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BANNED PESTICIDES RESIDUES IN FARMGATE VEGETABLES OF SRI GANGANAGAR

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ABSTRACT
The present study was conducted to evaluate the banned pesticide contamination in tomato from Sri Ganganagar City, Rajasthan, India, using Gas Chromatograph and Multiple residue method. 68% of the samples were found to be contaminated with various organochlorine pesticide residues. The amount of pesticide detected in Tomato was higher than the permissible limits prescribed by WHO/FAO.

KEY WORDS: Pesticides, Multiple residue method, Gas Chromatograph, MRL value.

INTRODUCTION

The global share of India, in vegetable production is about 13.4%. Surveys carried out by institutions spread throughout the nation indicated that 50-70% of total vegetables are contaminated with pesticide residues (Karanth, 2002). In India, farmer uses about 6000 tonnes of active ingredients to control pests of vegetables and fruits (Mohan and Gujar, 2003). Vegetables consume 14% of the total pesticides used in India, in which, the share of different types of pesticides in Indian agriculture market shows that organophosphorus (50%) ranked first, followed by pyrethroids (19%), organochlorines (18%), carbamates (4%) and biopesticides (1%) (Dhaliwal and Singh, 2000). Many nations banned or restricted their use in agriculture because of their environmental persistence, bio-accumulation and toxic action on many non-target organisms, damage to wildlife and potential harm to human and environmental health (Witczak and Abdel, 2012; Wurl; Obbard, 2006).Organochlorine pesticides have been considered as endocrine-disrupting chemicals and carcinogenic substances (Amaral-Mendes, 2002). Considering the above points, a study has conducted for the assessment of banned organochlorine pesticides contamination in Tomato from the Sri Ganganagar city.

MATERIALS & METHODS

Sampling: Sampling was conducted for the period of one year from 2010 to 2011. Tomato was selected for the assessment of pesticide residues as it is used by people in their daily diet in various ways such as vegetable, raw in salad, in ketchup etc. 50 samples of tomato were collected from agricultural fields. After collection, these samples were kept in polythene bags and then transported on ice to the laboratory where they were analyzed, stored at 4°C until analysis.

Extraction and Clean-up

All the solvents used in extraction and clean-up process were of HPLC grade procured from E. Merck India limited. Multi Residue Method (MRM) was followed for the extraction of organochlorine pesticides from vegetable samples. 50 gm. of each vegetable was grinded, was extracted twice, with 50 ml acetonitrile each time. The pooled extract was partitioned with petroleum ether (50 ml). To this extract 5 ml of NaCl solution (2%) and 300ml of distilled water was added. The solvent layer, after discarding aqueous layer, was washed with two 100 ml portions of distilled water. The solvent layer was then treated with 7.5 gms anhydrous sodium sulphate to remove the moisture. Extract after cleanup was evaporated till dryness and final makeup done with n-Hexane and stored in deep freezer for analysis.

RESULTS & DISCUSSION

The present study was undertaken to determine the concentration of different banned organochlorine pesticides residues in farmgate vegetables of Sri Ganganagar. Pesticides are known to be present in vegetables due to extensive use of corresponding pesticides in interfiled cultivation. The result of study reveals that the 68% of total analyzed samples were contaminated with different pesticide residues. 50% of total contaminated samples were exceeded the maximum residual limit (MRL) values as per the FAO/WHO. It is reported that out of fifty samples of tomato, twenty were found contaminated with Endosulfan and among them, none was exceeded from MRL value. Twelve were found contaminated with Aldrin and among them, eleven was exceeded from MRL value. Twenty five were found contaminated with HCH and among them, seventeen was exceeded from MRL value. Five were found contaminated with DDT but MRL value of it is not given. The results of the study are in consonance with the earlier studies on farmgate vegetable samples. Periodic monitoring of farmgate vegetables must be carried out to know the prevailing scenario of banned pesticide contamination of vegetables grown in the Sri Ganganagar. The present research will not only serve as reference document but also helpful in taking necessary and timely preventive measure to mitigate such problems.

TABLE 1: Seasonal distribution of organochlorine pesticide in tomato (In ppm).

Seasons	Beginning Season (January)	Middle Season (June - July)	End Season (December)
α HCH	ND	ND	ND
β HCH	ND	ND	ND
γ-HCH	0.312 ±.046	0.126 ±.044	0.157 ±.002
pp DDD	0.018 ±.006	0.018 ±.006	ND
op DDE	0.018 ±.006	ND	ND
op DDD	ND	ND	ND
pp DDT	0.022 ±.007	0.018 ±.006	ND
α Endo	0.051 ±.018	0.123 ±0.043	0.059 ±0.020
β Endo	0.036 ±0.012	0.064 ±0.022	0.086 ±0.030
Aldrin	0.274 ±.097	0.224 ±0.079	0.089 ±0.031
Dieldrin	ND	0.106 ±0.037	ND

TABLE 2: Total organochlorine pesticide in tomato (In ppm).

Name of pesticide detected (No. of sample contaminated)	Vegetables (No. of samples studied)	Total no. of samples contaminated with different pesticides	Acute Toxicity	MRL In ppm WHO/FAO	% of samples contaminated with pesticides	No. of samples exceeded MRL In ppm
Endosulfan		21	High	.5	42%	Nil
Aldrin		12	High	.1	24%	11
Dieldrin	Tomato	ND	High	.1	ND	Nil
HCH(Lindane)	(50)	25	Moderate	.01	50%	17
DDT		5	Moderate	Not given	1%	-

TABLE 3: Prevailing scenario of different banned pesticides in farmgate vegetables of Sri Ganganagar during Year 2010 to 2011

Name of pesticide detected (No. of sample contaminated)	Vegetables (No. of samples studied)	Total no. of samples contaminated with different pesticides	Acute Toxicity	MRL In ppm	% of samples contaminated with pesticides	No. of samples exceeded MRL In ppm
Endosulfan		21	High	.5	42%	Nil
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DDT		5	Moderate	Not given	1%	-

RECOMMENDATION

Since, Sriganganagar is considered as 'the food basket of Rajasthan', the presence of banned pesticides in vegetables here is a matter of great concern. It is recommended that to forestall an environmental disaster, environmental contamination needs to be regularly monitored.

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