Synthesis and Characterization of Silver Nanoparticles against Insect Pests

Saba Gulzar[1], Rida Zulfiqar[1], Maimoona Tahira[1], Faheem Abbas[1], Mudassar Khadim[2], Sana Pervaiz[2], Samina noreen[2],Muhamamd Abdul Hafeez[1], Mazhar Abbas[1],Jawad Habib[1]

[1]Department of chemistry, University of Agriculture Faisalabad 38000, Pakistan
[2]Department of chemistry, Government College University Faisalabad, Pakistan

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Abstract- Micro sciences including nanotechnology are nm-scale investigations of extremely small objects. Specific and mixed age *Tribolium castaneum* and *Trogoderma granarium* have been reported from Faisalabad's grain market. The population had been acclimatized to the laboratory for each of the two species. Pupa of same age were obtained during insect rearing and in separately plastic containers for adult development (2 weeks) to increase diverse population. After isolation of plant products, biosynthesis of microparticles was performed similarly to standard operating procedure. Toxicity Bioassays were performed through three amounts (5, 10 and 15 %) of the extracts (for each of the basic plant oils and silver -particles). Mortaliy results were reported after 24, 48 and 72 hours of medication. Tribolium castaeium had the highest mortality rate (15.10 %) and the lowest t mortality rate (46.12 %). Silver nanoparticle gave highest mortality 57.91% against Tribolium castanium and 39.39% against Trogoderma granarium. Repellency bioassay was conducted using a region choice approach followed by 75.39% (Silver nanoparticles),further results are confirmed by using Uv-visible and FTIR for their characterization.Under CRD statistical layout, data of all the bioassays is analyzed by factorial.

Index Terms- Micro sciences, nanotechnology, *Tribolium castaneum and Trogoderma granarium*, Mortaliy

I. INTRODUCTION

Nanosciences is an evolving and increasingly evolved process that can accept the elements of the fundamental that can recognize and advance the emerging type of material production that has one aspect. Nano meter is very small, Nano is a Greek word, which means 'dwarf' but in the technical term, it means 10^{-9}. It can take hydrogen side by side equal width and size of nanometers, thousands of nanometers equal to the typical bacterium, and their diameter is equal to the redwood tree and human hair would be equal to 1nm in diameter. At this similar dimension, they display some physical properties such as, insulating materials to become conductors, and materials that would be inert can cause the explosive in nature. They are prepared from many nanostructured materials and devices. It has one dimension which is less than 100 nm[1].It also used as a biomedical, optical and electronic field. The nanoparticle has been work very successfully in the field of medicine, environmental sciences and food processing [2]Recently Nanoparticles can be produced by the physical, chemical and green synthesis method for a long time but their major role nowadays is in microbes' biological system in the fabrication of metal Nanoparticles. Furthermore, the biosynthesis of nanoparticles is ecofriendly in nature because it can form without the use of harsh expensive chemicals. It also used as a highly conductor and semi-conductor, medical devices, sensor coating, catalytic agents and also used as a pesticide. Nanocarriers are aimed at reducing implementation quantity and slow pesticides transfer kinetics. [3]. Larvae and adults of this insect feed on damage grains [4] resulting up to 1-10% losses in different stored varieties of sorghum [5]. This insect pest has a presence in collected cereals can be contaminated the Grains as well as nutritional declines values([6]*T. castaneum* attacks the Germ section of the grains and reduces germination potential [7] Unluckily, these synthetic insecticides are to be get accumulated in the environment because it should not be degradable, resulting in polluted surroundings [8]. This alarming situation has prompted the researchers to explore biodegradable and eco-friendly insecticides [9]which are crucial needs of the contemporary scenario. Due to the potential insecticidal properties botanical is the possible alternative source of pest control [9]In the past years, *T. castaneum* pest can be controlled by Polyethalyen glycol and diatomaceous earth but garlic essential oil can be act as a reducing agent [10]Noble metal nanoparticles such as silver are widely used in different fields due to its antibacterial and antioxidant properties. [11]. The efficacy of nano sized silver particles to control the pathogenic effect in plants [12].

II. MATERIALS AND METHODOLOGY

Select and rear the insect for test culture

T.castaneum and T.granarium of various and varying age will be harvested through the grain market located in Faisalabad. The population for all tow species is assimilated to the laboratory and has a supply potential of 1.5 kg in plastic containers (firstly decontaminate the store grains for T.granarium and store grain flour for T.castaneum; it can decontaminate through the oven for 30 minutes at 70 ° C (Lab Line Instrument Inc. Model No.3512-1) and cover it with muslin cloths. All insects will be sieved out from adults in goods after three days. Goal insects should have nests that can be processed commodities, are stored in jars and can be put in an ideal position (65±5±%al.H. and 30±2°C) and can be homogeneous to the F1 population as well (Hbib-ur-Rehman, 2018). After 3 days, bottles will be drained, then the bottles will be transferred into new boxes, the floor left behind will hold the eggs, the hatching time will be equivalent to 3 to 5 days [13].

Preparation of silver Nano-particles

Firstly we can prepare the silver Nano particle like this way, Take the leaves powder from *R.communis*, *Jatropha curcus*, *Citrus paradise* purchased from the local market. Deionized water used in all experiments, I took 10g of *R. communis*, *Jatropha curcus* and *Citrus paradise* extracts by using weight balance, which can be boiled in 100ml distill water in 250ml conical flask. Then this extract were cooled at room temperature, filter through Whatmans No. 1 Paper Filter. This filtrate was just an act of decreasing and stabilizing Silver nanoparticles synthesis operative. [14]Ammonium solution will be added to AgNO3 (solution accompanied by addition of 110ml extract of plant material) as described [14].

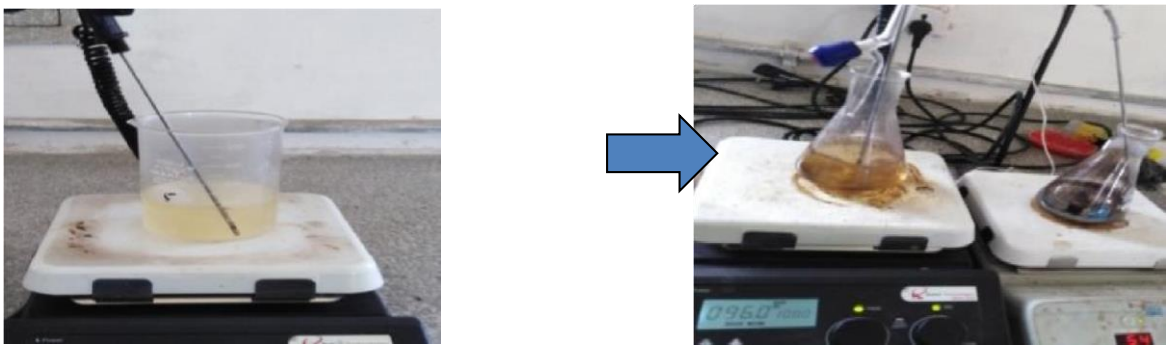

***Figure 1.(*Color changes after sometime)**

The Silver Nanoparticles Biosynthesis

Using the green synthesis process, silver nanoparticles were synthesised. In this way silver nitrate were used as a precursor of silver metal cations which were reduced by ammonia solution (reducing agent). 1.6987mg (1mM) amount of silver nitrate was taken as a stock solution in 100 ml beaker, dissolve in 50ml deionized water. 5ml plant extract oil mixed in 50 ml distilled water and boiled at 100°C or 200rpm in hot plate for 1 hour. Add 10ml of plant extract (oil +Distill water) in silver nitrate solution drop wise in it. The total volume of the solution is 100ml by adding the deionized water. The solution was boiled at 80°C at 200rpm for 30 minutes and maintained the pH by adding the ammonia solution (0.5M) , Different salt concentration (0.7-2 mM) were also be used. After adding ammonia solution Changed color of the solution. A Color transition from yellow to brown , was observed due to the reduction of Ag+ ion into Ag0 [14].

Figure 2.(Silver Dried nano-composits)

Table 3.2: Change in color of solution during formation of Silver Nitrate nanoparticles by using *Jatropha curcus* ,*Citrus paradise and R. communis* plant extract

Solution	**Before Reduction**	**After Reduction**	**Color intensity**	**Time**
Jatropha curcus	Dark Yellow			
1.6987mg (1mM) AgNO3	Lite grey	Pale Yellow	+	Immediately
		Lite brown	++	After 7 hours
		Brown	+++	After 24 hours
Citrus paradise	Lite Yellow			
1.6987mg (1mM) AgNO3	Lite grey	Dark Yellow	+	Immediately
		Brown	++	After 7 hours
		Dark brownish	+++	After 24 hours
R. communis				
1.6987mg (1mM) AgNO3	Lite grey	Yellow	+	Immediately
		Black brownish	++	After 7 hours
		Brown	+++	After 24 hours

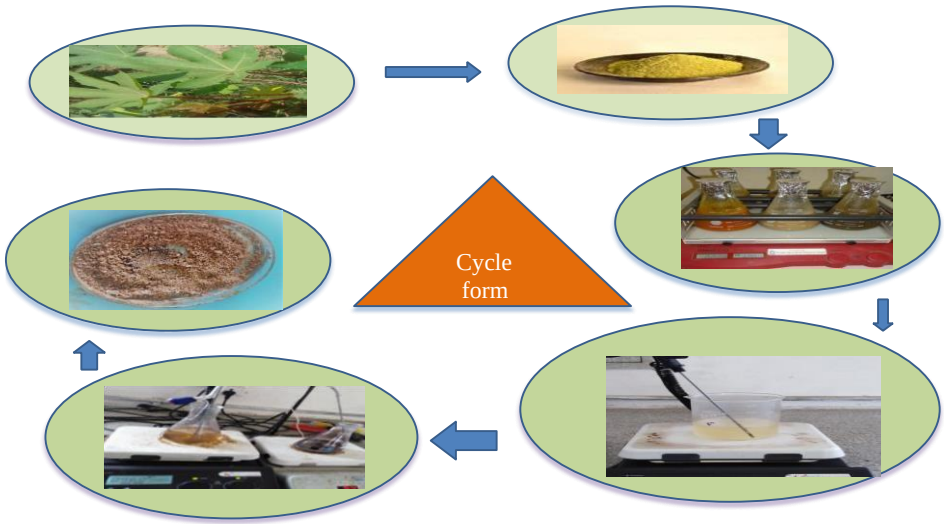

***Figure 3 :*Sketch representation**

CHARACTERIZATION OF NANOPARTICLES

We can determine the maximum production through absorption spectra of silver nanoparticle. We can observe the wavelength of SNP by using UV-visible spectrophotometer [15]; deionized Water continues to serve as a blank solution. Silver Nano particle optimum top point will be in air-dried form and it will be allowed to Characterized as described in Atomic-Force-Microscopy (Model-Nanosurf easyscan 2 AFM, Switzerland) [16].

Toxicity Bio Assay

Three plant extracts their concentration is (15, 10 and 5%) will be diluted in the stock solution by the use of four solvents. The concentration will be hands-on crushed grains, shaken for even distribution of concentration. It will allow to air dried and placed in small plastic jars. Both the insects, adults will be released in treated diet containing jars as described [17].

Repellency

Mean percent repellency was determining by using through a Favourable process. After the filter paper was cut in to the two halves, one half of each paper was treated with the extracts from the plants and acetone. After this som time passed the solution would be evaporated, then two halfs were joined togather and placed in a peteri dish. 20 Adults of *Tribolium castanium* and *Trogoderma granarium* were realeased in a center treated filter paper.The data was reported within 24, 48 and 72 hours, respectively [18].

$$\text{Percentage of repels} = \frac{Nc - Nt}{Nc + Nt} \times 100$$

III. STATISTICAL ANALYSIS

This Recorded data will be given through the Abott's formula, for the calculation of percent corrected values (i.e. mortality), and statistical analysis (ANOVA) will be performed by using statistica-8.1 software. Treatments means will be compared by using TukeyHSD test at 5% signific The mortality (%) was corrected by Abbot's (1925) formula:

$$\text{Corrected Mortality} = \frac{(\%)Mc - (\%)Mo}{100 - (\%)Mc} \times 100$$

Where, Mo = Mortality Watched; Mc = Control mortalityant level.

IV. RESULTS

Determining The Mortality Of *Tribolium Castanium* Through Silver Nano-Particals Mortality Data After Exposure Of 24 Hrs

To evaluate the mortality by *T. castaneum*, homogenous adults Was produced in small plastic jars on treated diet. Adults are encouraged to feed on treated diets and data regarding mortality was recorded. Wheat grains were used as diet and three Concentrations were used for each plant extract viz., 5, 10 and 15%. Data on mortality were recorded at 24, 48 and 72 h of exposure period. Insects were kept at 30±2oC and 60±5%RH in incubators for mortality assessment. There were three replicates of each treatment and control. Table 1. reveals the Variance Analysis (ANOVA) of T mean percent mortality data. Castaneum at different Jatropha curcus, Citrus paradise, and R concentrations. Common. Data Showed the key effects, plants ($F=4.66$; df=1: $p<0.05$) and concentration ($F=11.10$ df=;2 $p<0.05$) were significant regarding mortality values of *T. castaneum* after exposure period of 24 hours.

Table 1. Variance analysis (ANOVA) of the % mortality data for Tribolium castaneum (Herbst)for Silver based nanoparticals

S.O.V	DF	SS	MSS	F value
Plant	2	1271.973	635.986	186.330 **
Concentration(Conc.)	2	926.744	463.372	135.757**
Plant*Concentration	4	292.456	73.114	21.421*
Error	18	61.438	3.413	
Total	26	2552.611	635.986	

Table 2. Comparison of mean percentage morbidity of Tribolium castaneum after exposure to various crop extract concentrations after 24 hours

Concentrations (%)	Mean percentage mortality ± SE
5	9.15 ± 1.19 c
10	17.08 ± 2.39 b
15	23.34 ± 3.62 a

Data in table 2. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum Mortality was recorded at 15 per cent (23.34 %). The mean mortality was 17.08 % at 10% concentration and 9.15 mortality rate was observed at 5 percent plant extract concentration. From this it is concluded that mortality only increased With increase in 3 different plant concentrations oil and also shows that concentration has major effect on average mortality percentage of *T. castaneum*.

3. Comparison of mean mortality percentage of *Tribolium castaneum* after exposure to different plant extracts after 24 hrs

Concentrations (%)	Mean percentage mortality ± SE
P1	8.32 ± 0.82 c
P2	17.11± 1.98 b
P3	25.76 ± 3.52 a

Table 3. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 25.76 and 17.11%,correspondly . While least mortality 8.32 % was given by extract of *Citrus paradise.*

4. Comparative mean percentage mortality of *Tribolium castaneum* after exposure to different plant extract concentrations following 24 hours

Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 5	5.23±1.83 g
Citrus paradise x 10	10.17±2.56efg
Citrus paradise x 15	12.02±2.89 def
Jatropha curcus x 5	10.13±1.61 fg
Jatropha curcus x 10	18.34±1.57 cd
Jatropha curcus x 15	23.09±2.45 bc
Ricinus communis x 5	13.10±1.68 de
Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Ricinus communis x 10	25.92±1.68 b
Ricinus communis x 15	37.07±0.89a

Table 4. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different periods of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 4.

Mean contrast of mortality percentage values for T. At various concentrations of selected plant extract castaneum was the highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (37.07 %) at 15% was recorded. The mean mortality was 25.92% at 10% concentration and 13.10% mortality The concentration of plant extracts was observed at 5 per cent. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (23.09%) at 15% was recorded. The mean mortality was 18.34% at 10% concentration and 10.13% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (12.02%) at 15% was recorded. The mean mortality was 10.17% at 10% concentration and 5.23% mortality Concentration of plant extracts was observed at 5%. The result given showed significant association between exposure time and concentration. We concluded from the results, that there was a gradually increase in mortality values with increased plant extract levels.

Mortality Data After Exposure Of 48 Hrs

Table 5. Variance analysis (ANOVA) of data on percent mortality of *Tribolium castaneum* (Herbst) for Silver based nanoparticals

S.O.V	DF	SS	MSS	F value
Plant	2	1536.53	768.27	189.142**
Concentration(Conc.)	2	1274.13	637.07	156.841**
Plant*Concentration	4	145.10	36.28	8.931*
Error	18	73.11	4.06	
Total	26	3028.88		

Table 6. Contrast of mean percent fertility of Tribolium castaneum after exposure to various plant extract concentrations after 48 hours

Concentrations (%)	Mean percentage mortality ± SE
5	11.39 ± 1.93 c
10	21.20 ± 2.60 b
15	28.13 ± 3.72 a

Data in table 6. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum mortality (28.13 %) at 15% was recorded. The mean mortality was 21.20 % at 10% concentration and 11.39% mortality The concentration of plant extracts was observed at 5%.From this it is concluded that mortality only increased with increasing concentrations of the three different plant oil and also shows that concentration has significant effect on % mean percent mortality of *T. castaneum*.

7. Comparison of mean percentage mortality of *Tribolium castaneum* after exposure to different plant extracts after 48 hrs

Concentrations (%)	Mean percentage mortality ± SE
P1	10.56 ± 0.82 c
P2	21.23± 2.60 b
P3	28.95 ± 3.40 a

Table 7. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 28.95 and 21.23%,correspondly . While least mortality 10.56 % was given by extract of *Citrus paradise.*

8. Comparative mean percentage tribolium castaneum mortality following exposure to different plant extract concentrations after 48 hrs

Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 5	5.00±0.00 g
Citrus paradise x 10	11.67±1.67efg
Citrus paradise x 15	15.00±0.00 def
Jatropha curcus x 5	11.67±1.67 fg
Jatropha curcus x 10	23.34±1.67 cd
Jatropha curcus x 15	28.67±0.34 bc
Ricinus communis x 5	17.50±1.68 de
Ricinus communis x 10	28.61±0.67 b
Ricinus communis x 15	40.74±0.67a

Table 8. showed the interaction between Various concentrations (5, 10 % and 15 %)and different time period of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 8.

Mean comparison of percentage mortality values of *T. castaneum* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (40.74%) at 15% was recorded. The mean mortality was 28.61% at 10% concentration and 17.50% mortality was observed at 5 per cent plant extract concentration. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (28.67%) at 15% was recorded. The mean mortality was 23.34% at 10% concentration and 11.67% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (15.00%) at 15% was recorded. The mean mortality was 11.67% at 10% concentration and 5.00% Mortality was observed at 5 per cent plant extract concentration. The result given showed significant association between exposure time and concentration. From the results we concluded that mortality values were increasing gradually with an increase in plant extract concentration.

Mortality Data After Exposure Of 72 Hrs

Table 9. Variance analysis (ANOVA) of the percent mortality data for Silver based nano-particals of Tribolium castaneum (Herbst).

S.O.V	**DF**	**SS**	**MSS**	**F value**
Plant	2	1422.21	711.11	92.275**

Concentration(Conc.)	2	1998.33	999.16	129.655**
Plant*Concentration	4	399.07	99.77	12.946*
Error	18	138.71	7.71	
Total	26	3958.33		

Table 10. Comparison of Tribolium castaneum mean percent mortality after exposure to various plant extract concentrations after 72 hrs.

Concentrations (%)	**Mean percentage mortality ± SE**
5	9.70 ± 1.08 c
10	22.56 ± 2.92 b
15	30.59 ± 4.18 a

Data in table 10. represents the insecticidal effect of different concentrations of 3 different oil against *Tribolium castaneum*. The experimental data revealed that maximum mortality (30.59 %) at 15% was recorded. The mean mortality was 22.55 % at 10% concentration and 9.70% mortality was observed at 5 per cent plant extract concentration. From this it is concluded that mortality only increased With increased concentrations of the 3 different plant oil and shows also that concentration has a positive effect on the mean percent morbidity of T. Castañea.

11. Comparison of mean percentage mortality of *Tribolium castaneum* after exposure to different plant extracts after 72 hrs

Concentrations (%)	**Mean percentage mortality ± SE**
P1	12.78 ± 1.88 c
P2	19.67± 2.60 b
Concentrations (%)	**Mean percentage mortality ± SE**
P3	30.41 ± 4.98 a

Table 11. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 30.41 and 19.67%,correspondly . While least mortality 12.78 % was given by extract of *Citrus paradise.*

12. Comparative mean percentage mortality of *Tribolium castaneum* after exposure to different plant extract concentrations following 72 hours

Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 5	6.67±1.67 g
Citrus paradise x 10	13.34±1.67efg
Citrus paradise x 15	18.34±1.67 def
Jatropha curcus x 5	10.00±0.00 fg
Jatropha curcus x 10	21.67±1.67 cd
Jatropha curcus x 15	27.34±0.67 bc
Ricinus communis x 5	12.45±1.68 de
Ricinus communis x 10	32.65±1.68 b
Ricinus communis x 15	46.12±2.42a

Table 12. showed the interaction between various concentrations (5, 10 and 15 per cent) and different time periods of exposure. Mean mortality of *T. castaneum* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 12.

Mean comparison of percentage mortality values of *T. castaneum* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (46.12%) at 15% was recorded. The mean mortality was 32.65% at 10% concentration and 12.45% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (27.34%) at 15% was recorded. The mean mortality was 21.67% at 10% concentration and 10.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (18.34%) at 15% was recorded. The mean mortality was 13.34% at 10% concentration and 6.67% mortality was observed at 5% concentration of the plant extracts.The given outcome showed that interaction of exposure time and concentration was significant. We concluded from the results, that there was a gradually increase in mortality values with increase in concentration of plant extracts.

Determining The Mortality Of *Trogoderma Granarium* Through Silver Nano-Particals

Mortality Data After Exposure Of 24 Hrs

To evaluate the mortality of *T. granarium*, homogenous adults were released on treated diet in small plastic jars. Adults were allowed to feed on treated diet and data regarding mortality was recorded. Wheat grains were used as diet and three Concentrations viz. 5, 10 and 15 % of each plant extract were used.Mortality data was recorded for 24, 48 and 72 h of exposure period. For mortality assessment insects incubators were kept at 30±2 oC and 60±5 per cent RH. They replicated each treatment and control three times.

Table 13 Reveals the variance analysis (ANOVA) of data on the mean mortality percentage of *T. granarium* at different concentrations of *Jatropha curcus ,Citrus paradise and R. communis.* Data showed that main effects, plants ($F=4.66$; df=1: $p<0.05$) and concentration ($F=11.10$ df=;2 $p<0.05$) were significant regarding mortality values of *T. castaneum* after exposure period of 24 hours.

Table 13. Variance analysis (ANOVA) of data on percent mortality of *T. granarium* (Herbst) for silver based nanoparticles

S.O.V	DF	SS	MSS	F value
Plant	2	555.807	277.904	38.4000**
Concentration	2	480.691	240.345	33.2103**
Plant*Concentration	4	65.422	16.355	2.2600*
Error	18	130.267	7.237	
Total	26	1232.187		

Table 14. Comparison of mean percent mortality of Trogoderma granarium after exposure to various plant extract concentrations after 24 hours

Concentrations (%)	Mean percentage mortality ± SE
5	4.13±1.19
10	10.28±2.15
15	14.40±2.08

Data in table 14. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (14.40%) at 15% was recorded. The mean mortality was 4.13% at 5% concentration and 10.28% mortality was found at a concentration of 10 per cent of plant extracts. From this it is concluded that mortality only increased with increasing concentrations of the three different plant oil and also shows that concentration has significant effect on Mean mortality %of *T. granarium*.

Table 15. Comparison of mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 24 hrs

Concentrations (%)	Mean percentage mortality ± SE
P1	4.44±1.30
P2	8.89±1.61
P3	15.48±2.25

Table 15. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 15.48 and 8.89%,correspondly . While least mortality 4.45% was given by extract of *Citrus paradise.*

Table 16. Comparative mean percentage mortality of *Trogoderma granarium* after exposure to different concentrations of plant extracts after 24 hrs

Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 5	1.67±1.67g
Citrus paradise x 10	3.34±1.67efg
Citrus paradise x 15	8.34±1.67def
Jatropha curcus x 5	3.34±1.67fg
Jatropha curcus x 10	10.00±0.00cd
Jatropha curcus x 15	13.34±1.67bc
Ricinus communis x 5	7.40±1.68de
Ricinus communis x 10	17.50±1.68b
Ricinus communis x 15	21.54±1.46a

Table 16. showed the interaction between different concentrations (5, 10 and 15%) and different exposure time period. Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 16.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (21.54%) at 15% was recorded. The mean mortality was 17.50% at 10% concentration and 7.40% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (13.34%) at 15% was recorded. The mean mortality was 10.00% at 10% concentration and 3.34% mortality was observed at 5 per cent plant extract concentration. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (8.34%) at 15% was recorded. The mean mortality was 3.34% at 10% concentration and 1.67% Mortality was observed at 5 per cent plant extract concentration. The result given showed significant association between exposure time and concentration. From the results we concluded that mortality values were increasing gradually with such an increase in plant extract concentration.

Mortality Data After Exposure Of 48 Hrs

Table 17.Variance of analysis (ANOVA) of the data concerning % mortality of *T. granarium* (Herbst) for silver based nanoparticles

S.O.V	**DF**	**SS**	**MSS**	**F value**
Plant	2	1608.555	804.278	123.0181**
Concentration				

	2	1265.198	632.599	96.7590**
Plant*Concentration	4	457.108	114.277	17.4792*
Error	18	117.682	6.538	
Total	26	3448.543		

Table 18. Comparison of Trogoderma granarium mean percent mortality after 48 hrs of exposure to various plant extract concentrations.

Concentrations (%)	**Mean percentage mortality ± SE**
5	5.81±1.49
10	14.18±2.30
15	22.58±4.77

Data in table 18. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (22.58%) at 15% was recorded. The mean mortality was 5.81% at 5% concentration and 14.18% mortality was observed at 10% concentration of the plant extracts. From this it is concluded that mortality only increased with increase in concentrations of the 3 different plant oil and also shows that concentration has significant effect on percent mean percent mortality of *T. granarium*.

Table 19. Comparison of the mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 48 hrs

Concentrations (%)	**Mean percentage mortality ± SE**
P1	6.67±1.44
P2	11.12±1.82
P3	24.80±4.48

Table 19. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 24.80 and 11.12%,correspondly . While least mortality 6.67% was given by extract of *Citrus paradise.*

Table 20.Comparative mean percentage mortality of *Trogoderma granarium* after exposure to different concentrations of plant extracts after 48 hrs

Plant extracts x Concentrations (%)	(%) Mean Mortality ± SE
Citrus paradise x 5	1.67 ±1.67 g
Citrus paradise x 10	8.34±1.67efg
Citrus paradise x 15	10.00±0.00def
Jatropha curcus x 5	5.00±0.00fg
Jatropha curcus x 10	11.67±1.67cd
Jatropha curcus x 15	16.67±1.67 bc
Ricinus communis x 5	10.77±1.68 de
Ricinus communis x 10	22.56±1.68 b
Ricinus communis x 15	41.07±1.68 a

Table 20. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different time periods of exposure. Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 20.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (41.07%) at 15% was recorded. The mean mortality was 22.56% at 10% concentration and 10.77% mortality was observed at 5% concentration of the plant extracts. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (16.67 %) at 15% was recorded. The mean mortality was 11.67% at 10% concentration and 5.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (10.00%) at 15% was recorded. The mean mortality was 8.34% at 10% concentration and 1.67 % mortality was observed at 5% concentration of the plant extracts. The result given showed significant association between exposure time and ability to concentrate. From results we concluded that there was a gradually increase in mortality values with increase in concentration of plant extracts.

Mortality Data After Exposure Of 72 Hrs

Table 21.Variance of analysis (ANOVA) of the data concerning % mortality of *T. granarium* (Herbst) for Titanium dioxide based nanoparticles

S.O.V	DF	SS	MSS	F value
Plant	2	1141.490	570.745	95.396**
Concentration	2	1497.094	748.547	125.115**
Plant*Concentration				

	4	278.498	69.625	11.637*
Errorr	18	107.692	5.983	
S.O.V	**DF**	**SS**	**MSS**	**F value**
Total	26	3024.774		

Table 22. Comparison of mean percent mortality of Trogoderma granarium after visibility to various plant extract concentrations after 72 hours

Concentrations (%)	**Mean percentage mortality ± SE**
5	8.59±1.02
10	18.64±2.63
15	26.79±3.63

Data in table 22. represents the insecticidal effect of different concentrations of 3 different oil against *Trogoderma granarium*. The experimental data revealed that maximum mortality (26.79%) at 15% was recorded. The mean mortality was 8.59% at 5% concentration and 18.64% Mortality was found at a concentration of 10 per cent of plant extracts. From this it is concluded that mortality only increased with increase in concentrations of the 3 different plant oil and also shows that concentration has significant effect on average mortality by percent of *T. granarium*.

Table 23. Comparison of the mean percentage mortality of *Trogoderma granarium* after exposure to different plant extracts after 72 hrs

Concentrations (%)	**Mean percentage mortality ± SE**
P1	10.00±1.44
P2	18.12±2.37
P3	25.92±4.29

Table 23. for percent mean mortality values of different plant extracts at different concentration levels showed that extracts of *R. communis and Jatropha curcus* gave mortality values 25.92 and 18.12%,correspondly . While least mortality 10.00% was given by extract of *Citrus paradise.*

Table 24. Comparative mean percentage mortality of *Trogoderma granarium* after exposure to Variable concentrations of plant extracts after 72 hrs

Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 5	5.00±0.00g
Citrus paradise x 10	10.00±0.00efg
Plant extracts x Concentrations (%)	**(%) Mean Mortality ± SE**
Citrus paradise x 15	15.00±0.00def
Jatropha curcus x 5	10.00±0.00fg
Jatropha curcus x 10	18.34±1.67 cd
Jatropha curcus x 15	26.00±1.00bc
Ricinus communis x 5	10.77±1.68de
Ricinus communis x 10	27.60±1.68b
Ricinus communis x 15	39.39±2.91a

Table 24. showed the interaction between Various concentrations (5, 10 and 15 per cent) and different time periods of exposure.Mean mortality of *T. granarium* was given in percentage by the application of extract of *Ricinus communis*, *Jatropha curcus*, *Citrus paradise* oil along with standard error in table 24.

Mean comparison of percentage mortality values of *T. granarium* at different concentrations of selected plant extract were highest at maximum concentration. Extract of *Ricinus communis* gave the highest mean mortality revealed that maximum mortality (39.39%) at 15% was recorded. The mean mortality was 27.60% at 10% concentration and 10.77% mortality was observed at 5 per cent plant extract concentration. Extract of *Jatropha curcus* gave the mean mortality revealed that maximum mortality (26.00%) at 15% was recorded. The mean mortality was 18.34% at 10% concentration and 10.00% mortality was observed at 5% concentration of the plant extracts. Extract of *Citrus paradise* gave the mean mortality revealed that maximum mortality (15.00%) at 15% was recorded. The mean mortality was 10.00% at 10% concentration and 5.00% mortality was observed at 5 per cent plant extract concentration..The given outcome showed that the exposure time and concentration interactions were significant. From the results we concluded that mortality values were increasing gradually with an increase in plant extract concentration..

V. CHARACTERIZATION OF NANOPARTICLES

Silver Nano-composits

UV-Visible spectroscopy is one of the techniques most widely used for structural characterisation of silver nanoparticles (green synthesized AgNPs of *Ricinus communis*). Typical for silver nanoparticles.c is the absorption band in the region 350 nm to 450 nm. Therefore we can conclude that the nanoparticles recommended for farming leveal are against pest control because of their cheap quality, supply, eco-friendly nature and good alternative type.which is shown in [19].

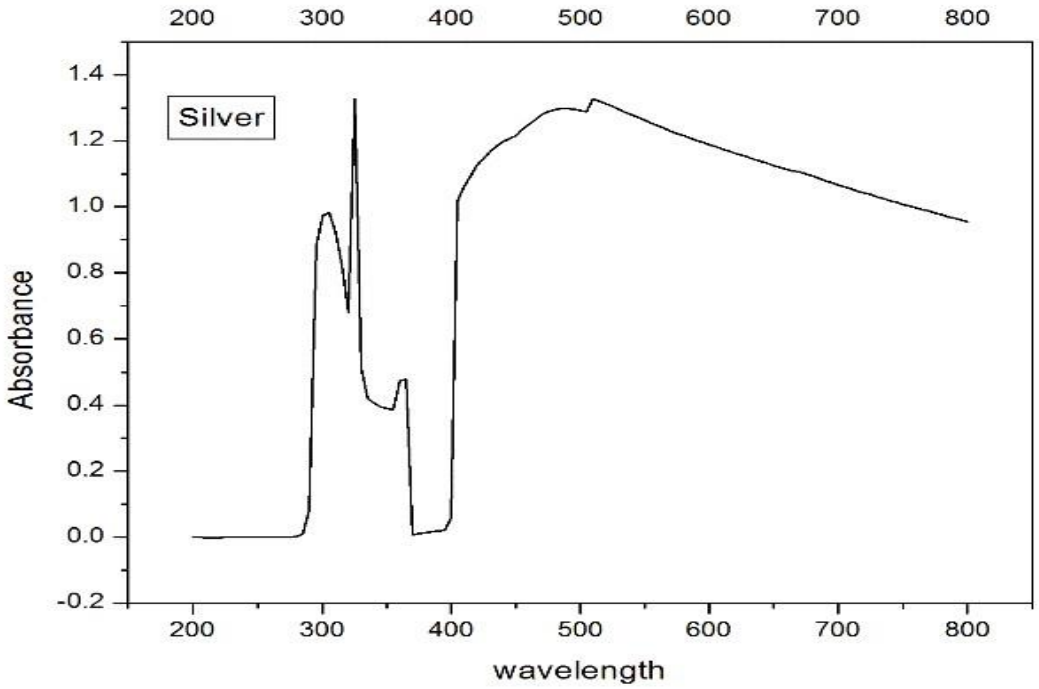

Figure 4 :Spectra of absorption of UV-Vis from synthesized silver nanoparticles

FTIR

FTIR observations were conducted to classify the potential biomolecules liable for both the capping and effective stabilization of metal nanoparticles synthesized with leaf broth. The peak IR bands (Fig. 4.2) observed in the dried Ricinus communis leaf at 3409 and 1733 cm1 are characteristic of the O – H and C,O stretching modes for the OH and C,O groups, possibly of oleuropein, apigenin-7glucoside and/or luteolin-7-glucoside present in the Ricinus communis leaf[20]. The medium band of 1624 cm1 refers to amide I, the result of carbonyl stretching in proteins[20]. The strong peak at 1077 cm1 is equivalent to the amine stretching vibration of C – N. CH is assigned the peak near 651 cm1 from plane bending vibrations of the substituted ethylene systems –CH,CH. In the case of nanoparticles, a large shift in the absorbance peak with decreased band intensity from 3436 to 3395 cm1 and 1420 to 1454 cm1 was observed, implying binding of the extract's silver ions with hydroxyl and carboxylate groups[20].

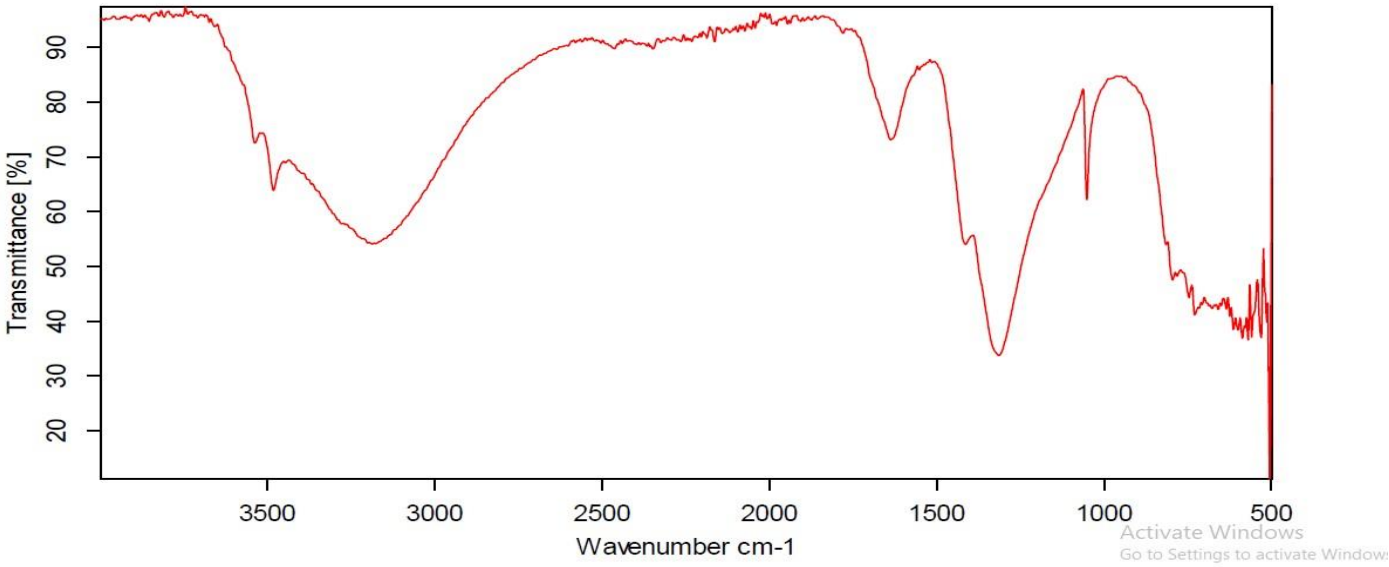

Figure 5: FTIR Spectra of silver Nano Particles

VI. CONCLUSION

The current study was directed to investigate the Insecticidal and growth-inhibiting vegetable extracts and new chemistry insecticide formulation of different nano-composits, against *Tribolium castaneum*. Two bioassays were carried in study including mortality and growth inhibition. The big impact on soil fertility or growth was produced by the tribolium castanium and Trigoderma granarium pests. Different plant extratc oil has been used in the past years to control these effects, but it does not work properly. The big impact on soil fertility or growth was produced by the tribolium castanium and Trigoderma granarium pests. Different plant extratc oil has been used in the past years to control these effects, but it does not work properly. Therefore we can conclude that the nanoparticles recommended for farming leveal are against pest control because of their cheap quality, supply, eco-friendly nature and good alternative type.

REFERENCES

[1] Bhattacharyya, A., et al., Nano-particles-A recent approach to insect pest control. African Journal of Biotechnology, 2010. 9(24): p. 3489-3493.

[2] Kauffmann, A., et al., High expression of DNA repair pathways is associated with metastasis in melanoma patients. Oncogene, 2008. 27(5): p. 565-573.

[3] Pérez-de-Luque, A. and D. Rubiales, Nanotechnology for parasitic plant control. Pest Management Science: formerly Pesticide Science, 2009. 65(5): p. 540-545.

[4] Boxall, D.L., et al., Rapid synthesis of a Pt1Ru1/carbon nanocomposite using microwave irradiation: A DMFC anode catalyst of high relative performance. Chemistry of materials, 2001. 13(3): p. 891-900.

[5] Binmoammar, T.A., et al., The impact of poor glycaemic control on the prevalence of erectile dysfunction in men with type 2 diabetes mellitus: a systematic review. JRSM open, 2016. 7(3): p. 2054270415622602.

[6] Barak, A., W. Burkholder, and D. Faustini, Factors affecting the design of traps for stored-product insects. Journal of the Kansas Entomological Society, 1990: p. 466-485.

[7] Daliparthy, J., A.V. Barker, and S.S. Mondal, Potassium fractions with other nutrients in crops: a review focusing on the tropics. Journal of plant nutrition, 1994. 17(11): p. 1859-1886.

[8] Fields, P.G. and N.D. White, Alternatives to methyl bromide treatments for stored-product and quarantine insects. Annual review of entomology, 2002. 47(1): p. 331-359.

[9] Türkez, H., et al., Effects of some boron compounds on peripheral human blood. Zeitschrift für Naturforschung C, 2007. 62(11-12): p. 889-896.

[10] Yang, B., et al., Electromagnetic energy harvesting from vibrations of multiple frequencies. Journal of micromechanics and microengineering, 2009. 19(3): p. 035001.

[11] Akhtar, M.S., J. Panwar, and Y.-S. Yun, Biogenic synthesis of metallic nanoparticles by plant extracts. ACS Sustainable Chemistry & Engineering, 2013. 1(6): p. 591-602.

[12] Park, C.L. and V.S. Helgeson, Introduction to the special section: growth following highly stressful life events--current status and future directions. Journal of consulting and clinical psychology, 2006. 74(5): p. 791.

[13] Sreenivas, D., et al., Genetic analysis of egg quality traits in White Leghorn chicken. Veterinary world, 2013. 6(5): p. 263.

[14] Khalilzadeh, M.A. and M. Borzoo, Green synthesis of silver nanoparticles using onion extract and their application for the preparation of a modified electrode for determination of ascorbic acid. journal of food and drug analysis, 2016. 24(4): p. 796-803.

[15] Swathi, T. and G. Buvaneswari, Application of NiCo2O4 as a catalyst in the conversion of p-nitrophenol to p-aminophenol. Materials Letters, 2008. 62(23): p. 39003902.

[16] Kasthuri, J., S. Veerapandian, and N. Rajendiran, Biological synthesis of silver and gold nanoparticles using apiin as reducing agent. Colloids and Surfaces B: Biointerfaces, 2009. 68(1): p. 55-60.

[17] Rehman, K., et al., Prevalence of exposure of heavy metals and their impact on health consequences. Journal of cellular biochemistry, 2018. 119(1): p. 157-184.

[18] Sabir, R.I., et al., Factors affecting customer satisfaction in banking sector of Pakistan. International review of management and business research, 2014. 3(2): p. 1014.

[19] Mikolajczyk, K., et al., A comparison of affine region detectors. International journal of computer vision, 2005. 65(1-2): p. 43-72.