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PESTICIDE RESIDUES IN FRUITS AND VEGETABLES

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Residues of chlorinated insecticides were estimated in twenty five samples of fruits and vegetables. DDEpp' and dieldrin were found to be present in most of the samples. DDTpp' was only present in the samples of lettuce and tea. Amounts of residues of these insecticides were less than the permissible limits.

Key words: Pesticide, Fruits; Vegetables.

INTRODUCTION

Pesticides are widely used in agriculture in Pakistan. These are being indiscriminately applied by the farmers without any awareness of the residues and their effect on the human health. Extremely toxic and fast acting organophosphate and carbamate insecticides undergo quick decomposition in the field. Chlorinated insecticides, on the other hand, act slowly, are stable for months and leave much residue on food. Monitoring of such residues in fruits and vegetables is thus needed regularly.

A collaborative project among India, Nepal, Pakistan and Sri Lanka, was sponsored by the F.A.O. to ascertain quantity of insecticidal residues in food stuffs. Findings of these studies are reported in this paper.

MATERIALS AND METHODS

Samples of fruits and vegetables which are generally consumed by the people, were purchased from the local market.

Acetonitrile, petroleum ether (40-60^{O}) and diethyl ether were of analytical grade. Anhydrous Na_2SO_4 and Florisil were of high grade purity. Florisil was kept in oven at 130^{O} overnight before use.

Pesticide Analytical Manual of Food and Drug Administration, USA, was followed in the analysis of pesticides.

100 g of fruits or vegetables were blended for two minutes in 200 ml of acetonitrile and 10 grams of celite. The acetonitrile extract was filtered by suction. Pesticide, if any, in the filtrate, was transferred to petroleum ether and concentrated on Kuderna Danish concentrator. The concentrate was purified on Florisil column by elution with 200 ml of (a) 6 % (12 ml ethyl ether + 188 ml petroleum ether (b) 15 % (30 ml ethyl ether + 170 ml petroleum ether) and (c) 50% (100 ml of ethyl ether + 100 ml petroleum ether). Each of the eluates was concentrated on Kuderna Danish concentrator to a known volume. This differential elution separates out insecticides of same retention time into different fractions.

5 μl of each concentrate was injected into Hitachi Gas Chromatograph (Model 1640E) equipped with electron capture detector. Conditions of chromatography were as under :–

(1) Nitrogen gas flow rate 60 ml/minute.
(2) Temperature of oven 220^{O}.
(3) Chromatographic, column (OV-17 (Liquid phase).
(4) Attenuation 32.
(5) Chart speed 5 mm/minute.

Besides a recorder, a Hitachi Chromato-Processor (Model 834-30) was also lined up with the Gas Chromatograph, so that retention time and integrated area of each peak was also obtained in a print-out form.

Before chromatographic separation of the samples, insecticide standards were run through the chromatograph and their retention times recorded. Ratio of retention time of the standards with aldrin was also recorded to provide a stable reference for identification of the unknown peaks. Ratio of retention time of the unknown peaks of samples with respect to aldrin were also measured. On comparison of this ratio of the unknown peaks with that of standards, a tentative qualitative identification was made. This was confirmed by running internal standards. Standard curves of identified pesticides were prepared and the amount of pesticides in the sample was calculated.

RESULTS AND DISCUSSION

DDEpp' was detected and estimated in 23 samples of fruits and vegetables, including a sample of tea (Table 1).

Table. Insecticide residue in vegetables and fruits.

Sr. No.	Local name	Botanical name	Parts per billion DDTpp'	DDEpp'	Dieldrin
1.	Egg plant	*Solamum melongena*		5.6	
2.	Tomato	*Lycoperricum esculentom*		3.6	
3.	Gourd	*Cucurbita maxima*			2.2
4.	Pumpkin	*Cucurbita pepo*		8.4	
5.	Cabbage	*Brassica oleracea*		12.0	
6.	Spinach	*Spinacia oleracea*		1.8	
7.	Fruit of radish	*Raphanus sativus*		5.6	
8.	Carrot	*Dacus carota*		3.2	
9.	Radish	*Raphanus sativus*			9.5
10.	Lady finger	*Hibiscus esculentus*		10.0	6.6
11.	Bitter gourd	*Momordica charantia*		12.0	11.4
12.	Lettuce	*Lactuca sativa*	9.6		6.6
13.	Green pepper (Shimla variety)	*Capsicum annuum*		18.0	12.0
14.	Giatori	*Brassica napus*		15.6	9.6
15.	Cucumber	*Cucumis sativus*		14.4	11.0
16.	Apple	*Malus pumila*		9.8	12.0
17.	Guava	*Pasidium quyava*		16.8	8.4
18.	Orange (Kinu)	*Citrus aurantium*		20.8	16.8
19.	Apricot	*Prunus armeniaca*		14.0	18.2
20.	Loquat	*Eriobotrya japonica*		22.4	15.6
21.	Melon	*Citrulus vulgaris*		14.4	16.8
22.	Plum	*Prunus domestica*		13.0	26.4
23.	Mango	*Mangifera indica*		10.0	
24.	Sugarcane	*Saccharum officinarum*		16.0	15.4
25.	Tea (Richbru)	*Camellia sinensis*	8.4	7.2	4.4

The amount ranged between 1.8 and 22.4 ppb. These quantities were far below the limit (0.5 ppm) prescribed by Food and Drug Administration, USA (1978). Dieldrin was found to be present in 17 samples. The amount of the residue (2.2 – 26.4 ppb) was also below the tolerance level (0.03-0.3 ppm). DDTpp' was only present in lettuce and tea. The amount of this insecticide in lettuce and tea was 9.6 and 8.4 ppb, respectively, which was also lower than the permissible limit of 2.0 ppm. These results indicate that the chlorinated insecticides, though detected in most of the fruits and vegetables analyzed during this study, constitute no health hazard as the quantities detected were less than the permissible limits.

REFERENCES

1. *Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed* (US Department of Health, Education and Welfare, Food and Drug Administration, 1978).
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