Chemical contaminants in dried herbs and aromatic plants and their risk assessment to Egyptian consumer

By

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B. Sc. Agric., Ain Shams University, 1981
Diploma of Environmental Sciences, Sciences, 1992
M.Sc. Agric., Ain Shams University, 2001

A Thesis
Submitted for Fulfillment of the Requirement for
Ph.D. Degree
in
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Department of Agricultural Science
Institute of Environmental Studies & Research
Ain Shams University

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ABSTRACT

Name **:** Wasfi Mohamed Thabet

Title of thesis: Chemical contaminants in dried herbs and aromatic plants and their risk assessment to Egyptian consumer.

Degree **:** Submitted for Fulfillment of the Requirement for Ph.D.

This work has been carried out to investigate the present situation of aromatic and medicinal plants contamination with pesticide residues in the different local markets of seven governorates from January 2003 to December 2004.

Monitoring of 25 organophosphorus and organonitrogen pesticide was carried out in 17008 samples of aromatic and medicinal plants.

The results revealed that malathion was the most frequently detected followed by profenofos and chlorpyrifos (35.77%).

The dietary intakes of the five most frequently detected pesticides were calculated as estimated daily intakes (EDI's).

Key words : Pesticide residues , Organophosphorus , Organonitrogen, Aromatic plants , Medicinal plants , Dietary intake.

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Table (6) : Frequencies of different pesticides detected in Aromatic plant samples collected from January 2003 to December 2003

Pesticide	Frequincy in aromatic plant samples											Total	% contamination
	Anise 147	Basil 961	Camomile 1424	Cumin 96	Fennel 635	Marjoram 964	D.Mint 2164	Caraway 327	Coriander 277	Dill 157	Hibiscus 290	7442	
Atrazine			3									3	0.04
Carbaryl		3	5		1	2	10		1			22	0.30
Chlorpyrifos	39	175	121	57	51	212	621	7	6	97	8	1394	18.73
Chlorpyrifos-methyl	16	4	9	12		42	445		1	32		561	7.54
Cyanofos					1							1	0.01
Diazinon	11	5	12	36	24	16	23	4		3		134	1.80
Dicofol						1						1	0.01
Dimethoate	17	13	241	38	75	661	263	3	5	17		1333	18.00
Malathion	109	36	494	86	480	341	273	19	17	91	3	1949	26.20
Metalaxyl			15	48								63	0.85
Omethoate			12			2	15					29	0.39
Parathion-methyl						5	2					7	0.10
Phenthoate		1		3		1	4			1		10	0.13
Pirimicarb			3	8	2	2	23			1		39	0.53
Pirimiphos-methyl		3	2	2	2	2	638					649	8.72
Profenophos	88	81	139	76	148	167	5	10	12	96	1	823	11.06
Pyrazophos			7	8								16	0.22
Triazophos			1	2		8	20			1		32	0.43
Fenitrothion			1	2								3	0.04
Tolclofos-methyl			25									25	0.34
Total	280	321	1090	288	784	1462	2342	43	42	339	12	7094	

Table (7) : Frequencies of different pesticides monitored in Aromatic plant samples collected from January 2004 to December 2004

Pesticide	Frequincy in aromatic plant samples											Total	% contamination
	Anise 200	**Basil 1491**	**Camomile 1930**	**Cumin 61**	**Fennel 754**	**Marjoram 1370**	**D.Mint 2655**	**Caraway 337**	**Coriander 209**	**Dill 233**	**Hibiscus** 754	9566	
Atrazine							1					1	0.01
Carbaryl		7	6			3	10					26	0.27
Chlorpyrifos	131	594	318	48	173	793	1296	24	10	206	18	3611	37.80
Chlorpyrifos-methyl	13	139	10	13	2	191	431			71		870	9.10
Diazinon	23	26	19	28	40	67	20	3		7		234	2.45
Dicofol						36						36	0.38
Dimethoate	37	124	542	41	203	1113	593	5	3	25		2686	28.10
Malathion	180	116	875	60	643	809	478	39		127	17	3351	35.03
Metalaxyl	1		14	22			1					38	0.40
Omethoate			5			7	17		7			30	0.31
Parathion-ethyl				1								1	0.01
Parathion-methyl	1					3	1					**5**	0.05
Phenthoate				8	1	7	4	1		1		22	0.23
Pirimicarb				8	1		31					40	0.42
Pirimiphos-methyl	1		2		25	1			1			30	0.31
Profenophos	163	368	281	55	326	578	838		7	159	1	2804	29.31
Pyrazophos				**4**				**28**				**32**	**0.34**
Triazophos			1	1		3						5	0.05
Fenitrothion		1	2	2		2	4	1		1		13	0.14
Tolclofos-methyl		1	14	1		1						17	0.18
Ethion	1			2		1						4	0.04
phosalone		1		1			1	1				4	0.04
Pendimethalin							1			3		4	0.04
fenvalerate						1						1	0.01
Tetradifon						2						2	0.02
Endosulfan beta							7					7	0.07
Total	551	1377	2089	295	1414	3618	3734	102	28	600	36	13860	

Table (8): Number of analyzed samples, uncontaminated samples, contaminated samples, samples of residues less than or equal MRL, and samples with residues exceed the MRL

Aromatic plant	Year	Number of analyzed samples	Uncontaminated samples		Contaminated samples		Contaminated samples			
			No.	%	No.	%	Not violated		Violated	
							No.	%	No.	%
Anise seed	2003	**147**	38	25.6	109	74.1x	**65**	44.2	44	29.9
	2004	**200**	20	10	180	90x	**144**	72	36	18
Basil	2003	**961**	786	81.8	175	18.2	**175**	18.2	-	
	2004	**1491**	897	60.2	594	39.8	**591**	39.6	3	0.2
Camomile	2003	**1424**	930	65.3	494	34.7	**455**	31.95	39	2.7
	2004	**1930**	1055	54.7	875	45.3	**830**	43	45	2.3
Caraway	2003	**327**	308	94.2	19	5.8	**19**	5.8	-	
	2004	**337**	298	88.4	39	11.6	**38**	11.3	1	0.3
Cumin	2003	**96**	10	13.4	86	89.6x	**34**	35.4	52	54.16
	2004	**61**	1	1.6	60	98.4x	**24**	39.3	36	59
Coriander	2003	**277**	260	93.9	17	6.1	**17**	6.1	-	
	2004	**219**	209	95.4	10	4.57	**10**	4.6	-	
Dill	2003	**157**	60	38.2	97	61.8x	**97**	61.8	-	
	2004	**233**	27	11.6	206	88.4x	**198**	85	8	3.4
Fennel	2003	**635**	155	24.4	480	75.6x	**476**	75	4	0.63
	2004	**754**	111	14.7	643	85.3x	**641**	85	2	0.265
Marjoram	2003	**964**	303	31.4	661	68.6x	**651**	67.5	10	1.04
	2004	**1370**	257	18.8	1113	81.24x	**1077**	78.6	36	2.63
Mint	2003	**2164**	1526	70.5	638	29.5	**550**	25.4	88	4.06
	2004	**2655**	1359	51.2	1296	48.8	**1296**	48.8	-	
Hibiscus	2003	**290**	282	97.	8	2.8	**8**	2.8	-	
	2004	**316**	298	94	18	5.7	**18**	5.7	-	
Total		**17008**	**9190**	**54%**	**7818**	**45.96**	**7414**	**43.6%**	**404**	**2.38%**

Table (4): Minimum, Maximum, Mean in mg/kg as well as Frequencies, Number and percentages of contaminated samples, violated samples and the detected metals residues in Spices and aromatic plants samples collected from Egyptian local markets during 2003.

Commodity	Total no. of samples	Total Contaminated samples		Detected pesticides	Pesticide level (mg/kg)		Mean mg/kg	Frequency		MRL's (mg/kg)	Violation in contaminated samples		Violation in total samples	
		No.	%		Min. mg/kg	Max. mg/kg		No.	%		No.	%	No.	%
Anise seed	147	109	74.1	Chlorpyrifos	0.025	11	0.72	39	26.53	5	-	-	44	29.9
				chlorpyrifos-methyl	0.025	1.2	0.25	16	10.88	1	1	0.92		
				diazinone	0.015	2.9	0.48	11	7.48	5	-	-		
				dimethoate	<LOQ	0.82	0.16	17	11.56	5	-	-		
				malathion	0.025	23	2.41	109	74.15	2	44	40.37		
				profenofos	0.025	44	1.95	88	59.86	-		-		
Chamomile	1424	494	34.7	Atrazine	0.5	3.7	1.65	3	0.21	-	-	-	39	2.74
				Carbaryl	<LOQ	3	1.14	5	0.35	-	-	-		
				chlorpyrifos	0.025	3.1	0.2	121	8.50	5	-	-		
				chlorpyrifos-methyl	0.05	0.85	0.22	9	0.07	1	-	-		
				diazinon	0.015	1.9	0.27	12	0.84	5	-	-		
				dimethoate	<LOQ	17	0.98	241	16.93	5	18	3.64		
				fenitrothion	0.025	0.025	0.025	1	0.07	7	-	-		
				malathion	0.025	29	0.81	494	34.7	2	39	7.89		
				metalaxyl	0.44	2.2	1.04	15	1.05	5	-	-		
				omethoate	0.21	24	6.9	12	0.84	-	-	-		
				pirimicarb	0.025	0.65	0.3	3	0.21	5	-	-		
				pirimiphos-methyl	0.08	0.11	0.1	2	0.14	3	-	-		
				profenofos	0.025	3.1	0.28	139	9.80	-	-	-		
				pyrazophos	0.07	0.16	0.12	7	0.49	-	-	-		
				tolclofos-methyl	0.025	0.18	0.04	25	1.76	-	-	-		
				triazophos	0.025	0.025	0.025	1	0.07	-	-	-		

*** To calculate the mean, samples at <LOQ were considered being at 1/2 LOQ.**