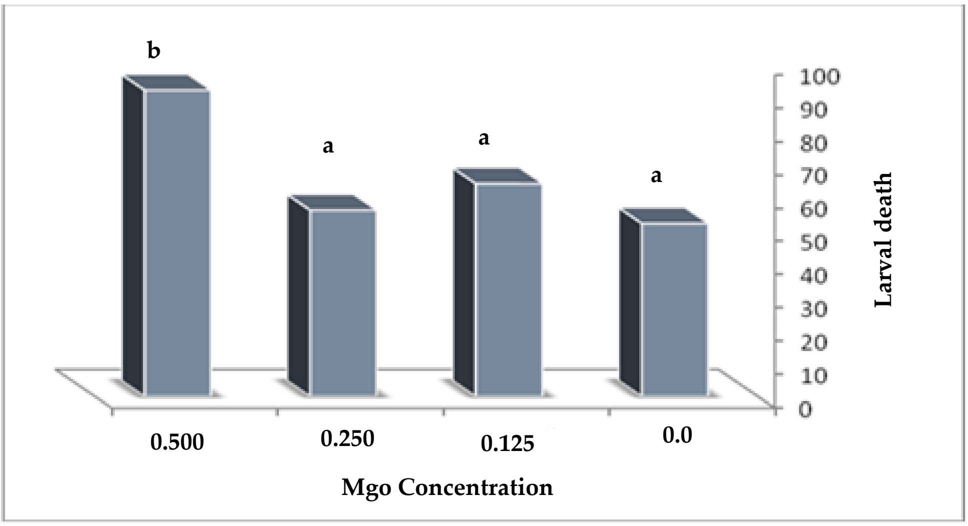

Figure 1. the percentage of larval Death treated with MgO D. ciliatus nanoparticles.

Figure (2) illustrated the percentage of larval death in the case of combat with TiO2, as it is clear to us through the comparison that there are no great differences between the concentration 0.125 and the concentration 0.00 while there existed high significant differences when compared with the concentration 0.250 as In it, the percentage of damage reached 65% of the total number of used samples, and this percentage increased when combating with a concentration of 0.500 ml / L to reach 90% of the number of combat larvae, while the value of the half-killer concentration is 0.16.

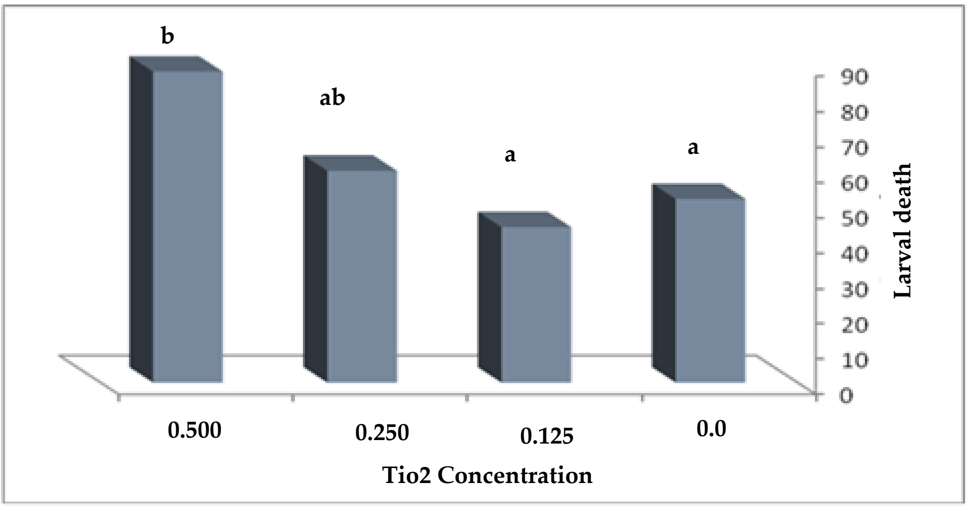

Figure 2. Ratios of larval decomposition of TiO2 nanoparticles to kind D. ciliates.

Figure (3) demonstrated the results of the combat of kind larvae D. frontalis with MgO nanoparticles mixed with the pesticide melathion, as it has discovered that there are substantial differences between the three concentrations compared to the combat concentration consisting of the pesticide only, as it reached the percentage of decay in it to 45, 59 and 82%, respectively, while it reached in the concentration of 0.00% 51 This is an evidence that the larval death rate increases with an increase in the concentration of the nanomaterial, and therefore this substance significantly affects the larval role of the insect, given that the value of LC50 here is equal to 0.091 and is similar to its value when combating the larvae of the kind D. ciliatus, that is, the effect of the substance.

Magnesium oxide on the larval role of the two species is the same.

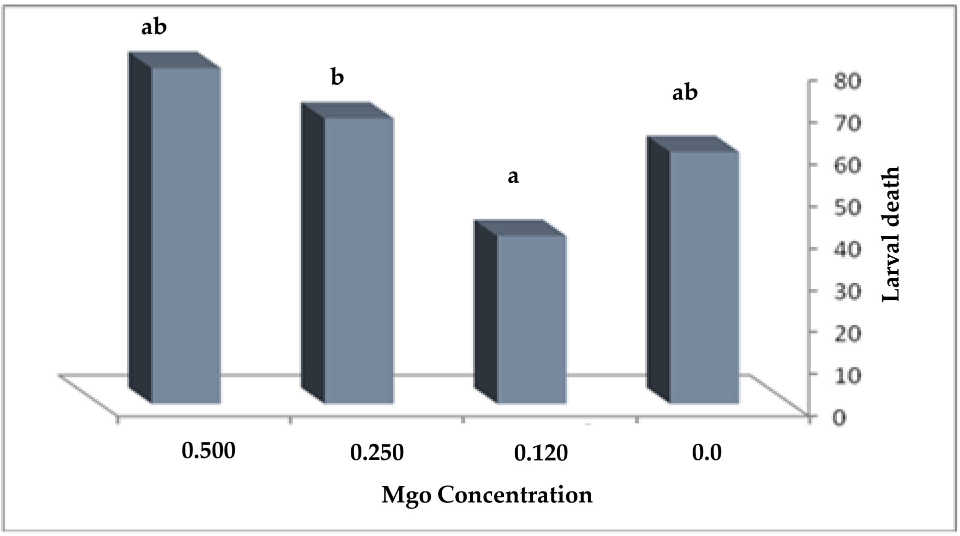

Figure 3. the percentage of larval destruction treated with MgO nanoparticles of the species *D. frontalis.*

Figure (4) demonstrated the results of combating larvae of kind D. frontalis with TiO2 nanoparticles, as it has discovered that the result of the combat with a concentration of 0.125 ml / L is equal to the result of the combat with a concentration of combat (0.00) where the killing rate in them, it is equal to 39%, and the similar letters above the graphic columns indicate this. As for the concentrations 0.250 and 0.500 ml / L, it is found that there is a difference between them in the effect on the combat larvae, as the rate of decay of both reached 65 and 85%, respectively, knowing that the value of the concentration half of the killer LC50 here amounted to 0.184 and it is conclusive evidence of the significant effect of titanium oxide nanoparticle on larvae of this species, especially in the concentration of 500 ml / L compared to the concentration of combat (0.00).

The results of this study are consistent with the results of the study conducted by [14] on the toxic effect of the insecticide Imidacloprid and Nano-Imidacloprid in combat the olive fruit fly Bactrocera oleae (Rossi) (Diptera: Tephritidae) under laboratory and field conditions. its samples are gathered from the governorates of Ismailia and Ibn Malik in Egypt, as the above researchers used various concentrations of the pesticide and the nanomaterial with the pesticide (0.125, 0.250, 0.500, 0.750 and 1000 ml / L).

The study concluded that the increase in the concentration of the nanomaterial resulted in more death and that Mixing the nanomaterial with the pesticide is more effective compared with using the insecticide alone, and other studies also include the study conducted by both [11] on the effect of some trace elements on the larval phases of Culex pipienis, where that study tested the toxic effect of five various concentrations of nitrates Cadmium, lead acetate, and four concentrations of manganese on the larvae of the insect above.

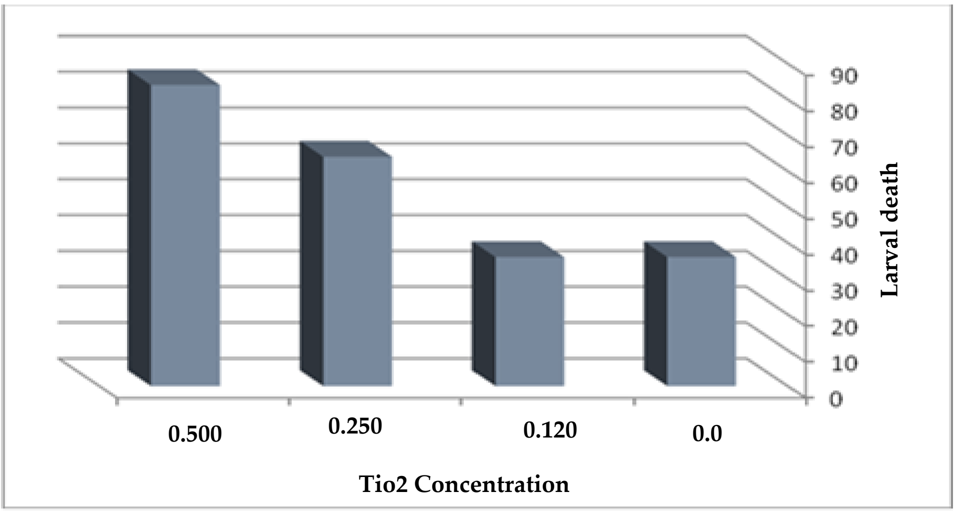

Figure 4. Ratios of larval decomposition of TiO2 nanoparticles to the species *D. frontalis*.

4. Conclusion

The discovered in this study, that the first and second larval stages are clearly and very significantly affected in all the used concentrations. Liters, while it is equal when handling with manganese chloride salt 107 mg/ liter, this suggested that the half-killer concentration of this substance has more effect on the larval role of the insect studied than the substance N Tritium cadmium and lead acetate.

Supplementary Materials:

No Supplementary Materials.

Author Contributions:

H. M. Al-Tamimi and A. A. Al-Qaraghouli; methodology, writing—original draft preparation, Z. T. Khudair and A. A. Jbar; writing—review and editing, A. A. Jbar; paraphrasing. All authors have read and agreed to the published version of the manuscript.

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The authors declare no conflict of interest.

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5. References

[1] A. M. Rizk, "Partial spray of the bio-insecticide Spinosad bait versus Spinosad on cucumber and squash to combat the lesser pumpkin fly, Dacus ciliates (Loew)," *Egypt J Biol Pest Control*, vol. 20, no. 2, 2010.

[2] E. D. Sanderson, "Report of the entomologist," *Annual Report of the Delaware College Agricultural Experiment Station*, vol. 13, 1902.

[3] K. Subedi, R. Regmi, R. B. Thapa, and S. Tiwari, "Evaluation of net house and mulching effect on Cucurbit fruit fly (Bactrocera cucurbitae Coquillett) on cucumber (Cucumis sativus L.)," *J Agric Food Res*, vol. 3, 2021, doi: 10.1016/j.jafr.2021.100103.

[4] O. O. R. Pitan and E. O. Esan, "Intercropping cucumber with amaranth (Amaranthus cruentus L.) to suppress populations of major insect pests of cucumber (Cucumis sativus L.)," *Archives of Phytopathology and Plant Protection*, vol. 47, no. 9, 2014, doi: 10.1080/03235408.2013.830809.

[5] H. Y. Al Shalchi and R. S. Al-Jorany, "Evaluation of some biological agents as an integrated pest-management components to control cuccurbit fruit fly (Leow) dacus ciliatus and melon fruit fly dacus frontalis (Beker) on cucumber," *Iraqi Journal of Agricultural Sciences*, vol. 48, no. 6, 2017.

[6] J. Pretty and Z. P. Bharucha, "Integrated pest management for sustainable intensification of agriculture in Asia and Africa," *Insects*, vol. 6, no. 1, 2015, doi: 10.3390/insects6010152.

[7] L. Di and E. H. Kerns, *Drug-Like Properties: Concepts, Structure Design and Methods from ADME to Toxicity Optimization*. 2016. doi: 10.1016/C2013-0-18378-X.

[8] T. C. Sparks, J. E. Dripps, G. B. Watson, and D. Paroonagian, "Resistance and cross-resistance to the spinosyns - A review and analysis," *Pesticide Biochemistry and Physiology*, vol. 102, no. 1. 2012. doi: 10.1016/j.pestbp.2011.11.004.

[9] S. Y. Yeo, H. J. Lee, and S. H. Jeong, "Preparation of nanocomposite fibers for permanent antibacterial effect," in *Journal of Materials Science*, 2003. doi: 10.1023/A:1023767828656.

[10] B. C. Kim, M. K. Ju, A. Dan-Chin-Yu, and P. Sommer, "Quantitative detection of HIV-1 particles using HIV-1 neutralizing antibody-conjugated beads," *Anal Chem*, vol. 81, no. 6, 2009, doi: 10.1021/ac802267u.

[11] L. L. Chambarelli, M. A. Pinho, L. G. Abraçado, D. M. S. Esquivel, and E. Wajnberg, "Temporal and preparation effects in the magnetic nanoparticles of Apis mellifera body parts," *J Magn Magn Mater*, vol. 320, no. 14, 2008, doi: 10.1016/j.jmmm.2008.02.049.

[12] A. H. Wardhana, G. Cecchi, S. Muharsini, M. M. Cameron, P. D. Ready, and M. J. R. Hall, "Environmental and phylogeographical determinants of the distribution of the Old World screwworm fly in Indonesia," *Acta Trop*, vol. 138, 2014, doi: 10.1016/j.actatropica.2014.06.001.

[13] S. Fruean and I. East, "Spatial analysis of targeted surveillance for screw-worm fly (Chrysomya bezziana or Cochliomyia hominivorax) in Australia," *Aust Vet J*, vol. 92, no. 7, 2014, doi: 10.1111/avj.12197.

[14] M. M. Sabbour and E. S. H. Shaurub, "Toxicity effect of Imidacloprid and nano-Imidacloprid particles in controlling Bactrocera oleae(Rossi) (Diptera: Tephritidae) under laboratory and field conditions," *Bioscience Research*, vol. 15, no. 3, 2018.