Risk Assessment of Dietary Exposure Assessment of Dimethoate Residues on some Fruits, Vegetables and Herbs in Egypt

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ABSTRACT

The central laboratory pesticide residues analysis and heavy metals in food have been set up by Egyptian Ministry of Agriculture and Finland conducts tests to evaluate the safe usage of pesticides in Egypt. Dimethoate one of the most widely applied organophosphate insecticide According to the U.S.EPA. On the other hand, dimethoate is a possible human carcinogen, classified as group C. A total of 12919 samples of 57 different types of fruits, vegetables, and aromatic medicinal plants samples were examined for dimethoate residues during 2002, seventeen commodities represent 10.1% were completely free of dimethoate residues. Fourty commodities represent total 11614 samples fruits (2818), vegetables (2212) and aromatic medicinal plants (6584) with percentages 89.9 % of total examined samples have dimethoate residues. Only 4.09 % of total contaminated commodities (475 samples) were below limit of determination (LOD = 0.05 ppm), 16.32 % at LOD or more However 83.68 % of those samples are not contaminated with dimethoate residues. Only 7.64 % of the samples exceeded MRL's of dimethoate residues compared with the national, codex and EU-MRL's. Dimethoate residue was detected frequently in peach and orange samples with percentages of 32.26 % and 19.69 %, respectively furthermore they showed the highest violation percentages 16.13% and 19.69 %. The main contributors to total intake of dimethoate are leafy vegetables 42.73 %,The major contributors crops to total intake of dimethoate are green molokhia 36.96 %. The total dietary intake of dimethoate 0.00214 mg/kg. body weight /day is lower than ADI (0.002 mg/kg body weight) and contributing 107 % of ADI . Therefore dietary exposures to dimethoate are a case for a concern. We can help and protect ourselves from a toxic environment by eating organic food, and by demanding a benign system of agriculture by avoiding using toxic pesticides into our food and environment.

Key words: Dimethoate, Exposure assessment, Residue, Monitoring, Fruits and Vegetables, Herbs, Aromatic and medicinal plants

INTRODUCTION

Dimethoate is an organophosphate insecticide used to kill mites and insects systemically and on contact. It is used against a wide range of insects. Dimethoate is available in aerosol spray, dust and emulsifiable concentrate.

According to the U.S.EPA, dimethoate is a possible human carcinogen, classified as group C. Dimethoate vapors are harmful (Product label). It has a high oral and dermal acute toxicity. It is an eye irritant. Dimethoate is the eighth pesticide related to non agricultural illnesses in California Pease, 1996.

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Dimethoate is readily absorbed through the skin and lungs. It is classified by the U.S. EPA as a category II nerve toxin that inhibits the enzyme acetochlolinesterase, which is vital to normal transmission of nerve impulses. Symptoms range from temporary behavioral disturbances, hair loss and nausea to persistent weakness, paralysis and reduced intelligence (WHO, 1989). Lab animals exposed to dimethoate showed abnormal DNA synthesis (DNA damage) in liver cells Department of Pesticide Regulation DPR, 1996.

The qualitative nature of the residue in plants is adequately understood. Dimethoate is readily taken up and translocated by plants, and is metabolized by hydrolytic and oxidative processes. The residues to be regulated in plants are dimethoate and its oxygen analog, omethoate. Tolerances are established for total residues of dimethoate and its oxygen metabolite, omethoate.

Monitoring programs can be contributed for improving safety of food, warning of actual and potential food contamination via food and evaluations of possible health hazards throughout providing continuous information on levels of environmental pollution in the country. Public concern over pesticide residues on vegetables and fruits has been increasing in recent years. The risk to human health is due to pesticide residues in the edible parts. The objectives of food contamination monitoring programmes are to safeguard health, to improve the management of food and agricultural resources as well as preventing economic losses. The benefits to be derived from national monitoring programmes are improved food safety, warning of problems of contamination, provision of intake data for evaluation of health hazards, better management and use of natural resources and a series of measures of good agricultural practices (GAP). The current study was conducted as a part of the main national food contamination monitoring program that has been carried out in Egypt since 1988, Dogheim *et al.*, 1988,1990,1991,1999, 2001 and 2002.

MATERIALS AND METHODS

Sampling

A total of 12919 samples of Local and imported vegetables, fruits and some aromatic medicinal plants were collected from different local markets representing 5 Egyptian Governorate including (Qalyubiya- Giza – Ismailia – Minufiya – Beni suef throughout 2002. The vegetables, fruits and medicinal plant samples that selected for the survey were, demonstrated in table (1). Two kg from vegetables, fruits and 500g from aromatic medicinal plant for each commodity was thoroughly homogenized and prepared according to Codex Alemintariuos Guidelines, 1993. dimethoate residues are subjected for analysis in all samples.

Pesticide Residues Analysis

Official method of **AOAC, 1995** was followed with some modifications which were, the sample and the solvent amounts are only half of those in AOAC method. Rotary evaporator and air blower are used instead of kuderna-Danish concentrators. The total volume of acetone extract is measured for result calculations. However, the AOAC method uses tabulated water percentages of commodities. After drying, aromatic phase is concentrated just to dryness. The dried samples were dissolved in hexane /acetone containing 0.3 ug/ml of ditalimphos as an internal standard for GC determination.

GC Determination

The detection and confirmation of presence of residues in the samples depends on the use of two chromatography columns of different polarities equipped with nitrogen-phosphorus detectors (NPD) installed in one GC instrument with one injector. Quantitative determinations are made using ditalimiphos as an internal standard.

Quality Assurance:

The analytical method and instruments were fully validated as part of a laboratory quality assurance system and are accredited by Finnish Accreditation Service FINAS (center of metrology and accreditation) Finland. The criteria of quality assurance of the codex committee are followed to determine the performance of the multiresidue method. This quality system is referred to ISO/IEC Guide 17025

The average recoveries percentages of the tested pesticides on chamomile were ranged between 80-102% at spiking levels 0.07-0.1 mg/kg, with coefficient of variation (CV%), 2.5-13%. However, the average recoveries, coefficient of variation (CV%) of the tested compounds on pepper samples at spiking levels 0.05-0.5 mg/kg were 80-106%, 2-19% respectively. The reproducibility expressed as relative standard deviation was less than 20%. The limit of quantification was 0.02 mg/kg. The measurement uncertainty including random and systematic error at 95% confidence level is less than 10%.Blank sample is fortified with the pesticides mixture and analyzed as normal sample with each set of samples. The results are recorded on control charts. Repeated analysis of old samples is regularly followed to control reproducibility

♦ **Apparatus**

(a) Gas chromatography: HP 5890 equipped with double Nitrogen Phosphorus

Detector (NPD) with two capillary columns, injector 225°C, detector 280 °C. Operating conditions: Hydrogen 3.5 ± 0.1 ml/min, Air 100-110 ml/min, and Nitrogen carrier gas 25 ml/min.

Chromatography columns are:

(1) PAS-5 NPD tested ultra 2 silicon, 25m x 0.32 mm, and film thickness 0.52 um

(2) PAS - 1701 NPD tested 1701 silicon, 25 m x 0.32mm, film thickness 0.25 um.

Temperature programmes of both GC instruments are; initial temperature 90 °C for 2 min, ramp (1) 20 (°C / min) to 150 °C, ramp (2) 6 (°C/min) to 270 °C hold 15min.

♦ **Reagents**

• **Solvents and chemicals**

(a) Acetone, dichloromethane, n-hexane, petroleum ether,(Pestiscan chromatography grade or similar quality).
(b) Anhydrous sodium sulphate (Riedel-de Haen), sodium chloride

♦ **Pesticide reference standards**

Dimethoat reference material is certified standard provided by Dr. Ehrenstorfer laboratories Gmbh, Gogginger Str. 78 D- 8900 Augsburg and financed by FAO (Food and Agriculture Organization of the United Nations), Rome, Italy.

RESULTS AND DISCUSSION

A total of 12919 samples of 57 different types of fruits, vegetables, and aromatic medicinal plants samples were examined for dimethoate residues during 2002. Results are shown in Tables (1) & (2). Seventeen commodities represented 1305 samples with percentages 10.1 % were completely free of dimethoate residues. Dimethoate residues are usually analyzed by multiresidue method capable of detecting up to 82 or more pesticides. Forty commodities represent total 11614 samples of fruit (2818), vegetables (2212) and aromatic medicinal plants (6584) with percentages 89.9 % of total examined samples showed dimethoate residues.

Tables (1) & (2) showed the levels of dimethoate residue detected in fruits, vegetables and aromatic medicinal plant samples. European union (EC), Egyptian Organization of Standardization (EOS) and codex maximum residue limits were followed and due to lack of dimethoate codex MRL's on such these commodities and combinations. The EC maximum residue limits was used

followed by EOS then codex to evaluate the results. In few cases extrapolation was followed in such crops that didn't include in codex or at any guidelines and produced locally such as grape leaf and molokhia and larkspur flower. The contaminated commodities had detectable dimethoate residues below the limit of determination (LOD) in 475 sample with 4.09 %, contaminated samples at LOD or more were 1420 sample with 12.23 %, thus the total contaminated samples were 1895 sample (475 + 1420 sample) with 16.32 %, However the samples which were not contaminated with dimethoate residues were 9719 sample with 83.68 %. Only 887 samples represent 7.64% exceeded MRL's of dimethoate residues comparing with national, codex and EU-MRL's. dimethoate residues was the detected frequently in peach and orange samples with percentages of 32.26% and 19.69 %, respectively furthermore they showed the highest violation percentages of 16.13% and 19.69 %.

In case of aromatic medicinal plants dimethoate residue was detected frequently in marjoram, cumin, larkspur flower and chamomile samples with percentages of 47.33, 31.82, 25 and 20.65 %, respectively furthermore they showed the highest violation rate with the following percentages 46.37, 31.25, 25 and 20.35 % respectively which indicates that we need to put a plane to apply good agricultural practices for dimethoate use for those commodities.

Potatoes, squash and molokhia showed the lowest contamination rates 0.23, 0.88 and 0.9 % respectively without any violation percentages furthermore they showed lowest violation. No violation observed in apple, cabbage, lettuce and green peas. However, in case of aromatic medicinal plants basil, dry and green coriander samples showed the lowest violation percentages 1.63, 1.8 and 1.12 % respectively . Basil, dry coriander and green parsley samples showed the lowest contamination rate than all herbs 2.17, 2.16 and 2.3 %.

Children are at special risk with any substance capable of causing cancer and nervous system damage. A number of animal studies have shown that animals are at greater risk of developing cancer if exposure began in infancy rather than later in life. Of 14 carcinogens reviewed by the US Natural Resources Defense Council, the young were more susceptible up to 12 (Whyatt 1993). The reason for such susceptibility may be linked with rapid cell division entailed in development and growth. Also children have more of their lives still to live during which exposure and carcinogenic action may occur. The young are especially more susceptible to the acute effects of organophosphate insecticides.

The young rats are more susceptible than adults to the lethal effects of 15 out of 16 organophosphates tested. For some organophosphates, the fatal dose in immature animals has been reported to be only 1% of the lethal dose in adult animals (Calabrese 1986).

The authoritative study by the US National Research Council (NRC) concluded: "The data strongly suggest that exposure to neurotoxic compounds at levels believed to be safe for adults could result in permanent loss of brain function if it occurred during the prenatal and early childhood period of brain development. This information is of particular relevance to dietary exposure to pesticides, since policies that established safe levels of exposures to neurotoxic pesticides for adults may not be such adequate protect a child less than four years of age (NRC 1993).

In the framework it is stated that a cumulative risk assessment of substances that cause a common toxic effect by a common mechanism will not be conducted until an aggregate exposure assessment of each substance has been completed. This framework is needs more studies to be finalized . The risk to human health is due to pesticide residues in the edible parts of the crop and the consequent daily intake of these residues. The acceptable daily intake (ADI) of the dimethoate is derived from the chronic toxicity data. The established ADI value of dimethoate in Egypt are indicated in codex published by Food and Agriculture Organization of United Nations (FAO) which is 0.002 mg/kg body weight. The EDI (Estimated daily intake) of a dimethoate by Egyptian people is calculated from the Middle Eastern food consumption GEMS / food data and dimethoate residue monitoring data using an average body weight of 60 kg.

The current exposure assessment addressed only the risks posed by dimethoate residue in fruit, vegetables and herbs. The contributors to total intake of dimethoate are in descending order as follows leafy vegetables 42.73 %, root vegetables 22.21 % , fruits 15.36 %, fruiting vegetables 9.04 %. Dry herbs 7.6 % and green herbs 3.07 %. The major contributors crops to total intake of dimethoate are green molokhia 36.96 % followed by green onion 15.79 %, potato 6.42 %, tomato 6.33 %, orange 6.08 and grape 5.07 %.

Recent research has brought to light another class of adverse effects from various pesticides and other chemicals. Several pesticides (as well as some widely used industrial chemicals) can disrupt the body's endocrine or hormonal system - so crucial in growth and development. These endocrine disruptors can mimic or disrupt the normal functions of hormones, and tamper with this delicately balanced signaling system in the body, which governs a range of functions and developmental processes. Though their effects in human beings are still being debated, the evidence is mounting. From wildlife and animal studies in laboratories, there is growing concern that these endocrine disruptors can cause developmental, reproductive, behavioral, immunological and physiological changes. Reuber, M.D. 1984

The risk exposure assessment of dimethoate residues results are shown in Table 3. Data showed that our results go with the EPA total diet studies results. The total dietary intake of dimethoate 0.00214 mg/kg. body weight /day

is lower than ADI (0.002 mg/kg body weight) and contributing 107% of ADI . Therefore dietary exposures to dimethoate are a real case for a concern .

The young, those who suffer from chronic illnesses and anyone who eats more bread, fruit and vegetables than average are more at risk in both short term and long term from pesticide residues in their diet. For these people particularly it is important to increase the amount of organic food eaten, to replace especially those foods which are heavily sprayed. In general, if you are trying to reduce pesticide residues in your diet, especially seek out organic fruit and salad vegetables. It is especially important for pregnant women and women who may conceive to eat organic fruit, vegetables. Ideally, a woman would detoxify before conceiving.

Finally, we can help protect ourselves from a toxic environment by eating organic food, and by demanding a benign system of agriculture and an economy and infrastructure that does not depend on pouring pollutants into our food and environment.

REFERENCES

AOAC Official Method of Analysis 16th Edition (1995). Gas chromatographic Multiresidue determination of Organochlorine, Organophosphorus and organonitrogen pesticides from fruits, vegetables, berries, herbs and cereals. Method 985.22, 10.1.02

Calabrese, E.J. (1986). Age and Susceptibility to Toxic Substances. New York: John Wiley & Sons.

Center of metrology and accreditation (1997). Finnish Accreditation Service (FINAS) Directory of Accreditation bodies January, Helsinki , Finland.

Codex Alemintariuos Commission (1993). Sampling Guidelines Joint FAO/WHO food Standard Program Vol. 1A P 391

Department of Pesticide Regulation. Medical Toxicology Branch (1996). Summary of Toxicology Data for Dimethoate. Sacramento, CA. USA.

Dogheim, S.M., M.M. Almaz, S.N. Kostandi, and M.E. Hegazy (1988). Pesticide residues in milk and fish samples collected from upper Egypt . J.Assoc.Off. Anal.Chem. 71, 872-874.

Dogheim, S.M., E.N. Nasr, M.M. Almaz, and M.M. El-Tohamy (1990). Pesticide residues in milk and fish samples collected from two Egyptian governorates. J. Assoc. Off. Anal. Chem.73, 19-21

Dogheim, S.M., M. El-Shafeey, A.M. Afifi, and F. Abdel-Aleem (1991). Levels of pesticide residues in Egyptian human milk samples and infant dietary intake . J. Assoc. Off. Anal. Chem. 74,89-91

Dogheim S.M., S.A. Gad Alla, and A.M. El-Marsafy (1999). Monitoring of pesticide residues in Egyptian fruits and vegetables in 1995. J. Assoc. Off. Anal. Chem.82, (4) ,984-955.

Dogheim S.M., S.A. Gad Alla, and A.M. El-Marsafy (2001). Monitoring of pesticide residues in Egyptian fruits and vegetables in 1996 J. Assoc. Off. Anal Chem.84,(2): 519-531.

Dogheim S.M., A.M. El-Marsafy, E.Y. Salama, S.A. Gad Alla, and Y. M. Nabil (2002). Monitoring of pesticide residues in Egyptian fruits and vegetables in 1997 J. Assoc.Off. Anal Chem.84, (2): 519-531.

Dr. Ehrenstorfer Laboratories. Specialized producer, supplier and distributor of reference materials used as analytical standards for residue analysis and quality control Gogginger Str. 78 D- 8900 Augsburg Germany

Environmental Protection Agency. Office of Pesticide Programs (1997). List of Chemicals Evaluated for Carcinogenic Potential. Washington D.C.

NRC (National Research Council) (1993). Pesticides in the diets of infants and children. Washington: National Academy Press.

Pease, W.S. (1996). Pesticide Use in California: Strategies for Reducing Environmental Health Impacts. California Policy Seminar. Berkeley, CA.

Reuber, M.D. (1984). Carcinogenicity of dimethoate. Journal of Environ. Res., 34:193.

Whyatt, R. (1993). The physiological susceptibility of children to pesticides. Journal of Pesticide Reform 9:3, pp5-9.

World Health Organization (1989). Environmental Health Criteria 90-Dimethoate. International Programme on Chemical Safety. Lyon, France.

Table 1. Monitoring data of dimethoate residues in some fruits and vegetables collected from local markets in 2002.

Commodities	Total No. of samples	Freq. %	contaminated samples		Min. Conc. ppm	Max. Conc. ppm	Mean Conc. ppm	MRL's mg/kg	No of violated samples	Violation %
			No	%						
Fruits										
Apples	2342	21.09	848	36.21	0.03	1.00	0.143	1.00 CXL	0	0.00
Figs	27	3.70	1	3.70	0.15	0.15	0.150	0.02 EC	1	3.70
Grapes	138	2.17	7	5.07	0.11	0.68	0.413	0.02 EC	3	2.17
Guava	77	5.19	9	11.69	0.06	0.34	0.140	0.02 EC	4	5.19
Oranges	127	19.69	33	25.98	0.05	0.96	0.166	0.02 EOS	25	19.69
Peaches	31	32.26	9	29.03	0.09	2.00	0.792	0.50 EOS	5	16.13
Pears	23	13.04	4	17.39	0.07	1.20	0.447	1.00 CXL	1	4.35
Plums	20	15.00	3	15.00	0.03	0.12	0.067	0.50 CXL	0	0.00
Pomegranates	33	9.09	8	24.24	0.05	0.11	0.083	0.02 EC	3	9.09
Vegetables										
Fruiting vegetables										
Cucumber	123	0.81	5	4.07	0.05	0.05	0.050	0.02 EC	1	0.81
Green beans	404	2.72	21	5.20	0.02	0.36	0.131	0.02 EC	10	2.48
Green Peas	79	5.06	5	6.33	0.06	0.40	0.170	0.50 CXL	0	0.00
Okra	69	2.90	3	4.35	0.24	0.31	0.275	0.02 EC	2	2.90
Pepper	166	3.61	9	5.42	0.13	0.84	0.323	0.02 EC	6	3.61
Squash	113	0.88	1	0.88	0.05	0.05	0.050	0.02 EC	1	0.88
Strawberry	57	7.02	4	7.02	0.09	0.42	0.200	0.02 EC	4	7.02
Tomatoes	149	0.67	1	0.67	0.10	0.10	0.100	0.02 EC	1	0.67
Leafy vegetables										
Cabbage	87	1.15	1	1.15	0.07	0.07	0.070	2.00 CXL	0	0.00
Grape leaf	69	8.70	8	11.59	0.07	1.20	0.755	0.02 EOS*	6	8.70
Lettuce	78	1.28	2	2.56	0.40	0.40	0.400	0.50 EC	0	0.00
Molokhia	111	0.90	1	0.90	6.10	6.10	6.100	0.02 EOS*	1	0.90
Spinach	71	1.41	2	2.82	0.52	0.52	0.520	0.02 EOS	1	1.41
Water Cress	87	2.30	4	4.60	0.05	0.05	0.050	0.02 EOS*	2	2.30
Root vegetables										
Green Onion	116	7.76	9	7.76	0.15	2.60	0.884	0.02 EC	9	7.76
Potatoes	433	0.23	1	0.23	0.14	0.14	0.140	0.05 CXL	1	0.23

(Codex) Codex Alemintariuos commission, (Min) Minimum, (Max) Maximum, (EC) European union (MRL's) Maximum Residue Limits, (Freq) Frequency, (EC) European union, (EOS) Egyptian Organization of Standardization, (ppm) part per million, (*) extrapolated .

The commodities (cantaloupe 79, lemon 15, Mandarin 1, Egg plant 117, hot chili 138 dry Molokhia 86, carrot 91 and celery 13) 527 samples are free of dimethoate residues

Total No of contaminated commodities of fruits and vegetables 5030 samples

Table 2. Monitoring data of dimethoate residues in some herbs collected from local markets in 2002.

Herbs	Total No. of samples	Freq. %	contaminated samples		Min. Conc. ppm	Max. Conc. ppm	Mean Conc. ppm	MRL's mg/kg	No of violated samples	Violation %
			No	%						
Dry										
Anise Seed	219	8.22	21	9.59	0.05	4.90	1.264	0.05 EOS*	18	8.22
Basil	737	1.90	16	2.17	0.05	0.96	0.292	0.05 EOS*	12	1.63
Chamomile	1022	20.65	222	21.72	0.05	33.00	1.207	0.05 EOS*	208	20.35
Cumin	176	31.82	57	32.39	0.05	12.00	1.794	0.05 EOS*	55	31.25
Dry Coriander	278	1.80	6	2.16	0.09	0.41	0.244	0.05 EOS*	5	1.80
Dry Dill	111	6.31	7	6.31	0.13	4.50	0.864	0.05 EOS*	7	6.31
Dry Mint	2442	7.53	215	8.80	0.05	50.00	2.247	0.05 EOS*	173	7.08
Dry Parsley	135	7.41	10	7.41	0.06	0.17	0.109	0.05 EOS*	10	7.41
Fennel	526	2.28	24	4.56	0.05	0.65	0.211	0.05 EOS*	11	2.09
Larkspur Flower	4	25.00	1	25.00	0.25	0.25	0.250	0.05 EOS*	1	25.00
Marjoram	619	47.33	301	48.63	0.05	33.00	0.757	0.05 EOS*	287	46.37
Green										
Green Coriander	89	1.12	3	3.37	0.11	0.11	0.110	0.02 EOS*	1	1.12
Green Dill	86	5.81	5	5.81	0.09	3.70	0.978	0.02 EOS*	5	5.81
Green Mint	53	5.66	5	9.43	0.05	4.40	1.643	0.02 EOS*	5	9.43
Green Parsley	87	2.30	2	2.30	0.08	0.24	0.160	0.02 EOS*	2	2.30

(Min) Minimum, (Max) Maximum, (EC) European union (MRL's) Maximum Residue Limits, (Freq) Frequency , (EC) European union, (EOS) Egyptian Organization of Standardization , (ppm) part per million (*) extrapolated.
The commodities (calendula flower 74, calendula petals 35, caraway 228, dry celery 39, hibiscus 219, Rosemary 7, Tillio 4, verbascum 17 and lemon grass 142) 778 samples were found to be free of dimethoate residues
Total No of contaminated commodities of herbs 6584 samples .

Table 3. The estimated daily intake and intake percentages of dimethoate residues for fruits, vegetables and herbs according to middle eastern food consumption data.

Commodity	Dimethoate residues Mean ppm	Middle eastern Food consumption gm/person/ day	Estimated Daily Intake (EDI) µg/day	% Intake
Fruits				
Apples	0.143	7.5	1.07	0.83
Figs	0.150	2.3	0.35	0.27
Grapes	0.413	15.8	6.53	5.07
Guava	0.140	3.1	0.43	0.33
Oranges	0.166	47.1	7.82	6.08
Peaches	0.792	2.5	1.98	1.54
Pears	0.447	3.3	1.48	1.15
Plums	0.067	1.8	0.12	0.09
Pomegranates	0.083	0.0	0.00	0.00
Subtotal fruit			19.77	15.36
Vegetables				
Fruiting vegetables				
Cucumber	0.050	4.8	0.24	0.19
Green beans	0.131	3.5	0.46	0.36
Green Peas	0.170	5.5	0.94	0.73
Okra	0.275	0.8	0.22	0.17
Pepper	0.323	3.4	1.10	0.85
Squash	0.050	10.5	0.53	0.41
Strawberry	0.200	0.0	0.00	0.00
Tomatoes	0.100	81.5	8.15	6.33
Subtotal Fruiting vegetables			**11.63**	**9.04**
Leafy vegetables				
Cabbage	0.070	5.0	0.35	0.27
Grape leaf	0.755	7.8	5.89	4.58
Lettuce	0.400	2.3	0.92	0.71
Green Molokhia	6.100	7.8	47.58	36.96
Spinach	0.520	0.5	0.26	0.20
Water Cress	0.050	0.1	0.01	0.01
Subtotal Leafy vegetables			**55.00**	**42.73**
Root vegetables			20.33	15.79
Green Onion	0.884	23.0	8.26	6.42
Potatoes	0.140	59.0		
Subtotal Root vegetables			28.59	22.21
Subtotal Vegetables			**95.22**	**73.97**

Cont. Table (3).

Herbs	Dimethoate residues Mean ppm	Middle eastern Food consumption gm/person/ day	Estimated Daily Intake (EDI) µg/day	% Intake
Dry				
Anise Seed	1.264	2.3	2.91	2.26
Basil	0.292	0.3	0.09	0.07
Chamomile	1.207	0.3	0.36	0.28
Cumin	1.794	0.5	0.90	0.70
Dry Coriander	0.244	0.5	0.12	0.09
Dry Dill	0.864	0.1	0.09	0.07
Dry Mint	2.247	2.3	5.17	4.02
Dry Parsley	0.109	0.1	0.01	0.01
Fennel	0.211	0.3	0.06	0.05
Larkspur Flower	0.250	0.0	0.00	0.00
Marjoram	0.757	0.1	0.08	0.06
Subtotal Dry Herbs			**9.78**	**7.6**
Green				
Green Coriander	0.110	0.5	0.06	0.05
Green Dill	0.978	0.1	0.10	0.08
Green Mint	1.643	2.3	3.78	2.94
Green Parsley	0.160	0 1	0.02	0.02
Subtotal Green Herbs			**3.95**	**3.07**
Subtotal Herbs			**13.73**	**10.67**
Total			**128.72**	**100**

Calculated Dietary intake for Dimethoate = 128.72 /1000/60 = 0.00214 mg/kg. body weigh/ day

Acceptable Daily Intake of Dimethoate (ADI) = 0.002 mg/kg body weight

Total estimated dietary intake for Dimethoate as a percentage of set ADI = 0.00214 * 100 / 0.002 = 107 %

الملخص العربي

مخاطر السمية للتعرض لمتبقي الدايمثيويت في بعض الفواكه والخضر والأعشاب في مصر

د. أشرف محمود المرصفي

المعمل المركزى لتحليل متبقيات المبيدات و العناصر الثقيلة فى الأغذية

وزارة الزراعة – مركز البحوث الزراعية

تم إنشاء المعمل المركزي لتحليل متبقيات المبيدات والعناصر الثقيلة في الأغذية بالتعاون بين وزارة الزراعة بمصرية ودولة فنلندا لعمل الاختبارات وتقيم الاستخدام الأمن للمبيدات في مصر . مركب الدايمثيويت أحد المركبات الفسفورية المستخدمة بصورة واسعة لمقاومة الآفات . تم تصنيف مركب الدايمثيويت كمركب بالرتبة سى محتمل مسرطن في وكالة حماية البيئة الأمريكية . تم اختبار عدد ١٢٩١٩ عينة من ٥٧ نوع من أنواع الخضر والفاكهة وكذلك النباتات الطبية والعطرية لمبيد الدايمثيويت لعام ٢٠٠٢ حيث وجد أن ١٧ نوع من أنواع المحاصيل المختبرة تمثل نسبة ١٠,١ % خاليه من متبقيات هذا المبيد بينما ٤٠ نوع من أنواع هذه المحاصيل بإجمالي ١١٦١٤ عينة ٢٨١٨ فاكهة ٢٢١٢ خضر و ٦٥٨٤ نباتات الطبية والعطرية بنسبة إجمالية ٨٩,٩% من مجموع العينات المختبرة ملوث بمتبقي مبيد الدايمثيويت وتعتبر هذه الأنواع من المحاصيل ملوثة . أشارت النتائج إلى أنه ٤,٠٩ % تمثل ٤٧٥ عينة من مجموع أنواع المحاصيل الملوثة تحت حدود التقدير (٠,٠٥ جزء في المليون) كما أن ١٦,٣٢ % عند أو أعلى من حدود التقدير لمتبقي مبيد الدايمثيويت بينما ٨٣,٦٨% من مجموع أنواع هذه المحاصيل غير ملوث بمتبقي مبيد الدايمثيويت. أشارت النتائج إلى أنة ٧,٦٤% من مجموع أنواع المحاصيل الملوثة تتعدى الحدود القصوى المسموح بها مقارنة بالحدود القصوى المسموح بها محليا أو حدود منظمة الكودكس وكذلك الحدود الأوروبية . تم تعيين متبقي مبيد الدايمثيويت بصورة متكررة في عينات الخوخ والبرتقال بنسبة ٣٢,٢٦% و ١٩,٦٩% على التوالي كما سجلت نفس المحاصيل أعلى نسب تعدى للحدود القصوى ١٦,١٣ % و ١٩,٦٩ % . أشارت النتائج إلى أن محاصيل الخضراوات الورقية هي أكثر المحاصيل مشاركة في المتناول الغذائي اليومي بمتبقي مبيد الدايمثيويت حيث وصلت هذه النسبة إلى ٤٢,٧٣% حيث أن اكبر محصول مشارك في هذه النسبة هو الملوخية بنسبة ٣٦,٩٦ % كما أظهرت الدراسة أن مجموع المتناول اليومي للخضر و الفاكهة وكذلك النباتات الطبية و العطرية للمحاصيل المختبرة لهذا المبيد للإنسان المصري ٠,٠٠٢١٤ مليجرام لكل كيلو جرام من وزن جسم الإنسان في اليوم وهذه القيمة اقل من قيمة المتناول اليومي المسموح به وهو ٠,٠٠٢ مليجرام لكل كيلو جرام من وزن جسم الإنسان في اليوم ويمثل ١٠٧% من قيمة المتناول اليومي المسموح به وهذا يعنى أن التعرض لمتبقي مبيد الدايمثيويت بدا أن يكون خطيرا بالنسبة للمستهلك المصري . يمكن المساعدة وحماية أنفسنا هذه السموم البيئية بتناول الأطعمة الغير معاملة بالمبيدات وتسمى بالأطعمة العضوية هذا بالإضافة إلى الحاجة الملحة إلى نظام زراعي محسن اقتصاديا وهيكليا لا يعتمد على تدفق الملوثات في الغذاء والبيئة .