



MONITORING OF PESTICIDE RESIDUES IN FARMGATE VEGETABLES OF SRI GANGANAGAR

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ABSTRACT

Organochlorine pesticides have been considered as endocrine-disrupting chemicals and carcinogenic substances. Contamination of vegetables with pesticide residues has been reported worldwide. The present study was therefore conducted to evaluate the pesticide contamination in chili from Sri Ganganagar City, Rajasthan, India using Gas Chromatograph and Multiple residue method. 60% of the samples were found to be contaminated with various organochlorine pesticide residues. The amount of pesticide detected in Chili was higher than the permissible limits prescribed by European Commission (E.C).

KEYWORDS: Organochlorine pesticides, multiple residue method, gas Chromatograph.

INTRODUCTION

India is the second largest producer of vegetables after China. Organochlorine pesticides (OCPs) such as DDT, HCH, and endosulfan are of much concern in the environment because of their persistence, long range transport nature, toxicity as well as tendency to accumulate in biota (Iwata *et al.*, 1994; Cox *et al.*, 2007; Lee *et al.*, 2007). Organochlorine pesticides have been considered as endocrine-disrupting chemicals and carcinogenic substances. Contamination of vegetables with pesticide residues has been reported worldwide (Tao *et al.*, 2005; Randhawa *et al.*, 2007; Kumari *et al.*, 2008; Owago *et al.*, 2009; Kumar *et al.*, 2010). Vegetables are important components of Indian diet both in terms of quantities consumed and nutritional value as majority of Indians are vegetarian, with a per capita consumption of 135 g per day. Therefore, even low levels of pesticides in vegetables shows high levels of adverse effects in the consumers. This information on residue levels of OCPs in vegetables is very important for the protection of human health, because the main non-occupational route of exposure to organochlorine is through dietary intake (Brock *et al.*, 1998). Considering the above points, a monitoring survey has conducted for the assessment of organochlorine pesticide contamination in Chili from the Sri Ganganagar city.

MATERIALS & METHODS

Sampling: Sampling was conducted for the period of one year from 2010 to 2011. Chili 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, pickle etc. 50 samples of chili 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 pesticides residues in Chili 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 95% of the analyzed samples were contaminated with different pesticide residues. All of the total contaminated samples were exceeded the maximum residual limit (MRL) values as per the European Commission (E.C). It is reported that out of forty samples of chili, twenty seven were found contaminated with Endosulfan and among them, twenty four was exceeded from MRL value. Nine were found contaminated with Aldrin and all nine was exceeded from MRL value. Eleven were found contaminated with Dieldrin and all eleven were exceeded from MRL value. Thirty two were found contaminated with HCH and all thirty two samples were exceeded from MRL value. None were found contaminated with DDT. The results of the study are in consonance with the earlier studies on farmgate vegetable

samples. It has also reported that majority of fruits and vegetables in India were found contaminated with pesticide residues, although the levels were generally below the prescribed MRL's. Periodic monitoring of farmgate vegetables must be carried out to know the prevailing scenario of 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.

CONCLUSIONS

The contamination level of pesticide residues could be considered as a possible public health problem. The results also emphasize the need for regular monitoring of a greater number of samples for pesticide residues. It is a global concern, as most of the vegetable produced is

supplied to different states within a particular country and to different countries all over the globe; This work revealed contamination of vegetables of Sriganagar with various organochlorine pesticides. These pesticides have originated from the sustained and intensive agricultural activities going on in these areas since last many years. Since, Sriganagar is considered as 'the food basket of Rajasthan', hence monitoring of pesticides at local level is very important.

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TABLE 1: Seasonal distribution of organochlorine pesticide (HCH, DDT, Endosulfan and its Isomers and Aldrin, Dieldrin) IN CHILI (In ppm).

Seasons	Beginning Season (January)	Middle Season (June - July)	End Season (December)
HCH	0.081 ±0.028	0.058 ±0.020	0.069 ±0.024
HCH	ND	ND	ND
-HCH	0.043±0.015	0.096±0.033	0.066 ±0.023
pp DDD	ND	ND	ND
op DDE	ND	ND	ND
op DDD	ND	ND	ND
pp DDT	ND	ND	ND
Endo	0.078 ±0.027	0.135±0.048	0.102 ±0.036
Endo	0.60 ±0.021	0.091±0.032	0.079 ±0.028
Aldrin	ND	ND	0.424±0.149
Dieldrin	0.029±0.010	0.148 ±0.052	0.132±0.046

TABLE 2: Total organochlorine pesticide (HCH, DDT, Endosulfan, Aldrin, Dieldrin) IN CHILI (In ppm).

Seasons	Endosulfan	Aldrin	Dieldrin	HCH	DDT	Total OCP
Beginning Season (January)	0.138	ND	0.029 ±0.010	0.124	ND	0.291
Middle Season (June - July)	0.226	ND	0.148 ±0.052	0.154	ND	0.528
End Season (December)	0.181	0.424 ±0.149	0.132 ±0.046	0.135	ND	0.872

TABLE 3: Prevailing scenario of different 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 with MRL In ppm
Endosulfan	CHILI (40)	27	High	0.05	67.5%	24
Aldrin		9	High	0.01	22.5%	9
Dieldrin		11	High	0.01	27.5%	11
HCH(Lindane)		32	Moderate	0.01	80%	32
DDT		ND	Moderate	0.05	ND	NIL

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