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PESTICIDE RESIDUES IN FRUITS AND VEGETABLES IN THE SAUDI ARABIA KINGDOM

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ABSTRACT

This paper presents from surveillance of pesticide residues in fruit and vegetables carried out in summer, 2009. 242 samples of 19 different types of fresh fruit and vegetables were analyzed for their pesticide residues contents. The highest residues found were captan residues (2.41 mg/kg), malathion residues (1.82 mg/kg), parathion-methyl residues (1.5 mg/kg), both of dazinon and carbaryl, tabulated the same results (1.41 mg/kg), Pirimiphos-methyl residues (1.38 mg/kg), chlorpyrifos residues (1.2 mg/kg), vinclozolin residues (1.09mg/kg), and cypermethrin residues (1.00 mg/kg). On the most cases pesticide residues occurred on levels well below the national codex MRLs. The data also indicated that, 18 samples (7.44% of samples) contain residues above their maximum residue limits (MRLs) of the methods applied.
Keywords: Kingdom Saudi Arabia, fresh fruit and vegetables, Pesticide residues, MRLs.

INTRODUCTION

Monitoring programmes for residues and contaminant contribute to improving food safety ,warn of actual and potential food scares , and facilitate evaluation of possible health hazards. Pesticides are widely used worldwide to control pest of crops and eliminate unwanted parasites. Around 860 active substances belonging to more than 100 substance classes are components of current pesticide products Tomlin, 2003. As a consequence of their use, some foods can contain residues of such compounds, which can eventually reach the consumers and present possible hazards for human health. Food safety control and pesticide residue determination are therefore of obvious importance to modern society. The European Union (EU) has set new stringent directives for pesticides in fruits and vegetables in order to minimize exposure of the population (www.europa.eu.int/comm/food/index-en.htm).

The established maximum residue levels (MRLs) or tolerance for pesticides in foods range from tens and hundreds of ppb (ug/kg) up to ppm (mg/kg) concentrations depending on their biological activity and or on how demanding their analysis is.

Sensitive and reliable analytical methods are required to monitor pesticide residues in foods. Extraction, purification and concentrations steps before the pesticide analysis are expensive and time – consuming, especially when a large batch of samples must be analysis.

The monitoring results are intended to check compliance with maximum residue limits (MRLs), to determine the origin or explanation for any contaminated agricultural products and to determine whether products produces have followed good agricultural practice (GAP).

By determing pesticide residues in agricultural products after picking, digging or harvesting (until marketing), one could check the proper use of pesticides and be assured of the quality of fresh food produced by Saudi Arabia or exported from out world producers for the market.

The present survey has included monitoring of organic pesticides residue in fruit and vegetables. Pesticide residue levels were evaluated in relation to their maximum resides levels/limits (MRLs).

MATERIALS AND METHODS

Sampling

In summer, 2009, 19 different types of fresh fruit and vegetables were collected from local markets and green house . Apple, gooseberry strawberry, cherry, cucumber, tomato, broad bean, carrot, leek, kale, corrugate, broccoli, spinach, mushroom, cabbage, onion, potato, lettuce, green peas and plum were freshly collected. A total of 500g from each commodity were thoroughly homogenized and prepared according to published guidelines (Codex Alimentarius Commission, 1993).

Extraction and clean up:

The sample was cut into four pieces; two opposite quarters were taken, mixed and stirred. The mixed sample was extracted immediately or was kept in plastic vessels at – 20Ċ, to 20 g mixed sample, the following mixture of three solvents was added; acetone, petroleum ether, and dichloromethane at a ratio of 1: 2: 2, homogenized with an ultra – blender, and filtered through filter paper (Whatman Qualitative circles 185 mm No.1) into a porcelain Buchner funnel apparatus. The lower water phase was separated and the upper organic one was filtered through filter paper (Whatman. Qualitative circles 185 mm No.1) into soxhlet flask. The solvents were evaporated and rotary – evaporator until dryness. The extract was dissolved in a mixture of cyclohexane and ethyl acetate at a ratio of 1:1, on a filtered through a filter (pore size 0.2 um), and cleaned up by florisel column chromatography. The elution was evaporated and rotary evaporator and blown down with nitrogen. The dry residue was dissolved in acetone (Their & Zeumex 1987 and 1992; Makovi & MC-Mahon 1999 and Basa cesnik & Gregoreic 2003).

Determination:

The content of pesticide residues was determined by GC-MS. The compounds were separated one Hp-5MS column (30m x 0.25mm x 0.25 mm). Selective-Ion monitoring was carried out for two to four characteristic ions. In order to avoid the influence of matrix, the calibration was carried out using matrix – matched standers. Identification was based on a comparison on of retention times and mass spectra of standers and samples. Quantitative analysis was carried out on forget (Fillion *et al*., 2000 and Basa cesnik & Gregorcic 2003).

RESULTS AND DISCUSSION

Maximum residue levels/limits (MRLs) are defined as the highest concentrations of pesticide residue (expressed in (mg) of a substance /kgm of commodity). Likely to occur in or on food commodities, the use of plant protection products were occurred according to good agricultural practice (GAP). MRLs are intended primarily as a check that GAP is being followed and to assist international trade in produce treated with pesticides. MRLs are not safety limits, and exposure to residue in excess of MRLs does not automatically imply a hazard to health.

In summer 2009, 242 samples of 19 different types of fresh fruit and vegetables were analyzed for their pesticide residue contents and samples of 8 commodities were free from measured residues.

Samples were analyzed for residues of 92 pesticides and metabolites. Details of the residues detected and evaluation of pesticide residue levels in comparison to MRLs. are provided in table 1.

In total, 132 detections of 28 of different pesticides were stated. Propoxur, endosulfane, and fenitrothion (7.58% of samples), carbaryl (6.8%), chlorpyrifos, dimethoate, malathion, and diazinon (5.3%), parathion-methyl and dicofol (4.55%), chlorpyrifos-methyl and mevinphos (3.88%), pirimiphos-methyl, cypermethrin, triazophos, vinclozolin, and metalaxyl (3.03%), DDT, methomyl, methocarb, pirimicarb, oxamyl, and captan (2.27%) were the most frequency detected. The other pesticides were detected in less than 1% of the sample analyzed.

The data also indicated that, 18 samples (7.44% of samples) were found to contain residues above their maximum residue limits (MRLs) of the methods applied.

The highest residues found were captan residues (2.41 mg/kg), malathion residues (1.82 mg/kg), parathion-methyl residues (1.5 mg/kg), both of diazinon and carbaryl, tabulated the same results (1.41 mg/kg), Pirimiphos-methyl residues (1.38 mg/kg), chlorpyrifos residues (1.2 mg/kg), vinclozolin residues (1.09mg/kg), and cypermethrin residues (1.00 mg/kg). On the most cases pesticide residues occurred on levels well below the national codex MRLs.

In total, 36 samples contained residues of two pesticides, 11 samples contained residues of three compounds, 6 samples contained four pesticides, 4 samples contained five pesticides, and 1 sample contain six pesticide, as tabulated in table 2.

Results of the surveys presented in this paper indicated that, most samples didn't have highest residues occur above MRLs. It means that the intake fresh fruit and vegetables seem to be quite safe for toddlers and therefore also for adult.

Table (1): Pesticide residue in fruit and vegetables analyzed in summer, 2009.

commodity	N	Name	No.	Max	MRLs	R> MRLs
Apple	28	Carbaryl	3	0.21	5	-
		Chlorpyrifos	5	1.2	1	1
		Diazinon	1	0.1	0.1	-
		Dimethoate	4	0.38	1	-
		Fenitrothion	2	0.29	0.5	-
		Malathion	6	1.82	2	-
		Parathion-methyl	1	1.5	0.2	1
Gooseberry	9	Parathion-methyl	3	0.1	0.01	1
		Propoxur	5	0.24	3	-
		Pirimiphos-methyl	2	1.38	1	1
		Vinclozolin	4	1.09	5	-
Strawberry	21	Phosphamidon	1	0.11	0.2	-
		Dichloran	1	0.36	10	-
		Methocarb	3	0.82	1	-
		Captan	1	2.41	20	-
Cucumber	40	Carbaryl	4	1.29	3	-
		Captan	2	0.18	3	-
		Diazinon	3	1.41	0.1	2
		Endosulfane	5	0.41	0.5	-
		Dicofol	6	0.65	0.5	1
		Fenitrothion	2	0.1	0.05	1
Lettuce	18	Fenitrothion	2	0.32	0.5	-
		Parathion-methyl	1	0.04	0.05	-
		Propoxur	1	0.21	0.5	-
Potato	15	Diazinon	1	0.56	0.01	1
		Dimethoate	3	0.87	0.05	1
		Endosulfane	2	0.17	0.2	-
		Fenitrothion	1	0.69	0.05	1
Tomato	26	Pirimiphos-methyl	2	0.94	1	-
		Chlorpyrifos-methyl	5	0.28	0.5	-
		Methomyl	3	0.81	1	-
		Pirimicarb	1	0.36	1	-
		Cypermethrin	1	0.49	0.5	-
		Permethrin	1	0.98	1	-
Broad bean	8	Oxamyl	3	0.09	0.1	-
		Triazophos	4	0.67	0.05	1
		Endosulfane	2	0.14	0.2	-
		Malathion	1	1.07	2	-
		Fenvelerate	1	0.49	0.5	-
carrot	12	DDT	3	0.91	0.05	1
		Carbaryl	2	1.41	2	-
		Metalaxyl	4	0.86	0.05	1
		Chlorpyrifos	2	0.41	0.5	-
leek	19	Fenitrothion	3	0.11	0.2	-
		Mevinphos	5	0.8	0.02	1
		Parathion	1	0.1	0.05	1
		Propoxur	4	0.2	1	-
		Pirimicarb	2	0.6	0.5	1
		Cypermethrin	3	1.00	0.5	1
spinach	15	Diazinon	2	0.8	0.5	-
		Endosulfane	1	0.2	2	-
		Parathion-methyl	1	0.43	0.5	-
Kale	2	-	-	-	-	-
Corrugate	1	-	-	-	-	-
Broccoli	2	-	-	-	-	-
Cherry	8	-	-	-	-	-
Mushroom	3	-	-	-	-	-
Onion	6	-	-	-	-	-
Plum	7	-	-	-	-	-
Green peas	2	-	-	-	-	-
Total	242		132			18

MRLs: Maximum Residue Limits

Table 2: Occurrence of multiple residues in fruit and vegetables in summer, 2009

Number of pesticide detected				
2	**3**	**4**	**5**	**6**
13	1	0	0	0
10	4	0	0	0
4	2	3	2	0
3	1	0	0	0
2	0	0	0	1
1	0	2	1	0
1	0	0	0	0
1	1	0	0	0
1	0	1	1	0
0	2	0	0	0
0	0	0	0	0
36	11	6	4	1

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متبقيات المبيدات فى الفاكهة والخضر فى اسواق المملكة العربية السعودية موسم عام ٢٠٠٩

منيرة عثمان الجبير
قسم التغذية وعلوم الاطعمة – جامعة الاميرة نورا بنت عبد الرحمن - الرياض - المملكة العربية السعودية

يعرض هذا البحث نتائج عمل مسح لدراسة كمية المتبقى من المبيدات فى الفاكهة والخضر المتواجدة فى اسواق المملكة العربية السعودية فى موسم ٢٠٠٩ ، تم تحليل ٢٤٢ عينة من ١٩ نوع مختلف من الفاكهة والخضر الطازجة ، وقد سجلت النتائج احتواء العينات على متبقى captan (٢,٤١ ملجم /كج) و malathion (١,٨٢ملجم /كج) و ***para***thion-methyl (١,٥ ملجم /كج) بينما كانت نسبة المتبقى فى كل من dazinon وcarbary (١,٤١ ملجم /كج) و Pirimiphos-methyl (١,٣٨ ملجم /كج) و chlorpyrifos (١,٢ ملجم /كج) و vinclozolin (١,٠٩ ملجم /كج) و cypermethrin (١,٠٠ ملجم /كج) ، وقد اتضح مما سبق ان معظم العينات تحتوى على الحد المسموح به حسب منظمة الكودكس العالمية ،فيما عدا ١٨ عينة تمثل ٧,٤٤% من العينات كانت تحتوى على كمية اكبر من الحد الاعلى المسموح به ، وعلى هذا يكون تناول الفاكهة والخضر الطازجة امن صحيا .

قام بتحكيم البحث

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