



THE SYNERGISTIC EFFECT OF CDO NPs CONCENTRATION AND CRUDE FRUIT EXTRACT OF *CORDIA MYXA* CONCENTRATION ON PUPA OF *MUSCA DOMESTICA*

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Abstract

The house fly (*Musca domestica* L.) is a common pest of human and animals and is also a vector of both human and animal diseases. *Cordia myxa* plant is one of the species of genus *Cordia*, family Because there are indications to contain effective compounds against insects have chosen as a means instead of manufacture chemical. Recently nanoparticle have shown promise in many fields of agriculture including pest management. In this article treatment pupa (age 24 and 72 hours) of house fly by mix concentrations from cadmium oxide nanoparticles and crude fruit extract of *Cordia myxa* in ratio 1:1 and 1:4.

Keywords : *Musca domestica*, *Cordia myxa*, nanoparticle.

Introduction

The housefly, *Musca domestica* L. (Diptera: Muscidae) is a 6-9 mm long gray insect with four dark stripes running along a thoracic dorsal length (Harwood and James, 1979). It is considered one of the most important health-related pests in the world as it follows humans everywhere, both indoors and outdoors, during their daily activities. (Emerson *et al.*, 1999; Douglass and Jesse, 2002; Mian *et al.*, 2002; Barin *et al.*, 2010). *M. domestica* - borne pathogens can cause cholera, food poisoning, typhoid, diarrhea, anthrax and shigellosis, (Banjo *et al.*, 2005; Fasanella *et al.*, 2005; Yap *et al.*, 2008). To stop these diseases, one way to reduce the number of house flies and to reduce human and animal habits (service, 2000) must be controlled. The use of pesticides is an effective tool for managing pests of agricultural, medical and veterinary insects. However, the potential of insect pests to develop insecticide resistance, through their effects on disease transmission, plant safety, environmental pollution, and human health, better threaten people. Additionally, previous exposure to some pesticides in the fields can lead to new insecticide resistance through the cross-resistance mechanism (Sawicki and Denholm, 1984). As a result, there is a need to consider safe and effective methods to be used in management plans together with careful use of insecticides in order to maintain their efficacy for long periods of time (Sparks *et al.*, 1995). *Cordia myxa* plant is one of the species of genus *Cordia*, family oraginaceae, comprise of trees and shrubs which are widely distributed in warmer regions (Thirupathi *et al.*, 2008). plant uses Antibacterial, Antiworm, Antiinflammation and is widely used in the treatment of urinary and chest diseases, as well as studies have shown that alcoholic extract of the fruits of *Cordia myxa* contain Flavonoids compounds such Datiscoïd, Hesperdin, Robinin, Rutin additional to Alkaloids. Because there are signs of effective insect compounds being chosen as a means rather than chemical pesticides being developed (Iniaghe, 2009). Nanomaterials are typically defined as materials smaller than 100 nm in at least one dimension. At this scale, materials often possess novel size-dependent properties different from their large counterparts. Some of these applications use the smoothly scalable size- dependent properties of nanomaterials related to the high specific area of the surface, such as rapid dissolution, high reactivity and heavy sorption .

(Pan and Xing, 2008). Nanoparticle materials is the most hopeful technology for plant protection against insect pests, recently nanoparticle have shown promise in many fields of agriculture including pest management (Maynard *et al.*, 2006 ; Barik *et al.*, 2008).

Materials and Methods

Musca domestica breeding

Insects about 35 whole were collected from the garden house after putting bowels of fish in a plastic dish for two days, during October of 2017. The insects was transferred to rearing room in Animal House, Biology department, College of Science, Mustansiriyah University, with temperature of 30±20 °C and 65 ±5% relative humidity, and 12:12hrs dark : light, the insects were placed in a cube cage with a metal structure (30×30×30) cm covered piece Perforated cloth. One side is long and open ended for the purpose of possible treatment. Each cage provide Petri dish contains about 50 g of (sugar and powdered milk) (1: 1) (weight: weight) and another Petri dish contains cotton wet with distilled water for the purpose of drinking the insects. To lay eggs and grow the larvae, the cage is provided with plastic container medium-sized container Contain (float fish diet) consist of crude protein (42.0% Min.), crude fat (11.0% Min.) and crude fiber (4.0% Max.) in addition to Amino acids, vitamins, minerals, after crushed and sterilized it in autoclave with temperature 121°C for 15 minutes where taking 200 gm. of sterilized (fish diet) mixed with 10 gm. of dry yeast and dissolved in 100 ml of distilled water (Hermize *et al.*, 2016). Each group of egg that were lay by adult were transferred to plastic containers contains about 200 gm of the media of larvae breeding, after observation the egg convert to larvae transferred Containers to cages of breeding to follow up it when convert to adult. The insect type has been diagnosed by Natural History Museum and Research center, Baghdad University, Iraq as it *Musca domestica*. Waiting colony of domestic flies for four generations to sure there is no remaining effect of pesticide and get pure generation and avoid presence natural distortions in the individuals.

Prepared the Plant Extract

The weight of the soft fruit *Cordia myxa* L. is 880 g, all of the quantity was soaked in 2 liter of 70% ethanol for a

month, then it was filtered with a gauze and put the filter in Autoclave to dry at temperature 45C. The result of extraction after drying 83g of dry matter and 377g residue (wit and intentions) (Richard *et al.*, 2000).

Preparation of crude fruit extract of *Cordia myxa* nanoparticles

1 g of crude fruit extract of *Cordia myxa* was dissolved in 100 ml of Sterile water then put the mix in Ultrasonic cleaner for 30 minutes (Sangeetha *et al.*, 2011). Drop-casting method has been used to deposit the p nanoparticles on glass samples. thickness of the thin film was found to be 200 ± 10 nm. Thickness of the films was measured using Fizeau Interferometer method. Crystal structure was studied at the following operation conditions: source Cu-K α radiation of wavelength $\lambda = 1.5405 \text{ \AA}$, voltage = 4 kV, current intensity = 20 mA, scanning speed = 5 cm/min by XRD 6100 Shimadzu. The following form represents the X-ray spectrum to thin film P as a function of Barak's angle For the extent (10-80).

In the figure, we notice the presence of one wide peak its peak in angle (25, 32)

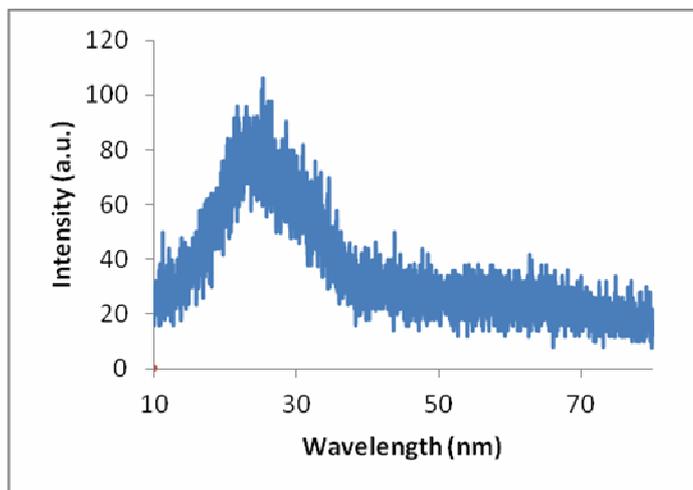


Fig. 1 : XRD pattern of P nanoparticles, which precipitated by drop casting technique on a glass

Table 1 : XRD properties of P nanoparticles

2 theta (deg)	β	D (nm)	Dislocation density ($1/m^2$)
25.3754	0.36	26.95889	0.001376
22.7158	0.62	15.57637	0.004122
24.1527	0.47	20.60106	0.002356

Copper colloidal nanoparticles have been prepared by electrolysis cell. The electrodes of this cell are cadmium plate as a positive electrode and gold plate as a negative electrode. Water was used with hydrochloride HCl_{40%} in the ratio of about 10:1 as an electrolyte liquid. The applied voltage was 5 V. Drop-casting method has been used to deposit the colloidal nanoparticles on glass samples. thickness of the thin film was found to be 200 ± 10 nm. Thickness of the films was measured using Fizeau Interferometer method. Crystal structure was studied at the following operation conditions: source Cu-K α radiation of wavelength $\lambda = 1.5405 \text{ \AA}$, voltage = 4 kV, current intensity = 20 mA, scanning speed = 5 cm/min by XRD 6100 Shimadzu. The following figure the X-ray spectrum to thin film CdO as a function of Barak's angle For the extent (10-80). The XRD patterns of CdO contain four main peaks at diffraction angle of 19.58° , 31.6° ,

33° , 37.4° indicated the standard peaks (JCPDS No. 77-2307).

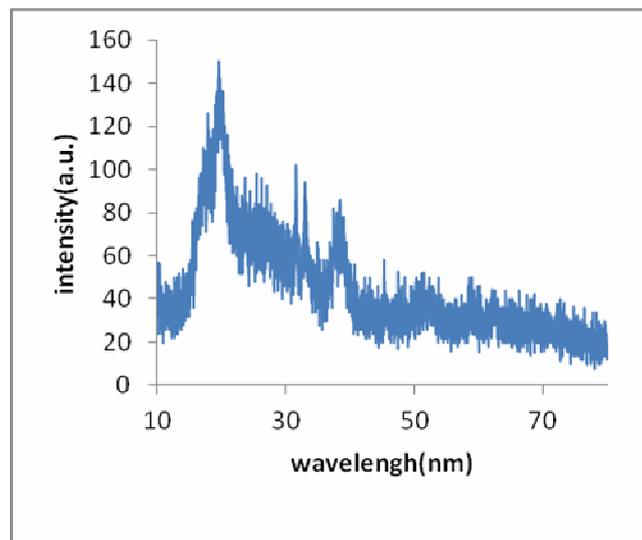


Fig. 2 : XRD pattern of CdO nanoparticles, which precipitated by drop casting technique on a glass

The concentration of crude fruit extract of *Cordia myxa* nanoparticles was mixed with nanoparticles cadmium oxide concentrations in ratio 1:1 and 4:1. take 10 ml from nanoparticles cadmium oxide concentrations and add to 10 ml of the concentration of crude fruit extract of *Cordia myxa* nanoparticles. take 10 ml from nanoparticles cadmium oxide concentrations and add to 40 ml of the concentration of crude fruit extract of *Cordia myxa* nanoparticles. This mixing process was a achieved on a hot plate using magnetic stirrer and at ambient temperature. Nanoparticles deposition by drop casting method, three drops (Each drop equal $100 \mu\text{l}$) of mix on slide and heated it at heat source not more than 80°C until thin film formation, leave for half an hour to cool down and then assay do it (Chávez *et al.*, 2013).

This analysis was used to characterize many properties of biosynthesized NPs such as, NPs size, NPs surface, NPs topography, and granularity volume distribution of NPs. A thin film of the NPs sample was prepared on a glass slide using $100 \mu\text{l}$ of the sample on the slide, allowed to dry for 5 min, then the slide was scanned using AFM, (AA-3000, USA) (Naveen HKS *et al.*, 2010).

X-Ray Diffractometer (XRD) was used to determine and identify the formation of the synthesized NPs, the XRD apparatus (Shimadzu 6000, Japan) operate at a voltage of (40 kv) and current of (30 mA) with Cu K α radiation in a (θ - 2θ) configuration.

Treatment of Pupa (age 24 and 72 hours) of house fly by mix concentrations by Spraying

Pupa with two ages treated by direct spray treatment. Sprayed 10 pupae old 24hrs. /replicate in plastic pot with 2ml for each concentration by sprinkler hand volume 10ml at distance 10cm to sure spray all the pupae and left to dry in the laboratory temperature and put the plastic pot in the rearing cage with 3replicates for each concentration while 3 replicates for control treatment have been pupae sprayed with 2ml of distilled water. Same method for pupa old 72hrs. and mentioned the treatments to record the following: Rate Mortality of pupa , Rate distorted of pupa ,Rate natural and partial emergence of adults.

Results and Discussion

The 3D AFM images and granularity accumulation distribution chart of 1P:1cdo and 4P:1cdo NPs synthesized have ball-shape with good dispensability, homogenous grains and aligned vertically. By using special software he estimated values of root mean square RMS of surface roughness average and average grain size were calculated and listed in table (3 & 4).

Table 3 : The grain size, roughness average and Root mean square 1P : cdo nanoparticles.

Avg. Diameter	Roughness Average	Root mean square
60.85 nm	0.687 nm	0.882 nm

Table 4 : The grain size, roughness average and root mean square of 4P : 1 cdo

Avg. Diameter	Roughness Average	Root mean square
60.85 nm	0.684 nm	0.81 nm

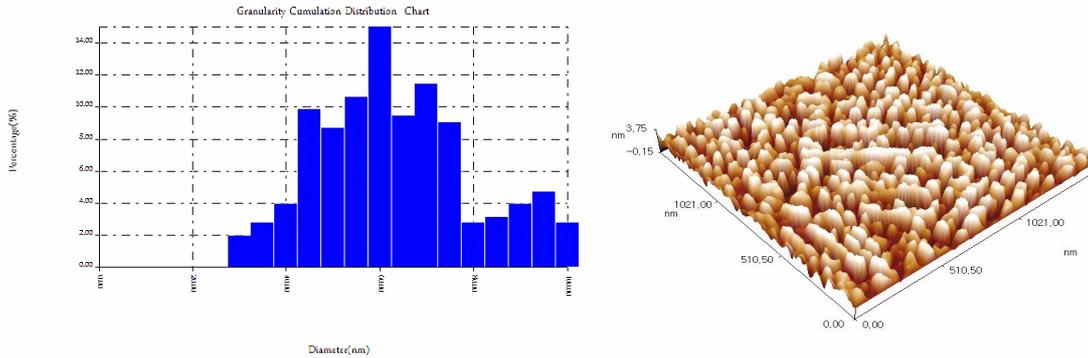


Fig. 3 : 3D AFM image and Granularity accumulation distribution chart of 1P:1CdO nanoparticles

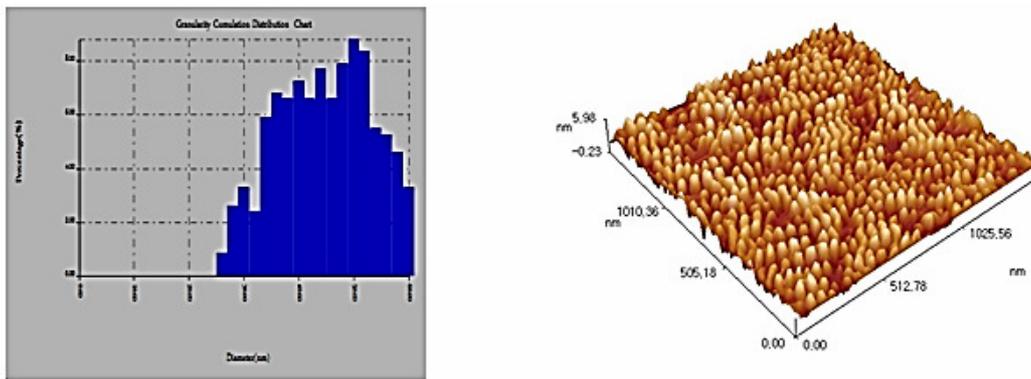


Fig. 4 : 3D AFM image and Granularity accumulation distribution chart of 4P:1 cdo nanoparticle

The XRD diffraction patterns of synthesized P:CdO nanostructure thin films deposited on glass are shown in figure5 the XRD patterns of P contain one angles Crystallite size (D) and dislocation density in nm for a knowing X-ray wavelength λ of P:CdO nanostructure is calculated by using Scherrer formula and listed in table 5 .

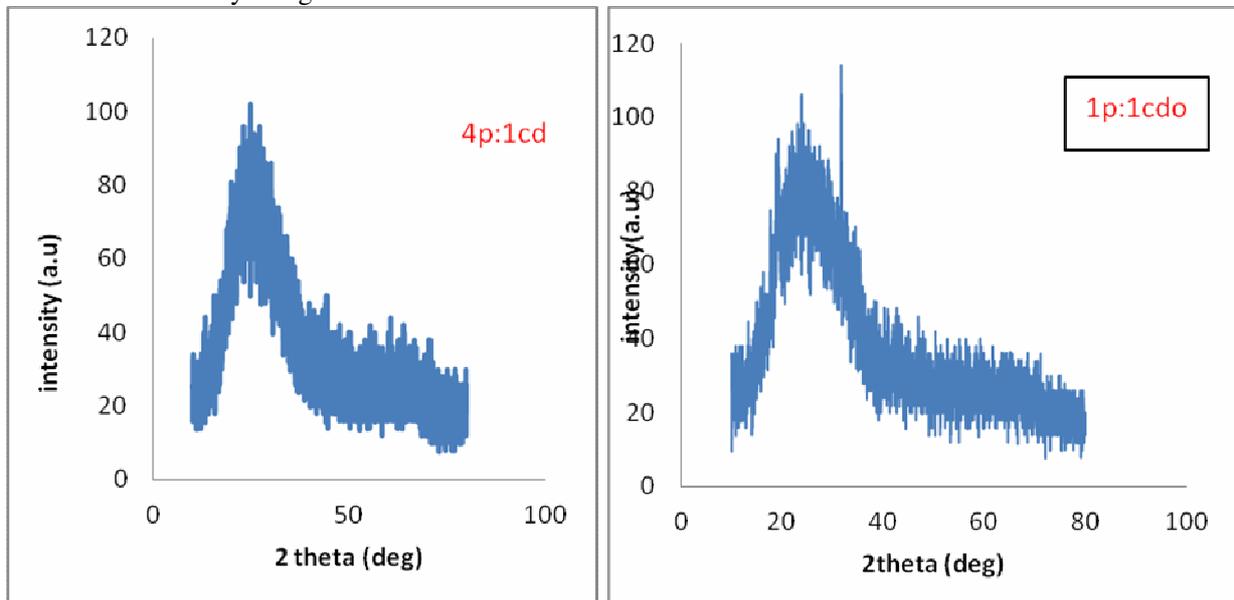


Fig. 5 : XRD pattern of P:cdo nanoparticles, is precipitated by drop casting technique on a glass

Table 5 : XRD pattern of P:cdo nanoparticles, is precipitated by drop casting technique on a glass

2 theta (deg)	β (deg)	D(nm)	Dislocation density (1/m ²)
31.6743	0.134	73.44611	0.000185
19.0259	0.26	36.92405	0.000733
21.9376	1.12	8.61109	0.013486
23.03	0.8	12.07839	0.006855
24.75	1	9.693437	0.010643

Particle size and shape. Figure (6) shows SEM images of P:CdO nanoparticles prepared with different laser fluences. SEM images confirm the different morphology of these NPS. The morphology of these 1P:1cdo is not uniform and consists of many small irregular nanoparticles like cloud

with average size ranging from 10 to 20 nm depending on laser fluences. The morphology of these 4P:1cdo the particles are well agglomerated in cluster shape. with average size ranging from 35 to 40 nm depending on laser fluences this result agree with (Charinpanitkul *et al.*, 2014).

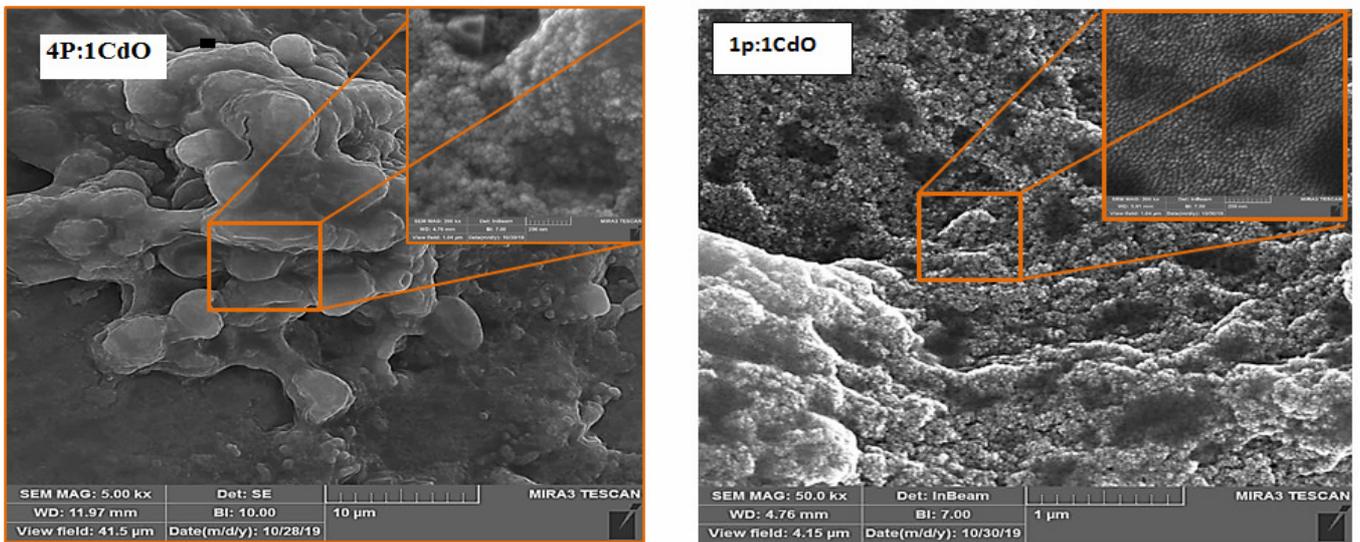


Fig. 6 : SEM images of P:cdo Nano crystalline thin films deposited on glass by drop casting method

Fig. (8 & 9) The following shows represents the optical transmittance spectrum from 200 - 900 nm to 1P:1CdO and 4P:1 CdO deposited on glass substrate .We observe a few permeability in the UV region and increase in Visible region where it reaches in maximum value (80)% in wavelength (890)nm This indicates that the material is transparent to visible light.

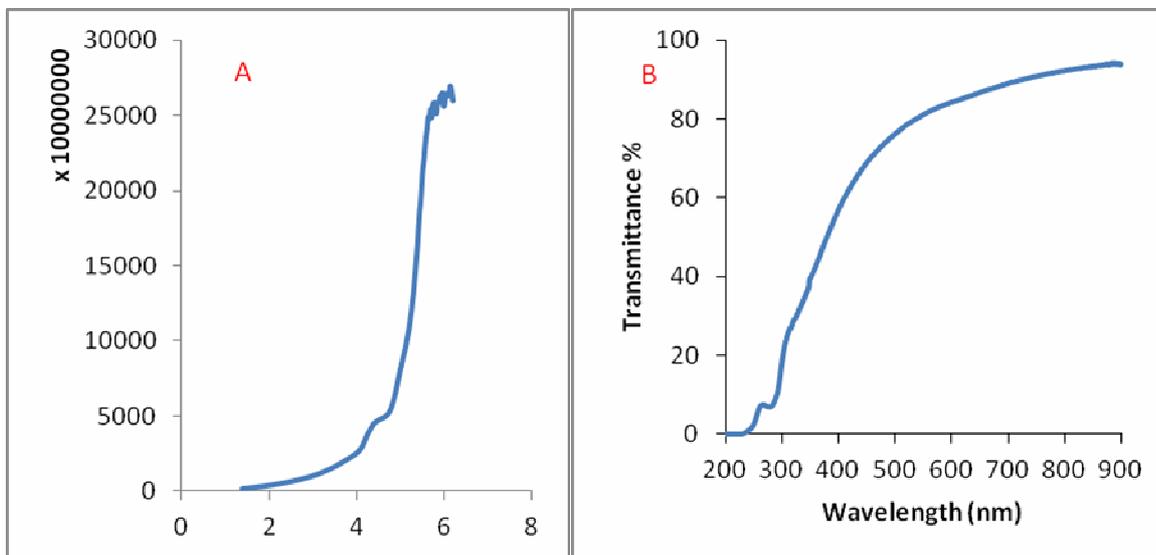


Fig. 7: (A)Transmittance and(B) energy gab of 1P:1 CdO

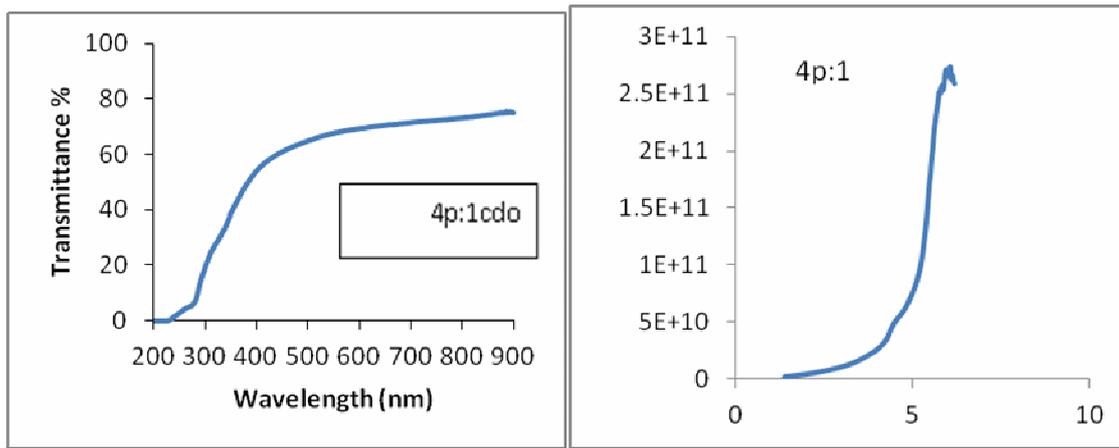


Fig. 8 : (A)Transmittance and(B) Absorption Spectrum of 4P:1 CdO

Treatment of Pupa (age 24 and 72 hours) of house fly by mix concentrations by Spraying result

Table 6 represents the results of the pupa house fly after treated by mix concentrations by spray, the result was showed high Mortality rate in concentration 4p:1cdo 63.3%in pupa age 24h and 80% in pupa age 72h compared with 1p:1cdo concentration the result of pupa Mortality rate age 24h and 72h 40% and The P-value is very clear between concentrations and control this is agreed with A study performed by Suchail *et al.* (2003). Fig.1 explain comparison between dead pupa and normal pupa.



Fig. 9 : A:Dead pupa B:Normal pupa

Table 6 : The synergistic effect of cadmium oxide nanoparticles concentration 0.9mg/ml and crude fruit extract of *Cordia myxa* concentration 0.06mg/ml on pupa of *Musca domestica*

Pupa age 24 hours			
The distortions	Natural emergence	Mortality Pupa	Type of treatment and concentration
N(%)	N(%)	N(%)	
1(3.3%)	17(56.7%)	12(40%)	1P:1cd
1(3.3%)	10(33.3%)	19(63.3%)	4p:1cd
Pupa age 72 hours			
0	18(60%)	12(40%)	1P:1cd
0(0%)	6(20%)	24(80%)	4p:1cd

P:C. *myxa* nanopartical CdO:cadmium oxide nanopartical

Conclusion

mortality rate at concentration 1p:1cdo 40% in pupa age 24h and 72h when treated by spray but increase the mortality rate when increase concentration of *C. myxa* to 4p:1CdO to

the mortality rate of pupa age 24h 63.3% and pupa 72h 80% compared with control.

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