REDU💧TION OF THE HEZARED INFLUENCES OF DIMETHOATE BY GUAVA ANTIOXIDANT ON BODY GROWTH RATE AND BLOOD CONSTITUENTS OF ALBINO RATS

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ABSTRACT

The experiments to be reported here were focused on the effect of dimethoate in technical and formulated forms at sublethal dose of 1/20 of the LD_{50} as well as the antioxidant effects of guava diet to reduce the pesticide toxicity on blood fractions, and body growth rate of male albino rats. Treatments of the pesticides were applied orally or dermally every two consecutive days for three months and the dried antioxidant agent (20% of the diet) was mixed with normal diet and fed *ad libitum* to rats. The influences of both forms of the pesticide and guava diet on body weight gain as well as RBCs and WBCs count, also the contents of blood hemoglobin, bilirubin, plasma soluble protein, thyroid gland hormones and the activity of acetylcholinesterase acid, alkaline phosphtatase and transaminases (GOT and GPT) of plasma were investigated. Body weight gain of male albino rats ingested technical or formulated form of dimethoate was lower than that of normal healthy animal and the level of feed efficiency was decreased but the ratio of liver weight/body weight was incrased at normal control. Moreover, both forms of the insecticide showed considerable elevation in all studied parameters in comparison with the control except cholinesterase activity, total hemoglobin level and RBCs count. These increases and decreases were more in case of formulated dimethoate than that of the technical form; also orally ingestions were more effective than dermally treatment relative to control. Guava (as antioxidant agent) feeding to dimethoate ingested

rats improved the disturbances of the studied pesticide in the experimental animals. Metabolism guava treatment elevated total hemoglobin content and increased RBCs count as well as stimulated cholinesterase activity of dimethoate intoxicated rats. In contrast, activity of GOT and GPT as well as acid and alkaline posphatose activity was inhibited, but total soluble protein, T_3, T_4 and total bilirubin content was normalized by feeding on guava as antioxidant treatment in the dimethoate intoxicated groups. In addition, body weight gain and feed efficiency as well as liver weight also improved in the intoxicated animals by the guava treatment as antioxidant. It means that dimethoat produced disturbance in animal metabolism but guava (antioxidant) treated this dimthoate toxicity and showed the ability of the fruit to improve the toxic effect of the pesticide, which reduced the disturbance of dimethoate in animal metabolism.

INTRODUCTION

Organophosphours insecticides including dimethoate are used to control insects of Coleopera, Diptera, Homoptera and Lepidoptera in soil or on foliage of a wide range of crope. They also used to control household pests and stored products insects (Pesticide Manual 2000). Pesticides are usually applied in the formulated form where the active ingredient is mixed with organic solvent, emulsifying and wetting agents to enhance their water miscibility and penetration. Pesticide formulation is therefore, the process of transforming a pesticidal chemical into a product which can be applied by practical methods to permit its effective, safe and economical use. However, it has been reported that formulation may cause synergism or antagonism to the toxicity of active ingredient (El-Sebae, 1985 and Abd El-Rahim et al, 1994).

To establish any toxicological data, acute toxicity tests are considered to be the base line or preliminary studies for chronic toxicity tests. In this respect, dimethoate is commonly used in Egypt, however, on or very little data are available in the literature about its influence in techncial and formulated dimethoate on animals.

Guidelines that limit pesticide residuces on foods are developed and enforced by public health agencies world wide. These guidelines incorporate data from many sources into the risk assessment process, including high-dose animal toxicity studies. Organophosphorous insecticides such as dimethoate inhibited acetylcholinesterase as a

toxicologic endpoint since neural of organophosphoruous insecticides (USEPA, 2002 and Marable et al 2007). It is probable that dimethoate is transported to the target organs through partitioning into blood lipids and binding to blood proteins (Cui et al, 2006).

The antioxidant potential of vitamin A, E and C is well established. They efficiently inhibits *in vitro* lipid peroxidation due to a combination of direct vadical interception. However *in vivo* cellular location of each compound may be an important factor in conferring protection against oxidative injurios (Irshad and Chaudhuri, 2002). In addition Verma et al (2007) showed that pretreatment with antioxidant vitamins decreased dimethoate (organophosphorous pesticide) induced lipid peroxidation, which have antioxidant potential. Also, the pretreatment with antioxidant vitamens decreased generation of reactive oxygen metabolites, thus prevents the organophosphorous pesticides-induced derangements in the activities of antioxidant enzymes. The redox status of the tissues is improved in vitamins fed rats.

The aim of the present studies is to compare the effects of technical and formulated dimethoate on body weight gain, food intake, feed efficiency, the ratio of liver weight/ body weight, RBCs and WBCs count, blood hemoglobin and plasma bilirubin, soluble protein, T_4 and T_3 level as well as cholinesterase, acid and alkaline phosphatase and transaminase (GOT and GPT) activities of plasma and also to evaluate the antagonistic effects of guava as antioxidant treatment against the dimethoate toxicity.

MATERIALS AND METHODS

Dimethoate (O, O - dimethyl S-methylcarbamoylmethyl phosphorodithioate 2-dimethoxyphosphinothioylthio-N-methyl technical (95% a.i), (Dimethoate LD50 oral = 387 mg/kg and Dermal = 2000 mg/kg body weight of rat) and formulated (40% E.C) was provided form the central Agricultural pesticides laboratory, ARC Ministry of Agriculture, Dokki, Egypt and used in this study.

Sixty healthy adult male albino rats, *Rattus norvegicus*, Sprague Dawley strain (100-110gg weighing) were obtained from the animal house of Nutrition Institute, Cairo. The animals were kept under normal healthy laboratory conditions for two weeks in their cages prior to the experiment of acclimatization. They were housed

individually in a well aerated cages under hygienic conditions and fed on a diet consisting of a mixture of casein 20%, cotton seed oil 10%, cellulose 5%, salts mixture 4%, vitamins mixture 1% and corn starch 60% (Lane – Pert and Pearson, 1971). The first group served as control and the second group fed on normal diet with 20% dried guava. The third crop was ingested with the sublethal dose of dimethoate which was twentieth (1/20) of oral LD_{50} of technical dimethoate. The fourth group was the same of 3^{ed} group but fed on normal diet with 20% dried guava. The fifth group was used for the dermal sublethal dose of dimethoate which was twentieth (1/20) of the dermal LD_{50} of technical dimethoate (Pesticide Manual, 2000) which was applied on dorsal skin shaved area of 2x2 cm. One day before dosing an area of 2x2 cm on the bank of the dermally treated rats was shaved with care not to abrade the skin. The shaved area was washed with acetone. The dose was then applied eventhy and carefully on the shaved area of rat skin (Abou-Zeid et al, 1993). The sixth group was the same of 5th group but fed on normal diet with 20% dried guava. The seventh group was ingested orally with the sublethal dose of formulated dimethoate (equal 1/20 of oral LD_{50} for technical dimethoate). The eight groups were the same of 7th group but fed on normal diet with 20% dried guava. The ninth group was used for the dermal sublethal dose of formulated dimethoate (equal 1/20 of dermal LD_{50} for technical dimethoate) which was applied like the same of group five. The last group was the same of 9th group but fed on normal diet with 20% dried guava.

Technical or formulated dimethoate was used without any additions for dermal induction but for oral the dose was mixed with 0.5ml emulsified distilled water. One dose was inducted every 48 hours for experimental period of 90 days, either for dermal or oral administration of the both forms of dimethoate. Diet and water were supplied *ad libitum* for all groups during the experimental period.

Each rat was weighed every day and its daily food intake was determinted. At the end of the experimental period (90 days) animal were killed by decapitation. Blood was collected and liver was dissected out and weighed.

Some of blood was centrifuged at 3000 rpm to obtain the plasma which was kept frozen at-20°C until used for analysis. Blood total hemoglobin was determined as described by Decra and Lewis (1975). Red blood cells (RBCs) and white blood cells (WBCs) were counted

after the decapitation immedatcly as pointed by Frankel and Reitman (1963). Plasma total bilirbuin was determined as demonstrated by Jendrassik and Graf (1953). Determination of total soluble protein of plasma was carried out by the method of Bradford (1976). Plasma GOT glutamate oxaloacetate transaminase) and GPT (glutamatye pyruvate transaminase) activities were determined as shown by Ritman and Frankel (1957). Plasma total thyroxine was measured by radioimmunoassay procedure described by Premachandra and Ibrahim (1976). Plasma triiodothyronine was measured by double antibody technique described by Chapra et al, (1972). Cholinesterase acivity was determined colorimetically according to the method of El-Lman et al, (1960). Acid and alkaline phosphatase activity was determined according to the method described by Kind and King (1954).

The data were statistically analysed using t-test as descried by Snedecor and Cochran (1976).

RESULTS AND DISCUSSION

The results of gain in body weight, food intake, feed efficiency and liver weight/body weight ratio were affected by technical and formulated dimethoate are shown in tables (1 and 2).

As shown in table (1), body weight of animals was increased with the increase of age in all rat groups fed on diets with or without dimethoate ingestion. The insecticide induction caused a decrease in the average gain of body weight and the severe influence was found in animals treated orally with the formulated pesticide. In this respect, the values of daily increases in body weight relative to control were arranged in the following order: dermal technical $\leq$ dermal formulated $<$ oral technical $<$ oral formulated.

Values of food intake of animals treated with formulated form (table 2) were about unchanged but significantly lowered than those of normal rats. The food intake were not paralleled to rats growth and feed efficiency. Results, reported in table (2), showed that oral ingestion of both forms of dimethoate revealed lower feed efficiency than dermal treatment. Formulated dimethoate had the lowest value of feed efficiency. The low feed efficiency ratio may be due to the toxic effect of dimethoate which in turn altered the rate of metabolism.

The present findings are in agreement with those of Schenhammar and Wilson (1990), who found that gain in body

weight, food intake and feed efficiency were reduced by pesticides. Abdel-Rahim and Abdel-Rahim, (2007) reported that the both formulated and technical dimethoate disturbed the body systems and formulated insecticide had more effect than that of technical ones.

Table (1): Effect of guava as antioxidant agent on the dimethoat toxicity in body weight gain of male albino rats.

Treatment	Initial-body weight (g)	Final body weight (g)	Body weight gain (g)	Deity gain in body weight (g)	Deity gain% at normal control
Control	99±4	270±15	171	1.90	100
Control + guava	100±6	277±11	177	1.97	104
Oral					
technical p	100±5	225±19*	125	1.39	73
technical p + guava	101±6	246±13*	145	1.61	85
formulated p	101±4	200±14*	99	101	58
Formulated P + guava	102±	230±12*	128	1.42	75
Dermal					
technical p	102±4	249±16*	147	1.63	86
technical p + guava	103±6	261±11	158	1.76	93
formulated p	99±5	231±17*	132	1.47	77
formulated p + guava	100±8	250±13*	150	1.67	88

% relative to control.   P= the pesticide (dimethoat)
Different is significant at control ($P < 0.05$).

Results in table (2) showed that the ratio of liver weight/body weight was elevated under the induction of dimethoate. The lowest value of the ratio was found for rats treated dermally with technical dimethoate while the highest one was recorded for rats ingested orally formulated dimethoate. These results were confirmed with those of Hoffman et al, (1991) and Abd el-Rahim et al, (1994), who observed that pesticides increased fresh liver weights and their ratio relative to body weight. These increases may be due to the hepatotoxicity of the pesticide which may cause hepatic tumor (Hoffman et al, 1991). This also may be due to the protumefaction or enlargement in liver relative to body weight of

experimental rats and to swelling of liver cells and then some of these swelled cells were bursted out or damaged (Goel et al, 2007).

In case of the feeding of guava as antioxidant agent to dimethoate intoxicated rats, the reduced values of gain in body weight of the intoxicated animals were improved, but gain still lower than that of normal control. The feeding on guava diet reduced the toxic effect of dimethoate.

Table (2): Effect of guava as antioxidant agent on the dimethoat toxicity in food intake, feed efficiency and liver weight of male albino rats.

Treatment	Food intake	Daity food intake	Food efficiency	Food effici. %	Liver weight (g)	Liver weight body weight	%
Control	1000±92	11.11	0.171	100	11.87±0.96	0.043	100
Control+guava	999±87	11.1	0.177	104	11.36±1.00	0.041	95
Oral							
technical p	1006±22	11.79	0.118*	69	11.03±0.98	0.049	114
technical p + guava	1003±91	11.14	0.145	85	10.89±0.89	0.044	102
formulated p	900±81	10.00	0.110*	64	10.40±0.61	0.052*	121
Formulated p + guava	911±71	10.12	0.140	82	10.254±0.70	0.045	105
Dermal							
technical p	1005±100	11.17	0.146*	58	11.70±0.98	0.047*	109
technical p + guava	1000±90	11.11	0.158	92	11.59±0.77	0.044	102
formulated p	950±59	10.56	0.139*	81	11.32±0.66	0.049*	114
formulated p + guava	944±44	10.49	0.159	93	10.92±0.87	0.044	102

% relative to control.   P= the pesticide (dimethoat)
Different is significant at control (P< 0.05).

Data in table (2) showed that, the toxic effect of dimethoate on feed efficiency was reduced when the toxified rat fed on guava diet. The amount of food intake was about the same of all expermintal groups. In connection, feed efficiency was changed paralleled with changed values of gain in body weight. Feeding on guava diet

improved values of feed efficiency which was decreased by dimethoate ingestion of all groups. It means that, antioxidant of guava diet reduced the influences of dimethoate on body weight gain and feed efficiency of albino rat. It can be noticed that, these antioxidant agents have significant antigonsimic effect on dimethoate toxicity.

The results in table (2) showed that the guava diet feeding reduced the high ratio of liver weight/body weight. The decreased in fresh liver weight by guava antioxidant may be attributed that guava have a hypolipmic factors and had no enlarged effect on liver. These mains that guava antioxidants reduced the influence of dimethoate on rat liver.

As shown in table (3), total hemoglobin (Hb) content was decreased by the ingestion of technical and formulated dimethoate. The decrease by oral ingestion of formulated diemthoate was more than that of the other treatemtns, but the lowest effect was observed by the dermal treatment of technical dimethoate. Similar trend was resulted for RBCs count, but that count of WBCs was increased as compared with control. The reduction in Hb content as well as RBCs counts may be attributed to the toxic effect of the insecticide, also associated with chronic pesticides exposure and malignant tumors of animals organs (Hoffman et al, 1991). The high influences by oral formulated dimethoate may be due to the synergestic effect of its formulation to the active ingredient. The active ingredient decreased total Hb in the treated rats which were confirmed by the finding of Abdel-Rahim et al (1994) they found that the technical and formulated malathion reduced total Hb. Plasma bilirubin production was elevated in albino rats under dimethoate induction. The increase in plasma bilirubin was to 228% in rats ingested formulated dimethoate, while dermal treatment with technical dimathoate increased the level to 147%. Bilirubin is considered one of the most important liver function tests. Hemoglobin is the principle source of bilirubin which produced by the breakdown of hemoglobin (Murrey et al, 2006). The present result of hemoglobin confirmed those of bilirubin table (3).

Table (3) presents the changes of total soluble protein content of blood of normal and rats ingested dimethoate either in technical or formulated form. The data show an increase in total soluble protein levels and formulated form caused superior increase in the protein relative to the other treatment with technical form. In connection, the oral treatment gave more effect than the dermal induction.

Table (3): Effect of guava as antioxidant agent on the dimethoat toxicity in blood Hb, soluble protein, RBCs, WBCs, T_3 and T_4.

Treatment	Total hemoglogbin (Hb)	Total soluble protein	RBCs count x 10^6	WBCs count x 10^3	T_4 Ug/100ml	T_3 U/100ml
Control	15.16±0.91	3.93±0.41	6.61±0.31	7.55±0.41	4.00±0.21	86.0±3.39
%	100	100	100	100	100	100
Control + guava	15.20±0.71	7.00±0.31	6.72±0.30	7.66±0.37	3.96±0.19	87±4.00
%	100	101	102	101	99	101
Oral technical p	12.89±0.87	8.01±0.40	5.99±0.24	8.45±0.40	5.51±0.22	97.0±5.16
%	85*	116*	9*0*	112*	138*	113*
Oral technical p + guava	14.55±0.96	7.77±0.33	6.11±0.32	8.00±0.41	5.15±0.30	90.0±4.66
96	96	112*	92*	106*	129*	105
Oral formulated p	11.00±0.90	8.10±0.39	4.63±2.21	9.00±0.51	5.00±0.23	98.0±4.11
%	73*	117*	70*	119*	125*	105*
Oral formulated p + guava	12.78±0.77	7.89±0.36	5.27±0.26	8.66±0.39	4.89±0.22	88.88±4.11
%	84*	114*	80*	115*	122*	103
Dermal technical p	14.89±0.77	7.76±0.37	5.95±0.30	8.13±0.37	6.30±0.30	105±5.11
%	92	112*	91	108*	158*	122*
Dermal technical p + guava	15.0±0.79	7.37±0.41	6.22±0.34	7.90±0.36	5.17±0.29	95.0±5.0
%	99	106	94	105	129*	110*
Dermal formulated p	11.99±0.83	8.10±0.35	5.16±0.24	8.73±0.35	5.56±0.31	96.0±4.44
%	79*	117*	78*	116*	139*	112*
Dermal formulated p + guava	13.99±0.68	775±0.40	5.99±0.31	8.10±.038	4.49±0.25	91.0±4.45
%	92	112*	91*	107*	112	106

% relative to control *.   P= the pesticide (dimethoat)   Different is significant at control (P< 0.05).

Similar work was conducted on technical pesticide by El-Sebae et al, (1988), Jaiswalk and Nagabbshanam (1991) and our works on formulated pesticide (Abdel-Rahim and Abdel-Rahim, 2007) in which these materials caused an increase in total soluble protein contents. The increase of total soluble protein contents found in the present work may be due to the stimulation of protein biosynthesis through specific enzymes for cell processes, and also may be due to high excretion of hormones in the present results of T_4 and T_3 which regulate protein metabolism (Wilsn et al, 1982; Soliman et al, 1983 and Abdel-Rahim et al, 1994).

The results cited in table (3) showed that the level of thyroid hormanones was increased due to the effect of the both forms of dimethoate either by oral or dermal. The increases in T_4 and T_3 were considerable to the form of dimethoate. However oral formulated dimethoate treatment showed the highest increase in T_4 and T_3 of blood rats but dermal technical dimethoate treatment appeared the lowest ones.

The alteration of thyroid function may have resulted from changes in the pituitary – thyroid axis as a consequence of the stressing effect of pesticide. The hypothalamic nuclei secrete thyrotrophin related hormone, (TRH) (Motto et al, 1975), which stimulates the anterior lobe to secrete thyrotrophic hormone, (TSH), which in turn stimulated thyroid function (Dickson, 1977).

These effects on T_4 and T_3 stimulated glycolytic process (Abdel-Rahim et al, 1994) for energy production to maintain the animal living process. These results are in harmony with the findings of our data of energy compound (ATP) (Abdel-Rahim and Abdel-Rahim 2007) who found that formulated dimethoate stimulated the cytochrome-enzymes-system and protein biosynthesis more than that of technical treatment. Also, the increase of thyroid hormones after the dimethoate administration stimulated lipid degration process for energy production which was needed mainly in nucleic acids and protein biosynthesis.

However, under the feeding of guava diet, blood T_4 content was normalized relative to normal control. T_3 level in blood gave similar pictures by guava antioxidant diet. Among the diets examined T_4 was more affected than T_3. these were paralleled with that thyroid system play an active effect in the general metabotic changes (Murrey et al, 2006).

Table (4) shows the influence of technical and formulated dimethoate on GOT and GPT activities. The transaminases activity was stimulated under the effect of the insecticide. In addition, the formulated dimethoate had a profound effect on GOT and GPT activities compared to the technical form. It is worth mentioning that the oral formulated dimethoate exhibited the highest activities of GOT and GPT compared with other types of treatments under investigation. Similar trend was observed by Enan et al (1982) Kaphalia et al, (1992) and Abdel-Rahim et al (1994) in rats, Litchfield et al (1974) in dogs.

In connection with treatment dimethoate toxicity by antioxidant agents, the pesticide intoxicated rat feeding on guava diet significantly improved Hb (total heamoglobin). The same trend was observed for RBCs count, in which dimethoate ingestion decreased the RBCs count, while guava treatment normalized this count of some group to about normal state. In contrast, WBCs count (to protecte the dimethoate toxicity) was increased by dimethoate ingestion. These increased counts of intoxicated albino rat was returned and normalized about to that of normal count by feeding on guava diet, in which the toxic effects of dimethoate was reduced by guava antioxidant (mainly vitamin C, polyphenol compounds and its content of Fe). The effects observed in Hb, RBCs and WBCs may be due to the chronic effect of the organophosphours pesticide exposure (Marrable et al, 2007).

Table (3) total plasma souble protein (which elevated by dimethoate ingestion) was normalized in the toxified rats fed on guava diet and the toxic effect of dimethoate ingestion was slightly reduced by guava antioxidant treatment. In the same time (table 4), the increased total bilirubin in dimethoate intoxicated rats was normalized but still significantly more than that of normal control.

The results in table (4) showed that the stimulated activities of GOT and GPT by dimethoate ingestion were normalized by guava diet feeding but the activities were still far from that of normal control.

Dimethoate ingestion increased plasma total bilirubin and total soluble protein as well as transaminases (GOT and GPT) activity, but guava diet feeding reduced these effects which acted as an antagonistic factor on the pesticide toxicity.

Table (4): Effect of guava as antioxidant agent on the dimethoat toxicity in blood bilirubin, GOT, GPT, choline sterase, acid phosphates and alkaline phosphates of male albino rats

Treatment	Total bilirubin mg/100ml	GOT activity	GPT activity	cholinester. Mg/100ml	acid phosph. Mg/100ml	alkalin phos. mg/100ml
Control	0.88±0.05	30.00±1.11	13.00±0.79	100±5.01	1.71±0.08	23.00±1.07
%	100	100	100	100	100	100
Control + guava	0.90±0.05	31.11±1.11	13.21±0.87	102±4.44	1.80±0.08	24.00±1.11
%	102	103	101	102	102	104
Oral technical p	1.7±0.08	49.12±2.41	17.28±0.90	53±3.01	6.12±0.31	52.90±2.99
%	201*	164*	138*	53*	348*	230*
Oral technical p + guava	1.30±0.06	40.11±2.12	16.00±0.82	60±3.11	5.07±0.21	40.11±2.07
96	148*	134*	123*	60*	288*	174*
Oral formulated	2.06±0.81	62.00±3.00	24.12±1.11	62±2.79	4.76±0.30	3800±1.11
%	228*	201*	189*	962*	270*	165*
Oral formulated p + guava	1.80±0.07	50.26±3.00	19.00±1.00	70±3.33	3.46±0.14	37.21±1.99
%	205*	168*	146*	70*	197*	169*
Dermal technical p	1.29±0.06	40.01±2.00	16.31±0.80	42±2.11	8.03±0.04	69.00±2.74
%	147*	133*	125*	42*	456*	300*
Dermal technical p + guava	1.10±0.04	36.21±1.71	15.01±0.71	63±2.99	5.00±0.31	60.11±2.99
%	125*	121*	116*	63*	284*	261*
Dermal formulated p	1.86±006	46.11±2.11	18.01±0.46	55±2.33	6.21±0.31	42.00±2.71
%	211*	153*	134*	55*	352*	183*
Dermal formulated p + guava	1.50±0.07	41.21±1.99	16.11±0.78	67±3.02	3.33±0.17	40.21±2.01
%	171*	137*	124*	67*	189*	175*

% relative to control *.   P= the pesticide (dimethoat)   Different is significant at control (P< 0.05).

Technical and formulated dimethoate treatments inhibited the activity of cholinesterase of rat blood relative to control, but he effect of formulated form was more than that of technical one (table 4). These results are in accordance with those obtained by Abou-Zeid et al, (1993) they found the formulated malathione inhibited cholinesterase activity more than the technical one. The decrease in blood cholinesterase activity is usually used as an indicator exposure to pesticides especially the organophophorous ones (Abou-Zeid et al, 1993 and Goel et al, 2000 and 2001).

Chandrasekara and Pathiralne (2007) showed that pesticides reacted with cholinesterase in a manner analogous to that of the normal substrate. The resultant excess of acetylcholine at neuromuscular junction can act as a blocking agent, depolarizing the motor and plate. The more effect of formulated dimethoate than technical one may be due to that formulation may caused synergism to the toxicity of the active ingredient.

The data demonstrated that acid and alkaline phosphatase activity of rat blood under the effect of technical and formulated dimethoate treatments were stimulated (table 4). It should be added that the oral formulated and technical treatment was more effective than those of the dermal treatments. Furthermore, acid phosphatase was more affected than alkaline phosphatase. These findings were confirmed by those of thyroid gland of the present work and ATP content of the our work (Abdel-Rahim and Abdel-Rahim 2007). The stimulation of phosphatases activity may be render to the abundant inorganic phosphate which is needed for ATP synthesis (Elliott and Elliott 2001). In this respect, Enan and Berberian (1986) reported that the stimulated acid and alkaline phosphatases activity may be associated with all disintegration resulting form pesticides treatment. In case of the feeding on guava diet as a good antioxidant agent (table 4) the inhibited chloinestrase activity by dimethoate ingestion was improved and normalized. At the same conditions the stimulated activity of acid phosphates and alkaline phosphatase by the studied organophosphorus pesticide was improved also and normalized to the values of normal control. The improved and normalized activities of cholinesterase as well as acid and alkaline phosphatase were still significantly far from those of normal control animals. Alkaline and acid phosphatases are much more abundant in organs tissue specially liver and spleen. The stimulation of the enzymes activity may rise due

to many cases. However, the diagonestic specificity attributed to alkaline phosphase and slightly to acid phospatase often fails to work out in practice because of the many condition in which liver may be involved secondarily. Moreover the rise in alkaline phosphatase may not become evident until acid phosphatase has begun to fall (Chatterjea and Shinde, 2002).

Guava (*Psidium Guajava*) fruits have many of antioxidant agents. These included ascorbic acid, vitamins A, B, B2, K, Fe, Zn and P which contained 227mg, 66 IU, 0.05mg, 225 mg, 1.0mg; 0.26 mg and 44 mg/100g respetively of edible portion which contains 89.9% water. Guava also contains several of the polyphenol and polyflavonoide compounds which acted as good antioxidant agents (Nutrition Institute, 1996 and Cheng and Yang, 1983).

In view of the vital role of the biotoxicity of dimethoate in modulating its acute mammalian toxicity, a better understanding of the enzymetic-regulators will allow designing appropriate preventative regiment to mitigate the mammalian toxicity of this class of insecticides. However, not much effort has been made in this direction and there is a potential need for identification of new preventive compounds targeted against accupational insecticide exposures that may offer significant protection but least toxicity of their own. Evidences suggest that the formation of oxygen free radical can be a major factor in the toxicity of pesticide (Banerjee et al, 2001).

Organophosphorus pesticides have been reported to produce oxidative stress (Abdollahi et al, 2004). Biological antioxidants, including vitamins and polyphenol compounds can prevent the uncontrolled formation of free radicals and activated oxygen species or inhibit their reaction with biological structures. The destraction of most free radicals and activated oxygen species rely on the oxidation of endogenous antioxidant mainly scarenging and reducing molecules.

Vitamin C, an important water soluble antioxidant, is reported to neutralize reactive oxygen metabolites (ROMs) and reduce oxidative DNA damage and hence genetic mutation. Vitamin C is a well known antioxidant. Dimthoate, like other organophosphorus pesticides is an anticholinesterase compound which covalently modified cholinesterase thus inhibiting its activity. These inhibition produce disturbances in whole body metabolism including blood. The protection of cholinesterase activity is offered by pretreatment with antioxidant. These may be due to the binding of cholinesterase from

inhibitory action of organophsphorus pesticide with any of these antioxidant, most likely vitamin C and thus making it unavailable for phosphorylation. Also, zinc used as a benefical agent during peroxidative damage and have demonstrated its efficacy in regulating the liver function (Sidhn et al 2004 a,b,c).

Dimethoate alters plasma activities of liver maker enzyme including GOT and GPT. Zinc treatment resulted in normalzing the hepatic damage. These protective effects of zinc can be related to the antiperoxidative property of this metalion. The precise mechanism of the observed zinc mediated regulation of enzymatic activities and lipid peroxidation   (Sidhn et al, 2004a).

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خفض التأثيرات الضارة لمبيد الدايمثويت على نمو الجسم ومكونات الدم باستخدام الجوافة كمضاد للأكسدة

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المعمل المركزى للمبيدات – مركز البحوث الزراعية

يهدف هذا البحث لدراسة تأثيرات مبيد الدايمثويت النقى والمجهز (التجارى) بجرعات ٠٫٠٥ من نصف الجرعة المميتة ($LD_{50}/20$) كذلك تأثير الجوافة كغذاء مضاد للأكسدة لخفض سمية المبيد على مكونات الدم وكذلك نمو الجسم للفئران البيضاء وقد أجريت تجربة المبيد بجرعة عن طريق الفم والجلد مرة كل ٤٨ ساعة لمدة ثلاثة أشهر. كما أن مضاد الأكسدة تم خلطة مع الغذاء العادى بنسبة ٢٠% مستبدل من نشا الغذاء وقد تم دراسة تأثر هذا المعاملات (سواء فى صورتى المبيد النقى والمجهز) وكذلك تأثير التغذية على الجوافة كمضاد للأكسدة على خفض سمية المبيد على نمو جسم الفئران البيضاء كذلك عدد كرات الدم الحمراء والبيضاء ومستوى الهيموجلوبين والبيليروبين والبروتين الذائب كذلك هرمونات الغدة الدرقية (T_3-T_4) ونشاط انزيمات استيل كولين استيريز و الانزيمات الناقلة للأمين (GOT-GPT) كذلك نشاط انزيمات الفوسفاتيز القلوى والحامضى فى دم الفئران البيضاء. وقد أدت المعاملة بالمبيد النقى والمجهز إلى قلة نمو الجسم مقارنة بالكنترول كما لوحظ أن كفاءة التغذية انخفضت أما نسبة لوزن الكبد مقارنة بوزن الجسم فقد ارتفعت مقارنة بالكنترول. كما اظهرت الدراسة أيضا زيادة واضحة لكل مكونات الدم مقارنة بالكنترول ماعدا نشاط انزيم استيل كولين استيريز ومحتوى الدم عن الهيموجلوبين وكذلك عدد كرات الدم الحمراء حيث أدت المعاملة بمبيد الدايتويث لخفضها. وهذه الزيادات أو الانخفاضات كانت أكبر فى حالة المعاملة بالمبيد المجهز عنها فى حالة المعاملة بالمبيد النقى كما أن المعاملة عن طريق الفم كان تأثيرها أعلى من العاملة عن طريق الجلد.

وقد أظهرت الدراسة أن تغذية الفئران المعاملة بالمبيد على ٢٠% جوافة جافة (مستبدلة من نشا الغذاء العادى) كعامل مضاد للأكسدة تحسن واضح لما أحدثه مبيد الدايمثويت من سميه فى التمثيل الغذائى للحيوانات تحت الدراسة. حيث أن التغذية على ٢٠% جوافة أدت لرفع مستوى هيموجلوبين الدم وزيادة عدد كرات الدم الحمراء كذلك زيادة نشاط إنزيمات الناقلة للأمين ونشاط الفوسفاتيز القلوى والحامضى فى البلازما. كذلك تحسن محتوى البلازما من البروتين الذائب وهرمونات الغدة الدرقية ومحتوى البلازما من البليروبين بالتغذية على غذاء عادى يحتوى على ٢٠% جوافة كغذاء مضاد للأكسدة. بالإضافة لذلك فإن نمو الجسم وكفاءة التغذية كذلك وزن الكبد قد تحسن أيضا بالتغذية على ٢٠% جوافة فى الفئران المعاملة بالمبيد.

مما سبق يمكن القول بأن المعاملة بالمبيد الدايمثويت أظهر اضطرابا فى التمثيل الغذائى للجسم ولكن بالتغذية على الجوافة كمضاد للأكسدة تم معالجة هذا التأثير السام للدايمثويت حيث أدت التغذية على غذاء عادى يحتوى على ٢٠% جوافة جافة إلى تحسن واضح وتأثير مضاد لفعل الديامتويت السام.