PHOTODECOMPOSITION AND BEHAVIOR OF METHOMYL INSECTICIDE RESIDUES ON SOYBEAN PLANT AND THE INDUCED INFLUENCE OF RESIDUES OR THEIR METABOLITES ON SOME BIOCHEMICAL PARAMETERS IN ADULT MALE ALBINO RATS

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Abstract

This investigation was performed to estimate the residue levels of the insecticide methomyl (neomyl 90% SP) on soybean plant (i.e. genotype Giza-21). The estimation was carried out on whole plant parts (i.e. foliage, peels and seeds) under the Egyptian normal field conditions. The recommended application rate of 67.5g active ingredient (a.i.) of methomyl/100 L water was used. The photodecomposition rate was estimated by exposing methomyl a.i. to the direct sunlight, short UV-rays and different temperature degrees. The probable influence of methomyl residues or metabolites remained in both oil and protein fractions of seeds at the harvest time on the biochemical parameters in adult male albino rats was checked. Recovery rate was done at two different fortification levels of 0.1 and 1 mg kg^{-1} for all parts and the resulted values were greater than 95% for all plant parts. Results indicated that the half-life values (RL_{50}) were 5.43 and 9.93 days for foliage and peels, respectively, while residue levels in seeds at harvest time were below the limit of detection (0.01ppm). The obtained results indicated that direct sunlight and high temperature degrees were more effective than UV-rays in accelerating the degradation rate of methomyl. ALT, AST, urea, creatinine, cholesterol, HDL, triglyceride and LDL were significantly affected while total protein, albumin and globulin contents were significantly not affected when the adult male albino rats have fed on substituted diets contained protein and oil of treated plant seeds at the harvest time each separated instead of the basic ones (casein and corn oil).

INTRODUCTION

Soybean crop (*Glycine max* L) is a very important economic crop from leguminosae and considered one of the most important high potentially protein source. Soybean crop considered the major and low cost protein source in nutrition for dietary, forages and artificial foods particularly in countries which have deficiency in the animal protein or when the vegetarian diets are common. Efforts have been directed toward the breeding and improvement of soybean cultivars for specific characteristics such as the high yield, early maturity, resistance to insect pests and diseases (Giami, 1997). Giza-21 genotype is one of the new used soybean genotypes used in Egypt which marked by the high yield and resistance to cotton leaf worm

which considered the major insect pest attacking crops. Many pesticides have provided for controlling soybean pests especially the carbamate insecticide methomyl [S-methyl N-(methylcarbamoyloxy) thioacetimidate] which known as a systemic insecticide and acaricide acts as cholinesterase inhibitor with contact and stomach action, uses to control the most harmful insect pest for soybean crop cotton leaf worm (Anonymous, 2001). The objective of this work was to demonstrate: (1) The residue levels of methomyl on and in whole soybean plant parts (foliage, peels and seeds). (2) The stability under some of the environmental factors (i.e. direct sunlight, UV rays and different temperature degrees). (3) The probable induced influence of methomyl residues or metabolites remained in seeds at harvest time on the biochemical parameters in adult male albino rats.

MATERIALS AND METHODS

1-Residue analysis

1.1- Field Experiment, application and sampling procedures

This trial was performed at Sakha station for agricultural experiments at Kafr El-Sheikh governorate during the growing season of 2003, the experimental area was comprised to be ten representative experimental plots, each of about $70m^2$, one plot applied as control (with no treatment) while the others were used as replicates in methomyl treatment. Sowing date of soybean seeds of the tested genotype Giza-21 was on June 13^{th}, 2003. Plots received the normal agronomic treatments throughout the experimental period. Insecticidal formulation of methomyl (neomyl, 90% SP) was applied on August 31^{st}, 2003 using the recommended rate of 67.5g a.i./100 L water (Anonymous, 2001). Samples were collected randomly from treated and untreated plots started one hour after treatment as the initial deposit (zero time) for all parts (i.e. foliage, peels and seeds), then 1, 3, 6, 10, 15, 20, 27 days later for foliage samples and 10, 20, 27 and 42 days (harvest time) after treatment for peels and seeds samples, then all undesired parts involved in samples were avoided, then seeds were removed out from peels to have each separated along. Subsampling was performed at the laboratory after sample collection to obtain representative analytical samples of 30, 30 and 15g of each foliage, peels and seeds, respectively in triplicates, with crushing of dry seeds to be fine flour using seed mill.

1.2- Extraction and cleaning up procedures

Extraction procedure mentioned by MacMahon and Hardin (1994) was found to be suitable to extract methomyl residues from all soybean parts. A representative sub-samples of 30, 30 and 15g of foliage, peels and seeds, consecutively were macerated with 20g activated sodium sulfate anhydrous (Na_2SO_4) till complete mixing achieved,

then 150ml acetonitrile (HPLC grade) were added and blended for two minutes on high speed using warring blender. The liquid was decanted through a funnel fitted with cotton covered with 50g of activated sodium sulfate anhydrous, and then a known volume of extract was taken and evaporated till dryness using rotary evaporator at 35°C. The method mentioned by MacMahon and Hardin (1994) was used for cleaning up of methomyl residues that was adapted to be suitable for clean up, whereon extracts of soybean foliage, peels and seeds were dissolved in 20 ml ethyl acetate, then mixed with 4, 2 and 1g of the adsorbent mixture that consists of activated charcoal : Celite 545 at the ratio of 1 : 4 w/w, for foliage, peels and seeds extracts, respectively, then were shaken for two minutes and dried on activated sodium sulfate anhydrous, then precipitate rinsed with an additional 20ml ethyl acetate, finally was evaporated using rotary evaporator under vacuum at 35°C.

1.3- Removal of oil from seed extract

Oil removal from seed extract was carried out as described by MacMahon and Hardin (1994). This process is a very important step to prevent the interference of oils in determination, which considered so effective on sensitivity.

1.4- Determination of methomyl residues

Knauer High Performance Liquid Chromatograph (HPLC) system equipped with Knauer variable wavelength detector, knauer online degasser and Knauer quaternary Maxistar K-1000 pump provided with Phenomenex Luna C18-5µ, (250 x 4.6 mm i.d.) 100A, system was isocratically reversed phase with mobile phase of acetonitrile : water at the ratio of 60 : 40 v/v, with flow rate of 1ml/min, was used to determine methomyl insecticide residues, detector have monitored at 230nm. Retention time at these conditions was 3.25 min.

1.5- Effect of Environmental Factors

To study the effect of the different environmental factors, aliquots of methomyl a.i., stock solution each representing 200µg a.i. per each milliliter dissolved in ethyl acetate were taken and spread uniformly as possible in uncovered petri dishes (5cm i.d.) and were left to dry at room temperature then were subjected to the different treatments at successive periods. Exposure to direct sunlight for 0, 1, 3, 6, 12, 24, 48, 72 and 96 hours, and the dominant atmospheric temperature was 41±2°C, different temperature degrees at 25, 35, 45 and 55°C for 0, 1, 3, 6, 12, 24, 48, 96 and 144 hours and short UV-rays at 254nm at a distance of 12cm for 0, 1, 3, 6, 12 and 24 hours. Residues remained in petri dishes were quantitatively transferred to known

volumes with ethyl acetate, and then were determined with HPLC as mentioned previously.

1.6- Recovery Efficacy Studies

To examine the efficacy and the limit of quantitation of the used method, untreated samples of foliage, peels and seeds were fortified with methomyl a.i., solution at two levels 0.1 and 1 mgkg^{-1} for all matrices, then procedures of extraction, cleaning up and determination that mentioned were performed. Averages of recovery were more than 98% at the level of 1 mg kg^{-1} for all matrices analyzed while values were 90.96, 92.50 and 97.78% at the level of 0.1 mg kg^{-1} for foliage, peels and seeds, respectively at limit of detection (LOD) 0.01ppm.

1.7- Kinetic studies

The degradation rate of methomyl insecticide was calculated mathematically according to Timme and Frehse (1980), that degradation behaviour of pesticide residues can be described mathematically as a pseudo-first order reaction, that rate of degradation (K) could be calculate using common logarithms from the following equation:-

$$\log R = \log R_0 - 0.434Kt \cdot$$

$$Kt = \frac{\log R_0 - \log R}{0.434}$$

R_0 *:* the residue level at the initial time (zero time).

R : the residue level at an interval in days after pesticide application.

Kt: the degradation rate constant at the successive intervals in days.

K: the mean of *Kt*

-The half-life values (RL_{50}) were calculated mathematically according to

Moye *et al.* (1987) from the following equation:-

$$RL_{50} = \frac{Ln2}{K} = \frac{0.6932}{K}$$

2- Adult male albino rats feeding trial (Methods c.a. Thabit, 2007)

2.1- Experimental animal and trial design

Adult male albino rats (*Rattus norvegicus*) of Sprague-Dawely strain with body weight average of 155±10g, were obtained from specialized animal colony, Giza governorate, Egypt., then were housed in cages under appropriate hygienic

conditions, and the atmosphere temperature was adjusted at 25 °C in the animal house of the Central Agric. Pesticides Lab., (CAPL), Dokki, Giza, Egypt. Animals were allowed to be acclimatized to the laboratory condition for two weeks prior the trial initiation, that provided with balanced basal diet through this period. Animals were divided randomly into five experimental groups at six rats per each. The first one has fed on a balanced basal diet with normal composition as a negative control. Second and third groups have fed on the substituted diet with soybean seed oil and protein, respectively coming from un-treated plants at the harvest time instead of corn oil and casein that considered the main source of oil and protein in the basal diet composition as positive controls. Fourth and fifth groups have fed on the substituted diet with soybean seed oil and protein, respectively coming from seeds of the treated plants with methomyl at the harvest time instead of corn oil and casein after Preparation of soybean oil extracts and protein isolates. Experiment was initiated with serving the previously prepared diets to rats daily for 28 days (the experimental period) with a source of running water. The body weight of each rat was recorded weekly.

2.2- Collecting of blood samples

Blood samples were collected under ethyl ether anesthesia from the orbital sinus vein. To separate serum, that all the tested parameters were analyzed in the blood serum, samples were collected with normal capillary tube, then left for one hour to coagulate, then the tube was centrifuged at 3500 rpm for 15 min, serum samples were kept under deep freezing at – 40°C, till analysis time. (Thabit, 2007)

2.3- Biochemical parameters analyzed in rat blood serum

The activities of alanine aminotransferase (ALT=GPT) and aspartate aminotransferase (AST=GOT) were determined colourimetrically using Biomerieux kit; total protein level was estimated using Stanbio kit; albumin level was determined using Stanbio kit; globulin level was obtained mathematically from the folloing equation:-

$$\textit{Serum globulin conc. (g/dl)} = \textit{Total protein conc.} - \textit{Albumin conc.}$$

Albumin/Globulin ratio was calculated from the following equation:-

$$\textit{Al/Gl} = \frac{\textit{Serum Albumin conc. (g/dL)}}{\textit{Serum Globulin conc. (g/dL)}}$$

Serum urea level was determined using QCA Kit; creatinine level was estimated using Stanbio kit; triglycerides level was estimated using Stanbio kit; total cholesterol level was estimated using Stanbio Kit. High density lipoprotein-cholesterol (HDL-C) level was determined using Stanbio kit. Serum Low density lipoprotein-cholesterol (LDL-C) level was obtained mathematically from the following equation:-

$$\textit{Serum LDL-C conc. (mg/dL)} = \textit{Total Chl} - \textit{HDL} - (\frac{\textit{Triglyceride coc.}}{5})$$

3- Statistical analysis

Student's *t*-test was used for analyzing the obtained data statistically to define the significance levels with the procedure outlined by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

1- Methomyl residues on soybean plant

Residues and loss rates of methomyl insecticide on and in soybean leaves of the tested genotypes Giza-21 were illustrated in Table (1). The initial deposit which remained on foliage one hour after treatment was 25.71ppm, this amount dropped to 21.81ppm one day after application indicating a loss rate of 15.16%. Residues gradually decreased to 16.67, 11.63, 7.61, 4.92 and 0.32ppm indicating loss rates of 35.16, 54.76, 70.40, 80.86 and 98.73%, respectively at 3, 6, 10, 15 and 20 days after treatment, while residues at 27 days after application were below the estimated detection limit of methomyl (0.01ppm). The calculated RL_{50} value was 5.43 days from application with degradation rate of 0.1274.

Table 1. Residues and loss rates of methomyl insecticide on and in soybean foliage of the tested genotype Giza-21 at rate of 67.5g a.i./100 L water.

	foliage of Giza-21 Soybean genotype	
Time after application in days	Residue* (ppm)	Loss (%)
0**	25.71±1.90	00.00
1	21.81±1.85	15.16
3	16.67±0.13	35.16
6	11.63±0.09	54.76
10	7.61±0.07	70.40
15	4.92±0.05	80.86
20	0.32±0.017	98.73
27	BDL	---
K	0.1274	
RL_{50} (days)	5.43	

* : Each value represents an average of three replicates.
** : Samples were taken one hour after application (zero time).
BDL : Below detection limit.
LOD : 0.01 ppm.
RL_{50} : Half-life value.
K : Constant of degradation rate.
Mean± Standard Deviation (SD).

Residues and loss rates of methomyl insecticide on and in soybean peels and seeds of the tested genotype Giza-21 were demonstrated in Table (2). Values of methomyl residues on and in peels were 9.75ppm, decrease to 5.52ppm indicating loss rate of 43.38% at 10 days after treatment. Residue levels decreased to 2.21 and 0.18ppm indicating loss rates of 77.33 and 98.15% at 20 and 27 days after application, respectively. Residues were below the estimated detection limit of methomyl (0.01ppm) at the harvest time (42 days after application). The calculated RL_{50} values were 9.93 days after treatment with degradation rate of 0.0697. Residues detected in seeds at 10, 20 and 27 days after treatment were 3.10, 0.53 and 0.03ppm, respectively while were not detected at the initial time. Mature seeds at harvest time were free from any detectable residues of methomyl at the mentioned detection limit. Concerning health aspects, the maximum residue limit (MRL) of methomyl residues on soybean crop found in Codex (2005), the estimated MRL's values are 40, 1 and 0.2ppm for green foliage, soybean hulls and dry soybean, respectively. Previous data show that deposits of methomyl residues which remained on foliage did not exceed the estimated MRL, while reached MRL's on peels after 15 days, but in seeds was 24 days. The estimated PHI for methomyl on soybean crop is 24 days from application. These findings indicated that soybean plants treated with methomyl during growing and ripening stages should stay in the field about 24 days before harvesting to be consumed and marketed safely for human consumption, since the rates of contamination with methomyl are below the estimated MRL's.

The obtained data are in agreement with those reported by Ahmed and Ismail (1995) and Gil-Garcia *et al.* (1997) who mentioned that the systemic insecticide methomyl never exceed the MRL's on all treated plants studied at harvest time, RL_{50} values differed according to the plant parts that were higher in vegetative parts than others.

Table 2. Residues and loss rates of methomyl insecticide on and in soybean peels and seeds of the tested genotype Giza-21 at rate of 67.5g a.i./100 L water.

Time after application in days	Giza-21 soybean genotype			
	Peels		Seeds	
	Residue** (ppm)	Loss (%)	Residue (ppm)	Loss (%)
0*	9.75±0.12	00.00	BDL	---
10	5.52±0.08	43.38	3.10±0.10	---
20	2.21±0.03	77.33	0.53±0.02	---
27	0.18±0.06	98.15	0.03±0.01	---
42	BDL	---	BDL	---
K	0.0697			
RL_{50} (days)	9.93		---	

* : Samples were taken one hour after application (zero time).

** : Each value represents an average of three replicates.

BDL : Below detection limit

LOD : 0.01 ppm.

42 days: Harvest time

RL_{50} : Half-life value.

K : Constant of degradation rate.

Mean±SD

2-Methomyl photodecomposition

Data in Table (3) show the photodecomposition of methomyl insecticide a.i. when exposed to the direct sunlight and short UV-rays. The data revealed that exposure to direct sunlight was more effective than exposure to UV-rays in accelerating the rate of photodecomposition, that loss rate values after one hour of exposure were 25.02 and 12.49% reached to 92.48 and 90.40% after 24 hours of the exposure to direct sunlight and short UV-rays, respectively. The estimated RL_{50} values were 5.31 and 8.20 hours, for sunlight and UV-rays exposure, respectively and the degradation rates were 0.1305 and 0.0844, respectively.

Table 3. Influence of direct sunlight (atmosphere temp. about 41°C±2) and short UV-rays on the dissipation rate of methomyl insecticide a.i.

Time of exposure in hours	Direct sunlight		UV-rays	
	µg**	Loss (%)	µg	Loss (%)
0*	200.00±0.12	00.00	200.00±0.06	0.000
1	149.96±1.23	25.02	175.00±0.69	12.49
3	108.02±1.19	45.99	151.83±0.94	24.08
6	80.58±0.37	59.71	125.65±1.45	37.17
12	45.40±0.45	77.30	56.14±2.18	71.93
24	15.03±0.38	92.48	19.19±2.66	90.40
48	4.47±0.29	97.76	---	-----
72	0.35±0.22	99.82	---	-----
96	BDL	---	---	-----
K	0.1305		0.0844	
RL_{50} (hours)	5.31		8.20	

* : Samples were taken directly after the quantitative transfer (zero time).
** : Each value represents an average of three replicates.
K : Constant of degradation rate.
RL_{50} : Half-life value.
LOD : 0.01ppm
Mean±SD

Table (4) shows the effect of exposure to different temperature degrees on methomyl a.i.. Data indicated that methomyl influenced by increasing temperature degree and period of exposure. The loss percentage values of methomyl residues were 5.49, 13.73, 26.47 and 66.45% within the first 6 hours after exposure at 25, 35, 45 and 55°C, respectively, while were 24.11, 64.77, and 99.58% after 144 hours from exposure at the same previous temperature degrees, respectively except at 55°C which were not detected. Results revealed that the calculated RL_{50} values of methomyl residues were 154.52, 53.22, 16.00 and 4.26 hours after exposure, indicating degradation rates of 0.0045, 0.0130, 0.0433 and 0.1629, at 25, 35, 45 and 55°C, respectively.

The obtained data agreed with the findings of Barakat *et al.* (2006) who mentioned that methomyl showed a high degradation when exposed to the direct sunlight and high temperature degrees (55°C), so it is recommended to use methomyl in areas with dominant temperature not exceed 30°C, also short UV-rays effect that

degradation rate is positively correlated with the period of exposure and chemical structure. UV-rays produce many chemical changes such as hydrolysis, oxidation and isomerization in large number of pesticides. The radiation energy produced from UV-rays and direct sunlight might be absorbed by pesticide molecule that may increase the transitional, rotational, vibrational or electronic energy of the molecule. This make sunlight is more effective than UV-rays in accelerating photodecomposition rate and this may due to thermal, evaporational and light intensity considerations.

Table 4. Influence of different temperature degrees (i.e. 25, 35, 45 and 55°C) on the dissipation rate of methomyl insecticide a.i.

Time of exposure in hours	25°C		35°C		45°C		55°C	
	µg**	Loss (%)	µg	Loss (%)	µg	Loss (%)	µg	Loss (%)
0*	200.00±0.07	00.00	200.00±0.05	00.00	200.00±0.08	00.00	200.00±0.03	00.00
1	198.64±0.73	0.68	195.96±0.44	2.02	181.59±0.88	9.20	122.50±0.22	38.75
3	195.46±0.60	2.27	187.89±0.56	6.05	160.93±0.75	19.53	105.90±0.18	47.05
6	189.02±0.04	5.49	172.54±0.34	13.73	147.06±0.94	26.47	67.10±0.56	66.45
12	186.76±0.57	6.62	161.56±0.55	19.22	129.19±1.12	35.40	31.66±0.98	84.17
24	180.74±0.60	9.63	152.85±0.39	23.57	98.94±2.05	50.53	18.30±0.77	90.85
48	177.76±1.56	11.12	137.30±1.32	31.35	39.38±2.18	80.31	1.66±0.07	99.17
96	162.57±0.89	18.71	99.92±2.01	50.04	9.43±0.45	95.28	0.393±0.04	99.80
144	151.78±1.17	24.11	70.46±2.23	64.77	0.84±0.22	99.58	BDL	---
K	0.0045		0.0130		0.0433		0.1629	
RL_{50} (hours)	154.52		53.22		16.00		4.26	

* : Samples were taken directly after the quantitative transfer (zero time).
** : Each value represents an average of three replicates.
BDL : Below detection limit.
K : Constant of degradation rate.
RL_{50} : Half-life value.
LOD : 0.01ppm
Mean±SD

3-Effect on the biochemical parameters in male albino rats

Data in table (5) demonstrated that the comparison of the results to control results of each soybean seeds protein and oil fractions control, revealed that perhaps methomyl insecticide residues or its metabolites significantly decreased AST while increased ALT activity in blood serum of male albino rats in both two groups have fed on diets contained protein and oil fractions coming from seeds of treated plants with

methomyl ($p \leq 0.05$). Similar findings were reported by Zidan *et al.* (1998) and Mahmoud (2004). These changes in serum AST and ALT activities may due to complex formation between methomyl metabolites and AST or ALT enzyme active sites in liver giving the depression in the activity. As reported by Yousef *et al.* (2006) the depression in transaminases activity may due to the formation of complexed compounds between pesticides or their metabolites and enzymes in liver, so ALT and AST enzymes are important for liver function evaluation. Vise versa metabolites may act as ALT synergist and increased the activity.

Total protein, albumin and globulin levels in serum generally were not affected significantly ($p \leq 0.05$) although there were some fluctuations between control levels and treatments levels, but did not approach the significancy level ($p \leq 0.05$). These findings are in agreement with those obtained by Yousef *et al.* (2003).

Kidney function parameters (urea and creatinine levels) were significantly were decreased in both treatments ($p \leq 0.05$). Similar findings were obtained by Zidan *et al.* (1998) and Mahmoud (2004), this reduction in both blood urea and creatinine levels may due to hepatic insufficiency because of impaired urea synthesis, on the other hand creatinine level in blood considered a significant marker for toxicity.

Lipid profile was also affected that total cholesterol levels generally were significantly increased while triglyceride levels were decreased in the substituted oil diet and decreased in substituted protein diet in serum. Cholesterol considered the most important lipid membrane constituents, steroid hormones and bile acids, while triglycerides are the most important lipid substance with regard to energy storage. Results were similar with those recorded by Yousef *et al.* (2003 and 2006).

Results also indicated that HDL levels were significantly increased in all treatments, while LDL levels were significantly decreased in the substituted oil diet but increased in the substituted protein diet. The obtained results were so similar with those obtained by Yousef *et al.* (2003 and 2006).

Table 5. Influence of methomyl insecticide residues on liver function, kidney function and lipid profile parameters in male albino rats fed on substituted diet with protein and oil fractions of treated soybean seeds of the genotype iza-21 at harvest time.

Treatment	Liver functions**						Kidney function**		Lipid profile**			
	AST (U/L)	ALT (U/L)	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	A/G ratio	Urea (mg/dl)	Creatinine (mg/dl)	Total cholesterol (mg/dl)	Triglyceride (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Normal basal diet Control	73.63 ± 6.90	49.79 ± 3.01	6.88 ± 0.27	3.47 ± 0.23	3.29 ± 0.29	1.05 ± 0.01	23.11 ± 1.14	0.40 ± 0.040	65.60 ± 2.77	90.45 ± 16.88	40.50 ± 2.25	7.01 ± 0.68
Protein fraction Control (untreated seeds)	77.21 ± 6.97	47.47 ± 2.86	7.64 ± 0.38	4.35 ± 0.29	3.31 ± 0.31	1.31 ± 0.13	26.83 ± 1.70	0.82 ± 0.06	89.23 ± 2.36	172.83 ± 6.13	44.98 ± 1.18	9.68 ± 0.84
Oil fraction Control (untreated seeds)	67.51 ± 5.50	45.48 ± 2.72	6.42 ± 0.26	4.09 ± 0.41	2.50 ± 0.22	1.63 ± 0.18	32.99 ± 1.12	0.55 ± 0.03	64.32 ± 3.82	89.88 ± 6.84	39.21 ± 2.86	7.13 ± 0.64
Protein fraction diet (treated seeds)	70.82* ± 4.80	48.49* ± 2.72	6.89 ± 0.20	4.38 ± 0.27	3.15 ± 0.02	1.39 ± 0.05	20.37* ± 2.37	0.52* ± 0.03	93.49* ± 1.17	133.21* ± 5.44	54.15* ± 2.50	12.69* ± 1.05
Oil fraction Diet (treated seeds)	65.35* ± 6.14	47.00* ± 2.57	6.65 ± 0.67	4.20 ± 0.13	2.55 ± 0.21	1.64 ± 0.03	20.67* ± 2.68	0.50* ± 0.03	73.13* ± 0.84	127.91* ± 6.30	41.53* ± 4.18	6.01* ± 1.49

* : Significancy

** : Each value represents an average of five replicates.

Mean±SD

p≤ 0.05

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التحلل الضوئي و سلوك متبقيات المبيد الحشري ميثوميل علي نبات فول الصويا كذلك التأثير الناتج عن هذه المتبقيات او نواتج تمثيلها علي بعض الوظائف الحيوية في ذكور فئران التجارب البيضاء

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تم اجراء هذه الدراسة بهدف تقدير ثبات المبيد الحشري ميثوميل علي نبات فول الصويا صنف جيزة–٢١ علي أجزاء النبات المختلفة (أوراق–قشور–بذور) علي فترات متعاقبة بعد المعاملة بالمعدل الموصي به تحت الظروف المصرية. كذلك تم دراسة تاثير التعريض لاشعة الشمس المباشرة و اشعة UV و درجات الحرارة المختلفة كذلك تأثير هذه المتبقيات الموجودة في البذور او نواتج تمثيلها علي الوظائف الحيوية في الفئران عند تغذيتها علي علائق تحتوي علي زيوت و بروتينات مستخلصة من بذور النباتات المعاملة كلا علي حدة. أوضحت الدراسة أن فترة نصف العمر للمبيد كانت ٥,٤٣ و ٩,٩٣ يوم لكل من الأوراق و القشور علي التوالي بينما لم تكن هناك أي متبقيات موجودة في البذور التي جمعت في الحصاد فكانت اقل من حدود القياس للمبيد و هي ٠,٠١ جزء في المليون. كذلك أوضحت النتائج أن تعريض المادة الفعالة للميثوميل لضوء الشمس المباشر كان له تأثيرا اكبر علي سرعة تحلل المركب ضوئيا أكثر من التعريض للأشعة فوق البنفسجية حيث كانت فترة نصف العمر هي ٥,٣١ و ٨,٢٠ ساعة علي التوالي بينما التعريض لدرجات الحرارة المختلفة اوضح انه كلما زادت درجة الحرارة و زمن التعريض زاد معدل التحطم اي ان اشعة الشمس المباشرة و درجات الحرارة العالية كان لهما التاثير الاكبر في زيادة معدل التكسير متناسبا طرديا مع زمن التعريض. اما التأثير علي حيوانات التجارب فقد اوضحت النتائج ان هناك تاثيرا معنويا حدث لكل من ALT, AST. بينما محتوي كل من Urea, creatinine, cholesterol, triglycerides, HDL and LDL levels البروتين الكلي و الالبيومين و الجلوبيولين لم يتأثر معنويا و ذلك عند تغذية فئران التجارب علي علائق تحتوي علي زيوت و بروتينات مستخلصة من بذور النباتات المعاملة كلا علي حدة.

من النتائج السابقة يمكن القول بانه اذا ما استخدم المبيد الحشري ميثوميل بالمعدل الموصي به و في التوقيت المناسب (توقيت الاصابة) يكون له درجة عالية من الامان للصحة العامة مع ادني مستوي من التأثيرات الجانبية.