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Study the Effect of Deltamethrin as an Insecticide, and Organic Fertilizer on the Chemical Content of the Lettuce Leaf and their Effects on Hepatic and Renal Functions in Male Rats

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Abstract:

Deltamethrin one of the insecticides recommended by the Wold Health Organization for agriculture spraying e.g.vegetables . Although deltamethrin appears to be the most persistent pyrethroid in commercial use and in field studies because this insecticide degrades faster than many of the persistent organochlorides . This study was designed to understand the side effect of deltamethrin pollution at a different concentrations on the chemical constituents of lettuce plants. Also, to illustrate the extent to which the organic fertilizer could prevent or ameliorate the deleterious effect of deltamethrin on plant growth and production . Moreover to study the toxic effect of lettuce ingestion on liver and kidney functions in rats and tries to test whether organic fertilizer attenuate exogenous and endogenous oxidant stress in rats . In this work deltamethrin at a different concentrations and organic fertilizer were used and samples from lettuce plant were taken at a different growth stages . Also, At the end of experimental period (three months) sampling from the plant will be studied for the chemical estimation of proline content ,total soluble sugar , total sugar , chlorophyll A and B . Also , the present study were conducted on male rats to examine the effect of lettuce ingestion before and after exposure to deltamethrin and after using organic fertilizer . In this work rats were divided into six groups .The first served as control, the second group fed on lettuce exposed to organic fertilizer only and third group rats fed on lettuce exposed to low concentration of deltamethrin, the fourth rats fed on lettuce exposed to high concentration of deltamethrin,fifth group rats fed on lettuce exposed to low concentration of deltamethrin mixed with organic fertilizer and six group rats fed ettuce exposed to high concentration of deltamethrin mixed with organic fertilizer . Blood samples were collected for estimation of blood glucose, insulin hormone, total cholesterol, lipoproteins, liver function, antioxidant enzymes, reactive oxygen species and kidney function. The results showed that proline content in lettuce plant increased in fertilizer treated group while it decreased in plant exposed to low dose of deltamethrin compared with fertilizer treated group. Combined treatment with both dose of deltametherin and fertilizer (group V and VI) leading to significant decrease in proline content vesus fertilizer group (group II) . As regard to charbohydrate content low and high dose of deltamethrin induced significant increase in total soluble sugers compared with normal and fertilizer treated groups . Combined treatment with fertilizer and low or high dose of deltamethrin produced significant increase in total soluble sugar content versus fertilizer treated group only .Chlorophyll A and B levels significantly increased in fertilizer and low dose deltamethrin treated group versus normal group , while in group IV and V its levels significantly decreased . In rats all treated groups revealed significant increased in blood glucose level accompanied with significant decreased in insulin concentration except in low and high dose of deltamethrin treated group . Total cholesterol levels in group 111 ,1V, V and V1 significantly increased . Total protein level significantly increased in all treated groups except in group V while albumin level significantly decrease compared with normal untreated group . Serum AST activity increased significantly in fertilizer and high dose treated groups but LDH activity significantly increased in all treated groups . Super oxide dismutase (SOD) and Ctalase (CAT) enzymes activity decreased significantly in fertilizer treated group ,while its activity showed significant increased in all treated groups, catalase enzyme activity showed significant increased in groups treated with low and high dose of deltamethrin (group III& IV) and in group V & VI compared to both normal and fertilizer treated groups . Malon dialdahyde (MDA) activity significantly increased in all treated groups versus normal and fertilizer treated groups . As regared to kidney functions , serum creatinine significantly decreased in group III and IV versus normal and fertilizer groups while serum urea significantly increased in all groups except in group VI when compared with normal and fertilizer treated groups .
Our results demonstrated that deltamethrin exhibited chemical and biochemical changes in the lettuce plant ,liver and kidney through induction of stress to the plants with injuries in liver and kidney that was demonstrated by enhanced activities of liver damage related enzymes and alteration of defense related enzymes .

Keywords: deltamethrin , pyrethroid ,pollution , hepatic , fertilizer , renal functions

Introduction

Deltamethrin(DM) is one of the insecticides recommended by the Wold Health Organization (WHO,1999) for agriculture spraying e.g.vegetables .However , the number of exposed individuals to deltamethrin is larger if we consider that this pyrethroid is also used in agriculture (Femandez et al ., 2008) . Deltamethrin is a type II pyrethroid insecticide that kills insects on contact and through digestion (Fidalgo et al., 1993). Although DM appears to be the most persistent pyrethroid in commercial use, and field studies suggest that this insecticide degrades faster than many of the persistent organ chlorides, including DDT. Exposure to the pyrethroid pesticide deltamethrin has been demonstrated to cause apoptosis both in vitro and in vivo (Hossain and

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Richardson, 2011). However, the molecular pathways leading to deltamethrin-induced apoptosis have not been established. Ingestion of treated soil particles e.g lettuce and contact with sprayed surface can be important pathway of exposure for individuals living in dwellings exposed to DM. Absorption of pyrethroids through gastrointestinal tract and skin has been observed in humans. Although acute effects of DM, including nervous system (e.g. neuronal apoptosis and induced DNA damage), limited information regarding chronic effect in humans is available. Researchers suggest that subacute exposure to DM exerts a serious metabolic distress on the fish corresponding to the exposure period,and histopathological findings can be as good biomarkers of pyrethroid ecosystem pollution(Rawn et al .,2010).

Despite widespread exposure of the general population to DM there is little basic toxicokinetic data to use in health risk assessments on the development of physiologically based toxicokinetic models (Hanke and Jurewicz, 2004). Although the study of Zhang et al. (1991) showed no significant change in blood cholinesterase activity of sprayman using DM methanidophos mixture but not in DM only . Deltamethrin exposure promoted free radical formation in rat brain and reactive oxygen species generation in pc12 cells (Li et al., 2011). The study of Azmi et al .(2006) conclude that exposure of DM for prolonged period has affected the normal functioning of different organ systems and possibly produced characteristics clinical effects such as hepatitis.In this study we will explored this hypothesis further, and we also include relevant data with regard to the toxicokinetics of deltamethrin in exposed adult rats. Moreover, to characterize the toxicokinetics and dose dependent systemic / tissue distribution of DM over a range of doses in rats.

The aim of the present study are to evaluate the side effect of deltamethrin(DM) pollution of different concentrations on the growth and chemical constituents of lettuce plants and to illustrate the extent to which the organic fertilizer could prevent or ameliorate the deleterious effect of deltamethrin on plant growth and production . Also to quantifying the transfer of DM from lettuce to mammalian target organs to estimate the health risk from this exposure and study the toxic effect of DM in lettuce administration in rat's organs , also to examine the bioavailability and protective ability of organic fertilizer against DM-induced liver and renal toxicity. So, they may help reverse the problems associated with deltamethrin pollution and may contribute to decrease its toxicity in individuals.

Materials and Methodes:

I-Plant experimental methods

Chemicals:

1- Deltametherin from Sulphur Mills Limited Company at low dose (5 / L) and high dose (7.5 / L) .

2- Acadian (fertilizer) at a dose 100 ml / L . (natural content) from Acadian Agrich Company , Canada

Methods:

Lettuce plant were used and divided into six groups as follow:

Group I: untreated plant (normal control group)
Group II: lettuce exposed to organic fertilizer only .
Group III: lettuce exposed to low concentration of DM alone.

Group IV: lettuce exposed to high concentration of DM .
Group V: lettuce exposed to low concentration of DM mixed with organic fertilizer .
Group VI: lettuce exposed to high concentration of DM mixed with organic fertilizer

The present study was planned to investigate the effect of deltamethrin at a different concentrations (low and high dose) and organic fertilizer in lettuce plant and samples will be taken at a different growth stages . Also, At the end of experimental period (three months) .Sampling from the plant will be studied for the chemical estimation of :

1-Proline content (Amino Acid) According to method of Bates et al .(1973) by using Spectrophotometer.

2-Total soluble sugars by using Spectrophotometer.

3- Total sugars According to method of Dubois et al .(1965) by using Spectrophotometer.

4-Photosynthetic pigments (chlorophyll A and B) According to method of Metzner etal. (1965) by using Spectrophotometer model Spectro UV-VIS RS ..

Also , the present study will be conducted on experimenal animals to examine the effect of lettuce ingestion before and after exposure to deltamethrin and after using organic fertilizer.

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II-Animal experimental methods:

The present study was conducted on experimenal animals to examine the effect of lettuce ingestion before and after exposure to deltamethrin only or with organic fertilizer.

In this work mature rats will be used . Rats will be housed under the prevailing atmospheric period in the laboratory of physiology , faculty of science and arts ,Al-Qassim University. The study was conducted on 60 adult male albino rats , weighing 200±50 gm . All rats included were housed under prevailing atmospheric conditions throughout the experimental period (4 weeks) in the laboratory of physiology . Rats were divided into six equal groups as follows:

Group I: normal control group fed on ordinary rat chow and received 0.5ml saline vehicle daily .
Group II:rats fed on lettuce exposed to organic fertilizer only .
Group III: rats fed lettuce exposed to low concentration of DM .
Group IV: rats fed lettuce exposed to high concentration of DM.
Group V: rats fed on lettuce exposed to low concentration of DM mixed with organic fertilizer .
Group VI: rats fed lettuce exposed to high concentration

of DM mixed with organic fertilizer.

At the end of experimental period fasting blood samples are collected from the orbital sinus then centrifuged and serum will be used for the measurment of the following parameter:
1-Fasting blood glucose and insulin hormone was estimated.

2-Total cholesterol and lipoproteins (LDL-c , HDL-c and triglycerides).

3--Liver functions test (total proteins , albumin , AST , ALT and LDH).

4-Reactive oxygen species (ROS).

5-Antioxidant enzymes e.g SOD , CAT and MDAwill be measured in serum.

6- Renal function test (serum creatinine and urea).

Statistical Analysis:-

The data were analyzed using SPSS program version 16 .The analysis of covariance (one way ANOVA) was used to detect the differences in the mean between the treated groups and the control and between fertilizer treated group with all treated groups . The mean differences is significant at $P < 0.05$.

Results:

I-Plant field results:

The results of the present study revealed that proline content in lettuce plant increased in fertilizer treated group while it decreased in plant exposed to low dose of DM compared with fertilizer treated group only .Combined treatment with both dose of DM and fertilizer (group V and VI) leading to significant decreased in proline content vesus fertilizer group (group II) . As regard to charbohydrate content (total soluble sugar & total sugar) low and high dose of deltamethrin and combined treatment with fertilizer induced significant increased in total soluble sugar compared with normal and fertilizer treated groups .Chlorophyll A and B levels significantly increased in fertilizer and low dose DM treated group versus normal group , while in group IV and V its levels significantly decreased.

II-Laboratory rat feeding results:

In rats all treated groups revealed significant increased in blood glucose level accompanied with significant decreased in insulin concentration except in low and high dose of deltamethrin treated group compared with fertilizer group . Total cholesterol levels in group 111 ,1V, V and V1 significantly increased versus fertilizer group . Total protein level significantly increased in all treated groups except in group V while albumin level significantly decrease compared with normal untreated group . AST activity significantly increased in fertilizer and high dose treated groups versus normal group but LDH activity significantly increased in all treated groups compared with normal and fertilizer treated groups . Super oxide dismutase (SOD) and catalase (CAT) enzymes activity decreased significantly in fertilizer treated group versus normal group ,while its activity showed significant increased in all treated groups when compared with fertilizer treated group , while catalase enzyme activity showed significant increased in groups treated with low and high dose of deltamethrin (group III& IV) and in group V & VI compared to both normal and fertilizer treated groups. Malon dialdahyde (MDA) activity significantly increased in all treated groups versus normal and fertilizer treated groups . As regared to kidney functions , serum creatinine significantly decreased in group III and IV versus normal and fertilizer groups while serum urea significantly increased in all groups except in group VI when compared with normal and fertilizer treated groups .

Discussion

Exposure to the deltamethrin has been demonstrated to cause apoptosis both in vitro and in vivo. However, the molecular pathways leading to deltamethrin-induced apoptosis have not been established.

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Deltamethrin is in the chemical class of pyrethroids which are synthetic chemicals modeled after the pyrethrin components of pyrethrum. Unlike other pyrethroids, deltamethrin consists of one pure compound (Davies,1985 and WHO , 1990).

While studies were documented the presence of pyrethriod insecticides at acutely toxic concentrations in sediments (Birthe *et. al.* , 2005).

The results of(Xiong *et. al.* , 2005) showed that higher concentration of cypermethrin is inhibitory for growth and other metabolic activities . Despite a reduction in growth (measured as chlorophyll -A content), the intracellular proline content increased in the presence of heavy metals , pesticides and high salt concentration and the intracellular cyanobacterialproline accumulation was more pronounced under salt stress than in the presence of pesticides and heavy metals. Among, deltamethrin was more toxic than alphamethrin(Fatma *et. al.* ,2007).

The degradation of chlorophyll A(Chl. A) ,carotenoids and proteins , were studied with short exposure (45 min – 30 hours) to the pyrethroid insecticide cypermethrin by taking 20 µM and 50 & amp ; muM of the chemical as treatment concentrations . There was significant reduction in Chl A, carotenoids and phycobiliprotein contents of cells in each of the selected concentrations of deltamethrin , and the results showed that higher concentration of pyrethroid caused inhibitory effect of growth and other metabolic activities (Li *et. al.* ,2005). Pheophytin and fluorescing and non - fluorescing chlorophyll catabolites (FCC s and NCC s) were produced as degradation products of Chl A during the exposure period . The amount of the degradation products gradually decreased with prolonged exposure of the cells to the insecticide . The general ultrastructure of mesophyll cells was not altered by deltamethrin ,but morphometric analysis of electron micrographs showed that the fractional volume of chloroplasts and starch in the treated leaves were consistently lower than in controls (Li ,*et. al.* 2005).

Results of Jian – Li , *et. al.*(2008) indicated that pesticide application increased the susceptibility of plants to *N. lugens*. Although the free amino acids in vegetable plants did not change with the pesticide treatments , the concentration of sucrose significantly decreased 5 day after application and also demonstrated that the changes in soluble sugar contents , there were significant interactions between insect origin and insecticide . The changes observed were dose – dependent , showing a strong correlation with the degree of treatment because lettuce and leafy greens are short-season annual crops with little or no tolerance for insect damage or contamination, biological control is generally considered unacceptable. High expectations from consumers for aesthetically appealing produce free of pesticide residues further forces vegetable growers to use chemical control tactics that are not only effective but safe. Consequently, scientists have been developing integrated pest management (IPM) programs for lettuce that are aimed at reducing the economic, occupational and dietary risks associated with chemical controls of the past. (Palumbo and Castle , 2009).

Deltamethrin produced a time- and dose-dependent increase (21-300%) in DNA fragmentation, an indicator of apoptosis. Data demonstrate that the initiation of DNA fragmentation resulted from interaction of deltamethrin with Na^+ channels and consequent calcium influx, as tetrodotoxin and the intracellular Ca^{2+}chelator BAPTA-AM completely prevented apoptosis. DNA fragmentation was accompanied by increased caspase-9 and -3 activities and was abolished by specific caspase-9 and -3 inhibitors. However, deltamethrin did not increase cytosolic cytochrome c levels, indicating that the mitochondrial pathway was likely not involved. (Hossain and, Richardson ,2011.).

In our study , rats in all treated groups revealed significant increased in blood glucose level accompanied with significant decreased in insulin concentration except in low and high dose of deltamethrin treated group compared with fertilizer group . Total cholesterol levels in group 111 ,1V, V and V1 significantly increased versus fertilizer group . Total protein level significantly increased in all treated groups except in group V while albumin level significantly decrease compared with normal untreated group . AST activity significantly increased in fertilizer and high dose treated groups versus normal group but LDH activity significantly increased in all treated groups compared with normal and fertilizer treated groups . Super oxide dismutase (SOD) and catalase (CAT) enzymes activity decreased significantly in fertilizer treated group versus normal group ,while its activity showed significant increased in all treated groups when compared with fertilizer treated group , while catalase enzyme activity showed significant increased in groups treated with low and high dose of deltamethrin (group III& IV) and in group V & VI compared to both normal and fertilizer treated groups . Malon dialdahyde (MDA) activity significantly increased in all treated groups versus

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normal and fertilizer treated groups . As regared to kidney functions , serum creatinine significantly decreased in group III and IV versus normal and fertilizer groups while serum urea significantly increased in all groups except in group VI when compared with normal and fertilizer treated groups . The transcription factor NF-E2-related factor 2 (Nrf2) plays a critical role in the mammalian response to chemical and oxidative stress through induction of phase II detoxification enzymes and oxidative stress response proteins (Li HY *et al* ., 2011.) reported that Nrf2 expression was activated by deltamethrin, a prototype of the widely used pyrithroid pesticides, in PC12 cells. However, no study has examined Nrf2 nuclear translocation and free radical production, two hallmarks of oxidative stress, in the mammalian brain in vivo. Deltamethrin exposure promoted free radical formation in rat brain and reactive oxygen species generation in PC12 cells. Translocation of Nrf2 may be a response to DM-dependent induction of free radicals and DM may act as a mammalian neurotoxin by initiating oxidative stress. Azmi, *et. al.* (2006) . concluded that exposure of multiple pesticides for prolonged period has affected the normal functions of different organ and possibly produced characteristics clinical effects such as hepatitis , dyspnea and burning sensation in urine . Dinu,*et al.*(2010) suggested that DM causes perturbations in lipid – lipid and lipid-protein interactions, interferes in transport mechanisms operating at the membrane level, and causes alterations of membrane permeability and mitochondrial enzyme activities . These effects could be associated with the toxicity of deltamethrin (Kim et.al., 2007) . The findings of Hakoi *et. al.*(1992) provide experimental evidence to indicated that DM compounds have a potential for liver carcinogenicity in rodents . In agreement of our results Tuzmen *et. al.* (2008) reported that the effects of deltamethrin treatment at low and high doses on lipid peroxidation (LPO) and antioxidant enzyme activities such as SOD, and CAT following 16 weeks exposure , as well as antioxidative defence mechanisms and lipid peroxidation in rat liver tissues display different responses depending on different pesticide treatments and doses . Biochemical analysis of Krechniak and Wrzesniowska (1991) showed that administrations of the deltamethrin caused liver damage . In the present study , we observed that lipid peroxidation levels are higher at high doses than at low doses , but DM caused more pronounced increase . We have also observed that oxidant – antioxidant balance is more affected by deltamethrin treatment (Tuzmen *et. al.* ,2008) . The study of Bashir , *et. al.* (2007) reported that deltamethrinin treatment increased lipid peroxidation , proline content and total glutathione content increased as compared with the control .

Among the enzymatic antioxidants activity of superoxide dismutase and glutathione reductase increased significantly whereas that of catalase declined markedly in relation to increased concentration of deltamethrin applied . As regared to kidney functions , insignificant changes might be attributed to th highest clearance of DM through the kidney(.Zhang et al ., 1991and Kilian et al ., 2007) .

In conclusion, these results suggested that deltamethrin induced chemical and biochemical changes in the lettuce plant ,liver and kidney through induction of stress to the plants with injuries in liver and kidney that was demonstrated by enhanced activities of liver damage related enzymes and alteration of defense related enzymes. Histological, histochemical and ultrastrucural investigations are needed to correlate the application of DM with the potential threat of their serious effects on the plant and animal organs . Also different doses of organic fertilizer are needed in future to reach to the effective dose that prevent the toxicity of DM on plans and animal organs.

Acknowledgment

I wish to express my sincere gratitude and thanks to the Dean of Scientific Research for funding this research.

Table 1: Effects of deltametherin, firtilizer alone or combined on Proline, Total soluble sugars, and Total sugars in different treated groups.

Parameter / Group	Prolin			T.R.S (mg/dl)			D.R.V(mg/dl)		
	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test
Group 1	2.03± 0.19	-	0.000*	514.33±11.21	-	0.847	5343.6±1.23	-	0.938
Group 11	4.21± 0.68	0.000*	-	507.83±32.66	0.847	-	5732.66±1.61	0.938	-

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Group 111	0.45± .0.06	0.001 *	0.00 0*	1030. 0±18. 42	0.000 *	0.00 0*	5037. 6±47. 36	0.951	0.889
Group 1V	1.36± 0.24	0.145	0.00 0*	783.0 0. ±38.0 5	0.000 *	0.00 0*	1514 5.0±8 .53	0.056	0.066
Group V	2.24± 0.11	0.632	0.00 0*	568.1 7±11. 80	0.117	0.08 0	4860. 6±3.3 0	0.923	0.861
Group V1	1.15± 0.13	0.058 *	0.00 0*	742.3 3±14. 58	0.000 *	0.00 0*	4197. 4±1.4 7	0.818	0.758

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group.

Table 2: Effect of deltamethirn in different doses and organic fertilizer on Chlorophyll(A) and (B) in different treated groups

Groups	Chlorophyl (A)		Chlorophyl (B)	
	Mean ± S E	significant change	Mean ± S E	significant change
Group 1	7.3433± .3601	--	3.720 ±0 .2626	--
Group 11	9.9117 ± O.236	.000*	5.692± 0.542	.000*
Group 111	9.4000 ± .O.276	.000*	5.550 ± 0.812	.000*
Group 1V	4.2833 ± .0.531	.000*	1.803± 0.132	.000*
Group V	5.9400 ± 0.375	.000*	3.567± .0.211	.564*
Group V1	7.9783 ± .0.321	.0.213	4.667 ± 0.917	.0.634

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group

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Table3: Changes in serum Glucose and Insulin levels in normal control, and different treated groups

Parameter / Group	Glucose			Insulin		
	Mean ± S.E.	(Ta) significant test	(Tb) significant test	Mean± S.E.	(Ta) significant test	(Tb) significant test
Group 1	55.20 ± 15.08	-	0.000 *	4.31± 0.48	-	0.000*
Group 11	125.62± 12.48	0.000*	-	0.36± 0.05	0.000*	-
Group 111	115.43± 3.75	0.001*	0.442	0.28± 0.09	0.000*	0.803
Group 1V	105.80± 9.90	0.005*	0.800	0.57± 0.174	0.000*	0.577
Group V	96.43 ± 5.77	0.013*	0.034 *	0.99± 0.36	0.000*	0.070*
Group V1	90.78 ± 4.71	0.011*	0.032 *	0.69± 0.24	0.000*	0.080

The mean difference is significant at the 0.05 level .
(Ta): significant as compared with normal control group.
(Tb): significant as compared fertilizer treated group

Table 4: Effect of deltamethirn in different doses and organic fertilizer on Lipid profiles in different treated groups

Parameter / Group	Total cholesterol (mg/dl)			LDL-c. (mg/dl)			HDL-c. (mg/dl)			Triglycerides (mg/dl)		
	Mean± S.E.	(Ta) significant test	(Tb) significant test	Mean± S.E.	(Ta) significant test	(Tb) significant test	Mean± S.E.	(Ta) significant test	(Tb) significant test	Mean± S.E.	(Ta) significant test	(Tb) significant test
Group 1	94.50 ±3.80	-	0.113	51.10 ±1.52	-	0.231	24.13 ±1.24	-	0.279	40.60 ±1.47	-	0.002 *
Group 11	86.70 ±2.96	0.113	-	48.00 ±1.85	0231	-	25.40 ±0.78	0.279	-	34.00 ±1.52	0.002 *	-
Group 111	103.00 ±3.35	0.085	0.002 *	59.20 ±1.10	0.003 *	0. 000*	19.72 ±0.39	0.001 *	0.000 *	41.00 ±1.40	0.797	0.001 *
Group 1V	99.00± 3.43	0.355	0.015 *	54.60 ±1.80	0.178	0.014	20.83 ±0.61	0.007 *	*0.000* *	40.50 ±099	0.959	0.002 *
Group V	91.00 ±2.31	0.235	0.005 *	53.00 ±1.20	0.002 *	0. 000*	20.52 ±0.39	0.002 *	*0.000* *	40.00 ±1.310	0.113	0.021 *
Group V1	103.00 ±3.35	0.211	o.o12 *	51.10 ±1.80	0.154	0.012 *	24.53 ±0.65	0.158	0.135	36.420 ±089	0.002 *	0.112

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group

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Table 5: Effect of deltamethirn in different doses and organic fertilizer on serum Protein &Albumin in different treated groups

Groups	Protein		Albumin	
	Mean ± S E	(Ta) significant test	Mean ± S E	Ta) significant test
Group 1	69.400 ±3.454	--	39.533 ±1.024	--
Group 11	52.200 ±2.235	0.001*	21.320 ±1.434	0.000*
Group 111	60.350 ± 3.722	.047*	32.983 ± 1.828	.0.004*
Group 1V	59.667 ± 1.158	.034*	32.300 ± .661	0.002*
Group V	62.433 ± 3.621	0.121	33.167 ± 2.053	0.004*
Group V1	60.967 ± 2.622	0.036	33.283 ± 1.157	0.005*

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated

Table 6: Effect of deltamethirn in different doses and organic fertilizer on serum AST, ALT and LDH in different treated groups.

Parameter / Group	AST (U/L)			ALT (U/L)			LDH (U/L)		
	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test
Group 1	147.85±1.868	-	0.001*	54.95 ±2.588	-	0.616	103.1 ±4.567	-	0.000*
Group 11	165.35±1.456	0.001*		55.55 ±1.654	0.616	-	178.85±1.543	0.000*	--
Group 111	175.93±19.377	0.149	--	58.083±3.385	0.616	--	272.37±2.712	0.000*	0/000*
Group 1V	192.48±8.556	0.026	0.388	60.967±1.967	0.339	0.644	293.3 ±2.029	0.000*	0..0.000*
Group V	163.05±19.562	0.428	0.501	60.883±5.173	0.345	0.654	252.93±2.969	0.000*	0.000*
Group V1	155.18±7.058	0.701	0.281	60.967±6.827	0.460	0.220	273.7 ±2.278	0.00*0	0.0.000*

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group

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Table 7: Effect of deltamethirn in different doses and organic fertilizer on serum SOD, CAT and MDA in different treated groups.

Parameter / Group	SOD (u/gm)			CAT (u/gm)			MDA (nmol/gm)		
	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test	Mean ±S.E.	(Ta) significant test	(Tb) significant test
Group 1	38.26 ±0.46	-	0.032*	1.75± 0.05	-	0.001*	10.23 ±0.47	-	0.002*
Group 11	22.00 ±6.15	0.000*	-	1.32± 0.04	0.001*	-	12.56 ±0.22	0.002*	-
Group 111	42.13 ±2.32	0.743	0.018*	2.19± 0.05	0.067	0.000*	12.65 ±0.46	0.001*	0.875
Group 1V	40.438±0.90	0.721	0.017*	2.02± 0.04	0.015*	0.000*	15.43 ±0.53	0.000*	0.000*
Group V	38.61 ±2.44	0.968	0.030*	1.87± 0.12	0.097	0.000*	15.07 ±0.08	0.000*	0.001*
Group V1	38.89 ±0.11	0.875	0.032	1.92± 0.16	o.060	0.001*	14.08	0.001*	0.123

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group

Table 8: Effect of deltamethirn in different doses and organic fertilizer on Creatinine, and Urea in different treated groups.

Parameter / Group	Creatinine (u/gm)			Urea (u/gm)		
	Mean±S.E.	(Ta) significant test	(Tb) significant test	Mean±S.E.	(Ta) significant test	(Tb) significant test
Group 1	0.50±.028	-	0.085	12.40±0.871	-	0.389
Group 11	0.42±0.022	0.085	-	11.40±0.921	0.389	-
Group 111	0.78±0.016	0.003	0.000*	20.80±0.727	0.000	0.000*
Group 1V	0.89±0.010	0.036*	0.000*	19.40±0.702	0.000*	0.000*
Group V	0.56±.032	0.143	0.000*	20.80±0.727	0.000*	0.000*
Group V1	0.45±.020	0.123	0.214	14.80±0.727	0.121	0.013*

The mean difference is significant at P<0.05 (*)
(Ta): significant as compared with normal control group.
(Tb): significant as compared with fertilizer treated group.

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Figure 1: Effects of deltametherin , firtilizer alone or combined on Proline, , Total soluble sugars, and Total sugars in different treated groups.

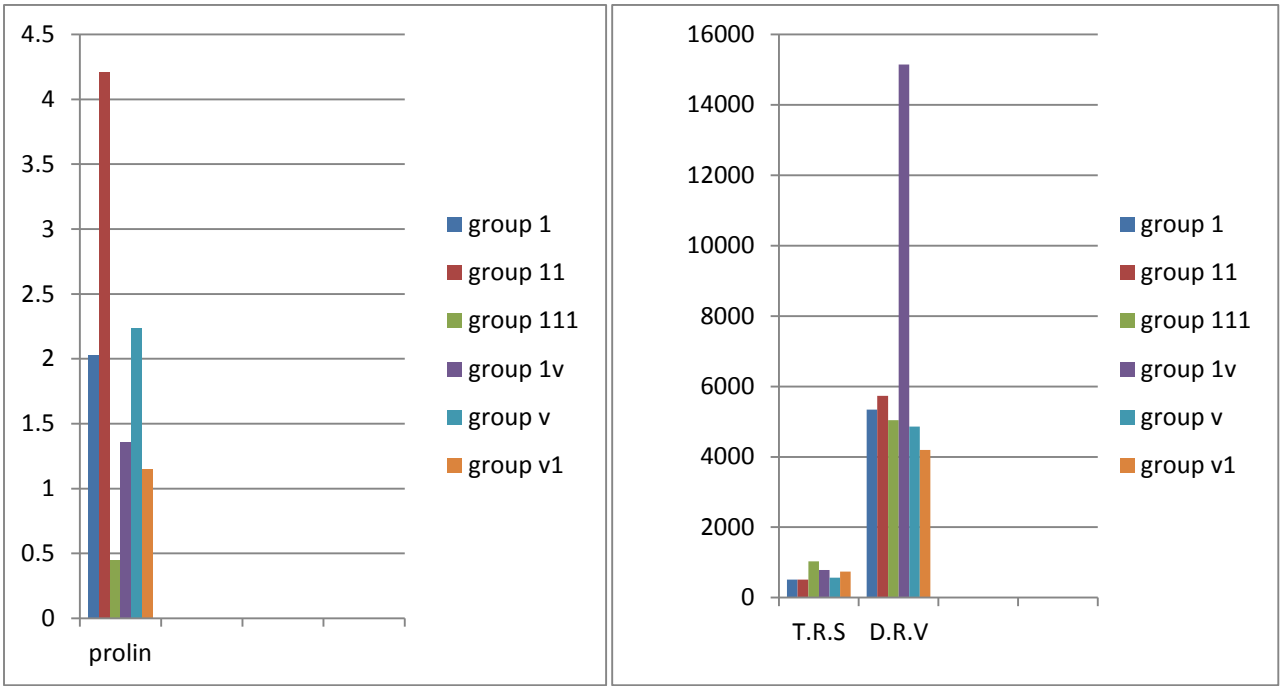

Figure 2: Effects of deltametherin , firtilizer alone or combined on chlorophil Aand chlorophil B in different treated groups

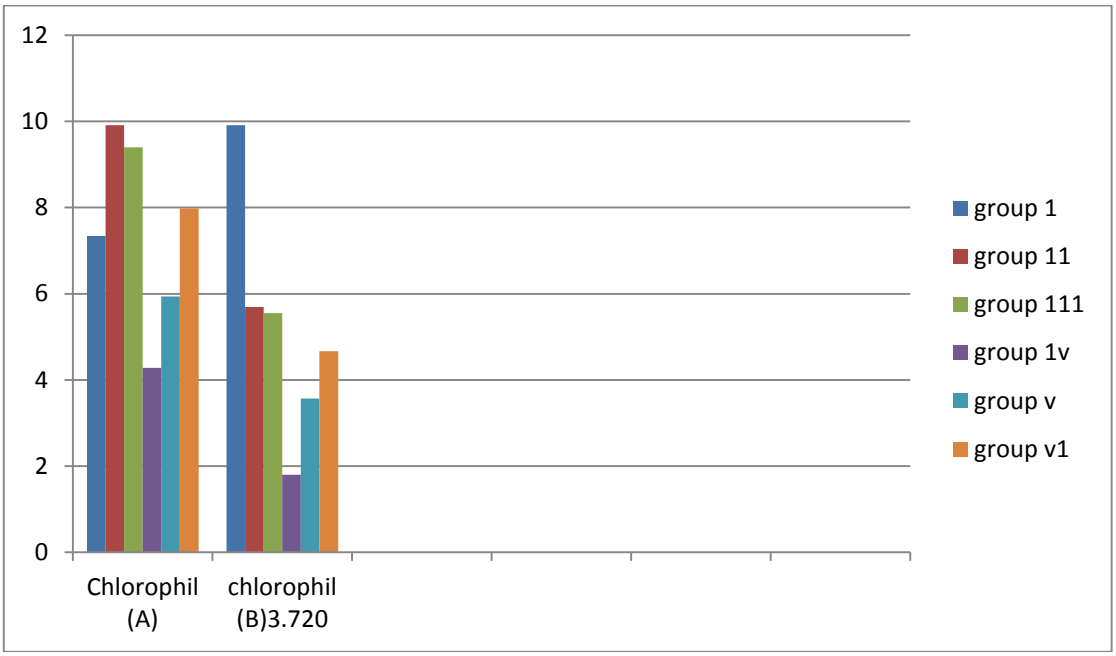

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Figure 3: Effects of deltametherin , firtilizer alone or combined on insulin and blood glucose in different treated groups.

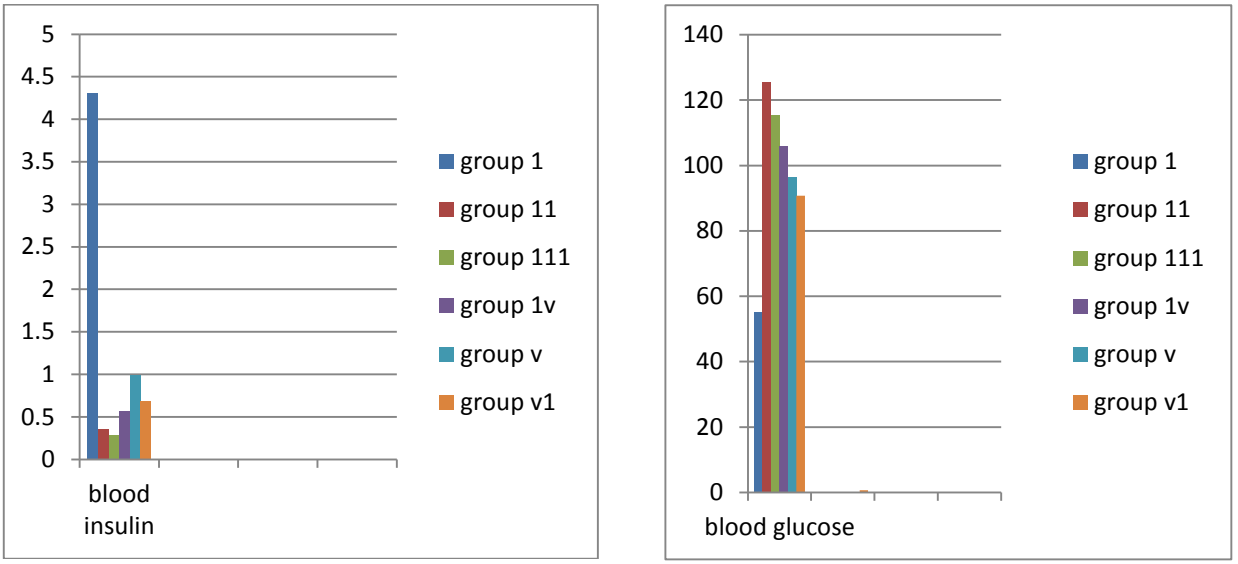

Figure 4: Effects of deltametherin , firtilizer alone or combined on Lipid profiles in different treated groups

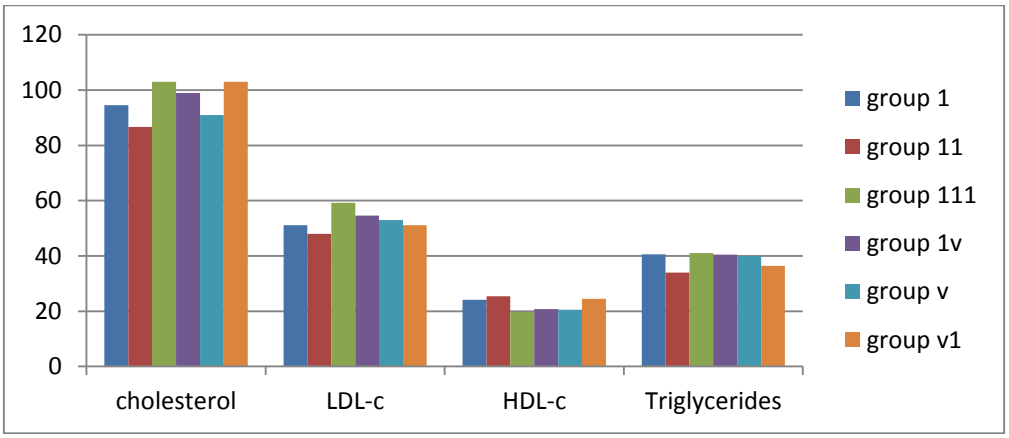

Figure 5: Effects of deltametherin , firtilizer alone or combined on total protein and albumin in different treated groups.

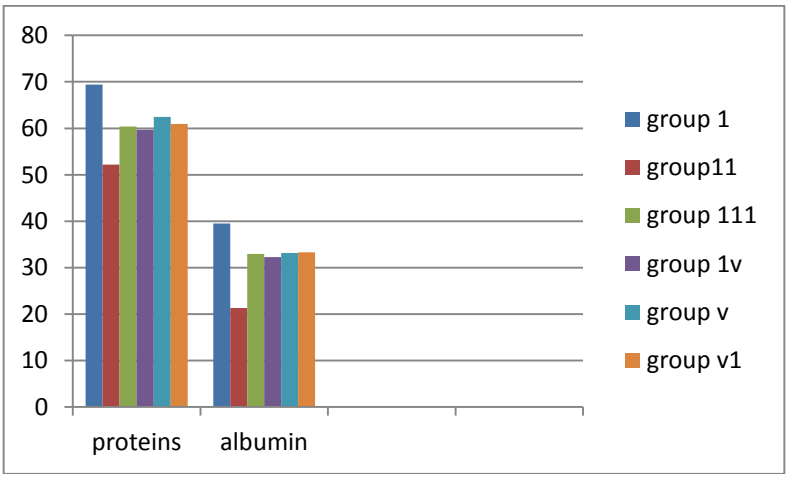

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Figure 6: Effects of deltametherin , firtilizer alone or combined on AST ,ALT and LDH in normal and different treated groups.

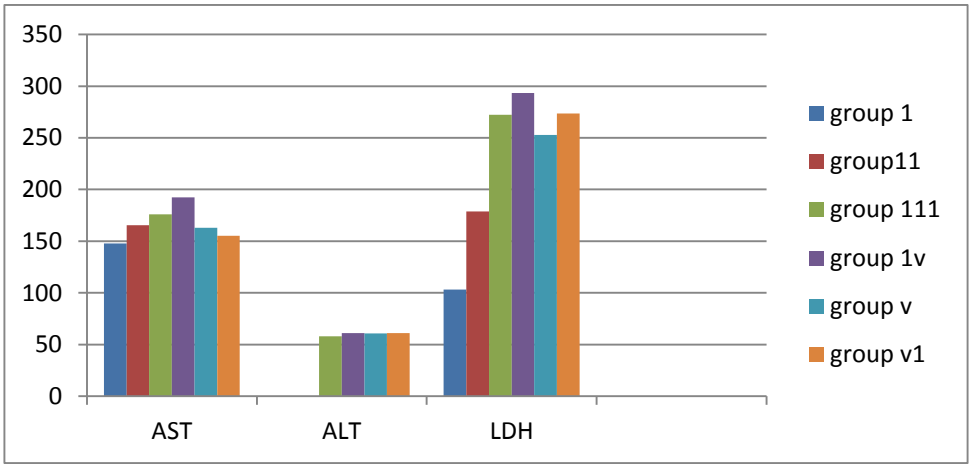


Figure 7: Effects of deltametherin , firtilizer alone or combined on SOD ,CAT and MDA in normal and different treated groups

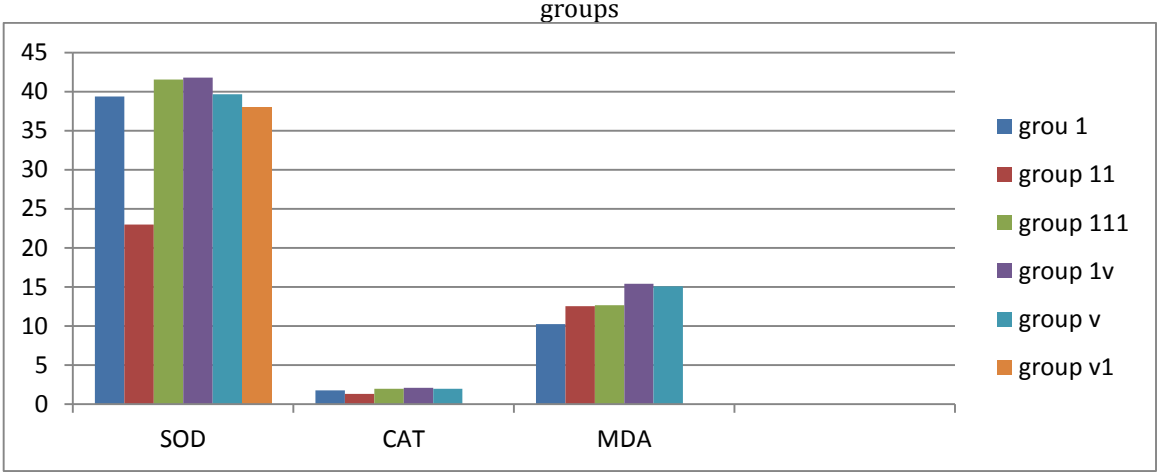
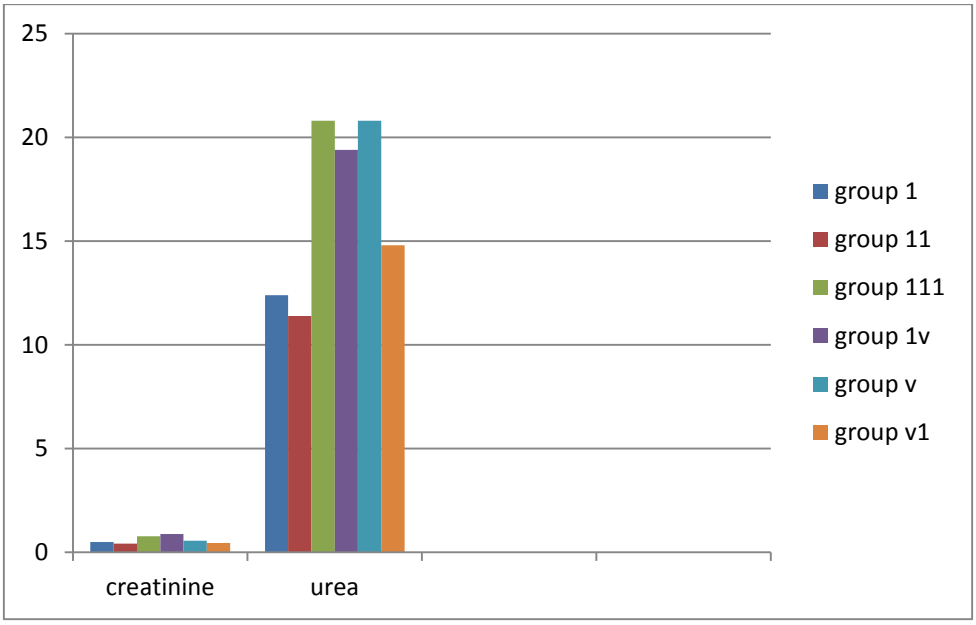


Figure 8: Effects of deltametherin , firtilizer alone or combined on serum Creatinine and Urea in different treated groups.



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