Determination of Organochlorine and Organophosphorus Pesticides in Rice and Wheat

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Abstract **- Pesticides are widely used in agriculture mainly to increase crop yields to cater huge supply of food products for increasing world population as well as to protect crops from pests and control insect-borne diseases. Increased use of pesticides results in contamination of the environment and the excess accumulation of pesticide residues in food products, which has always been a matter of serious concern. Pesticide residues in food and crops are directly related to the irrational application of pesticides to the growing crops. Accumulated pesticide residues in food products have been associated with a broad variety of human health hazards, ranging from short-term effects to longterm toxic effects. The preventive measures for pesticide residues in the developing countries are limited due to a shortage of funds and lack of defined government regulations. The impact of pesticide residues can be minimised by taking certain measures such as the rational use of pesticides, promoting organic farming, exploit natural and bio- pesticides and proper implementation and amendment of pesticide- related laws. The present article has been planned to review various aspects of pesticide residues including their accumulation in food products, impact on human health, and the preventive measures to counter their toxic effects.**

Index Terms **- Pesticides, Contamination, Toxicity.**

INTRODUCTION

The term pesticide covers a broad variety of compounds including insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and others[1]. Depending on the chemical structure pesticides can be classified as organochlorines (endosulfan, hexachlorobenzene), organophosphates (diazinon, omethoate, glyphosate), carbamic and thiocarbamic derivatives, carboxylic acids and their derivatives, urea derivatives, heterocyclic compounds (benzimidazole and triazole derivatives), phenol and nitro phenol derivatives, hydrocarbons, ketones, aldehydes and their derivatives, fluorine containing compounds, copper-containing compounds, metal organic and inorganic compounds, and natural and synthetic pyrethroids[2]. Ever since the origin of civilization, it has been the major task of man to engage in a continuous endeavor to improve his living conditions. One of the main tasks in which human beings have been engaged is securing relief from hunger. Secondly,

The control of insects, weeds, fungi and other pests of economic or public health is of utmost importance to our government[3]. Pesticides have consistently revealed their worth through increased agriculture productivity, reduced insect-borne, endemic diseases and protection as well as restoration of plantations, forests, harvested wood products, homes and fiber[4]. Currently, pesticides are very valuable in developing nations, particularly those in tropical are as looking for an entry in the global economy by providing off-season fresh vegetables and fruits to nations in more temperate weathers. However, these goals cannot be achieved without the increased use of pesticides, mainly insecticides, herbicides and fungicides[5]. Ideal pesticides must act selectively against certain pest organisms without adverse effects to non-target organisms. However, it is difficult to achieve absolute selectivity and most pesticides are also toxic to humans and other non-target organisms. Pesticide use raises a number of environmental worries, including human and animal health hazards. Food products contaminated with toxic pesticides are associated with severe effects on the human health. More than 95% of sprayed insecticides and herbicides reach a destination other than their target species, including non-target species, air, water and soil[6]. Pesticide contamination of both surface and ground waters can affect aquatic animals and plants, as well as human health when water is used for public consumption[7]. The increased use of chemical pesticides has resulted in

contamination of the environment and also caused many associated long-termeffects on human health. Pesticides[8,9]have been associated with a wide spectrum of human health hazards, ranging from short-term impacts such as headaches and nausea to chronic impacts like cancer.The present studies are aimed at measuring the level of organophosphorous pesticides in Rice and Wheat[10] gives a clear concentration of organophosphates pesticides residues level in different location of Ghaziabad.

METHODS

First Method:

Sample Prepration and Extraction of Rice

50gm sample with 250ml of 2:1 mixture of acetone and water was blended for 2 min and filtered with buchner fitted with sharkskin whatmann filter paper no.1. Sample extract was placed in 1L separator and treated with 1:1 mixture of methylene chloride and petroleum ether. The organic layer was separated, dried over sodium sulphate and concentrated in a rotary vacuum evaporator. The concentrate was diluted with acetone and reconcentrated.

The process was repeated twice. The aqueous layer was treated with NaCl and sample was extracted with methylene chloride, dried over sodium sulphate and concentrated. All the concentrates were mixed and subjected to florosil cleanup. Method using 1:16 mixture of diethyl ether and pet ether as eluate. The sample was concentrated and analysed by GC-ECD method in which 1-2®ml aliquot of prepared sample was injected along with the external standard of the analyte of interest.The chromatogram of sample and standard were compared on basis of peak and retention time. Quantity was determined by comparising areas of sample with that of external standards.

Second Method: QuEChERS (quick, easy, cheap, effective, rugged and safe) sample preparation was used for the determination of 16 Organophosphate Pesticide Residues (OPP's) in food grain samples, wheat and rice collected from local market of Ghaziabad city, India. The pesticide residues analysis method was based on QuEChERS in which the best approach to extract with ethyl acetate followed by clean-up of extracts using anhy.MgSO4 and Primary Secondary Amine (PSA). The analyses were carried out with gas-chromatography (GC–NPD,/MS).

RESULT AND DISCUSSION

Table 1 Pesticide residue of wheat & rice

Sr.no.	Pesticides	Commodity	Result	Residue unit(mg/kg)	Detection limit
1	Chlorpyriphos methyl	Wheat Rice	0.521 0.428	Mg/kg	0.01
2	Methyl parathion	Wheat Rice	0.021-0.33 ND	Mg/kg	0.01
3	Chloropyriphos	Wheat Rice	BDL-0.022 0.028-0.032	Mg/kg	0.01
4	Chlorofenvi	Wheat Rice	BDL 0.216	Mg/kg	0.01
5	Profenophes	Wheat Rice	ND BDL-0.010	Mg/kg	0.01
6	Ethion	Wheat Rice	ND BDL-0.024	Mg/kg	0.01
7	Delta BHC	Wheat Rice	---- 2.8 (0.10)	Mg/kg	0.01
8	Beta BHC	Wheat Rice	---- 4.5(0.20)	Mg/kg	0.01
9	Dieldrin	Wheat Rice	ND ND	Mg/kg	0.01
10	Metathion	Wheat Rice	BDL 0.01	Mg/kg	0.01

ND = Not detected , BDL = Below detection level

The results of analysis of the rice and wheat samples have shown the presence of organochlorine and organophosphorous pesticides. The compounds detected were chloropyriphos methyl, parathion, chloropyriphos, chlorofenviphos, proferiphos, ethion, Beta and Delta-BHC, dieldrin, melathion. Results of the sample analysed are summarized in table 1, Among the various pesticides analysed only organo chlorine pesticides were found in high concentration in comparison to organophosphorous pesticides. The predominance of BHC in rice and wheat samples analysed indicate the liberal application of these pesticides by the local farmers[11]owing to its low cost. Lu(12)studied that considering the dietry daily intake of a comman man which includes fruit, vegetables, cereals, milk and water, the concentration of the pesticides intake from these food stuffs alone could be much higher than the acceptable daily intake.

ACKNOWLEDGMENT

The author is grateful to Principal, M.M. College, Modinagar, Ghaziabad for providing laboratory facilities and guidance.

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