

NOTES

Chlorinated Pesticide Residues in Fruits and Vegetables

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412 samples of different fruits and vegetables were collected from some districts of western Uttar Pradesh and Delhi (India) and analysed for organochlorine pesticides residues by GLC using electron capture detector. Residues of BHC (benzene hexachloride) and DDT (dichloro diphenyl trichloro ethane) were detected in 391 samples of vegetables and fruits. A total of 373 sample were lying below the tolerance limit while 18 sample shown comparatively higher value for BHC & DDT. For six samples these values found exceedingly high in comparison to tolerance limit of 0.15 and 1.25 ppm. as recommended by WHO/FAO.

The importance of plant protection technology in agriculture is well established¹⁻⁴. Application of pesticide is must for boosting up of crop production but in discriminate use of pesticide has contaminated our environment, particularly the organochlorine pesticides pose a greater risk as they are non-degradable and have cumulative effect on human being⁵⁻⁷.

Dale *et al*⁸ in 1963 reported the highest DDT residue level in the body of Indian people, which clearly indicate the higher contamination level of food product by DDT. Extensive studies have been performed for the determination of organochlorine pesticide in variety of food products viz. dairy, fruit, vegetable and meat etc. in almost every part of country⁹⁻¹². But comparatively less attention has been paid towards the western Uttar Pradesh.

Keeping this in view authors have carried out a survey on the pesticide residue food commodities in order to estimate the DDT & BHC. In present communication we are reporting the chlorinated pesticide residue level in fruits and vegetables.

A total of 412 samples were collected from Ghaziabad and its adjoining area by adopting the standard method¹³ and processed for analysis. The methodology adopted for extraction and identification are as reported earlier^{14,15}.

(a) **Vegetable**—Perusal of the data presented in Table 1 indicate the incidence and range of BHC, DDT and dieldrin in vegetable samples. It

TABLE 1
INCIDENCE AND RANGE OF PESTICIDE RESIDUES IN VEGETABLES

Vegetables	Samples analysed	Samples with residues	Incidence of residues	Range of residues (mg/kg)		
				Total BHC	Total DDT	Aldrin
1. Beans	1	1	—	0.04	0.01	—
2. Beet	2	2	100%	0.18-0.30	0.49-0.53	—
3. Bitter Gourd	10	10	100%	0.03-1.21	0.08-1.00	—
4. Bottle Gourd	9	8	88.8%	0.05-0.25	0.004-0.02	—
5. Brinjal	20	20	100%	0.01-1.02	0.07-1.63	0.01-0.24
6. Cabbage	17	17	100%	0.02-0.77	0.003-2.65	0.01-0.23
7. Carrot	13	13	100%	0.01-0.78	0.005-0.59	0.05-0.63
8. Cauliflower	10	10	100%	0.02-0.77	0.003-2.65	0.01-0.23
9. Cucumber	9	9	100%	0.01-0.31	0.88-0.12	—
10. Kundrus	1	1	—	0.35	—	—
11. Lady's finger	14	14	100%	0.005-0.73	0.04-0.14	0.01-0.06
12. Metni	3	3	100%	0.19-0.30	—	—
13. Onion	20	17	85%	0.01-1.85	0.01-0.88	0.05-0.01
14. Pea	7	7	100%	0.12-0.23	0.03-0.12	—
15. Potato	19	19	100%	0.02-0.30	0.02-1.17	0.03-0.27
16. Pumpkin	12	12	100%	0.02-0.90	0.12	—
17. Radish	12	12	100%	0.01-0.80	0.02-0.41	—
18. Ridge Gourd	3	3	100%	0.02-0.34	0.01	0.05
19. Sarson	1	1	100%	0.60	—	—
20. Spinach	15	14	93.3%	0.04-0.64	0.01-0.60	0.02-0.39
21. Tinda	12	12	100%	0.12-0.89	0.03-1.02	0.01-0.03
22. Tomato	15	15	100%	0.02-0.89	0.002-0.65	0.01-0.46
23. Turnip	2	1	50%	0.34	—	—

TABLE 2
INCIDENCE AND RANGE OF PESTICIDE RESIDUES IN FRUITS

Fruits	Samples analysed	Samples with residues	Incidence of residues	Range of residues (mg/kg)		
				Total BHC	Total DDT	Aldrin
1. Fig	3	2	66.6%	0.02-0.09	—	—
2. Litchi	3	3	100%	0.35-0.72	0.80-1.20	—
3. Pears	12	12	100%	0.03-0.62	0.04-0.52	0.01-0.02
4. Peachers	2	2	100%	0.01-0.02	0.16	—
5. Grapes	9	9	100%	0.01-0.53	0.09-2.64	—
6. Papaya	9	18	88.8%	0.007-0.09	0.003-0.40	—
7. Sweet Lemon	11	10	90.9%	0.006-0.30	traces-0.04	traces
8. Lemon	6	6	100%	0.02-0.44	0.02-0.07	traces-0.10
9. Plum	17	17	100%	0.02-2.84	0.01-1.63	0.04-0.16
10. Melon	8	8	100%	0.02-0.26	0.01-0.56	traces-0.04
11. Watermelon	8	7	87.5%	0.03-0.36	0.004-0.93	—
12. Sapota	4	4	100%	0.011-0.013	1.10-2.52	traces-0.02
13. Orange	3	3	100%	0.01-0.01	—	traces-0.02
14. Guava	12	11	91.7%	0.01-0.36	0.04-3.13	—
15. Pineapple	4	4	100%	0.01-0.06	0.004-0.04	—
16. Apple	20	18	90%	0.003-3.24	0.012-1.80	0.01-0.04
17. Banana	28	24	85.7%	0.02-1.05	0.003-4.40	0.001-0.05
18. Mango	23	22	95.6%	0.02-1.89	0.0003-1.48	0.10

can be seen that out of 231 samples analysed, 222 samples contained pesticide residue. BHC was the main residue in vegetables but the residue levels were well within the prescribed tolerance limits of WHO/FAO. The residue of BHC was detected in 210 samples, for onion the maximum amount of BHC was 1.85 mg/kg. In case of tomato the mean concentration of BHC complex was in the range of 0.02–0.89 mg/kg. For lady's finger, the range is very low. However, the BHC residues obtained in vegetables were for below the PFA limit of 3 mg/kg of lindane. Regarding DDT, only in case of cauliflower the residue totalled 3.74 mg/kg thus exceeding the limit. In the remaining samples, DDT residues were within acceptable levels.

(b) **Fruits:** Out of the 181 samples of fruits analysed, only 12 were free of pesticide residue while the remaining 169 were found to contain residue of one or the other insecticides. BHC isomers were detected in 159 samples, while DDT metabolites were present in 89 samples. 22 samples of mango, 21 of banana and 15 of apple were found to contain residue of BHC. But it was always below the tolerance limit. The situation was also same with other varieties of fruits only for apple, the range value for lindane 3.24 mg/kg crossed the tolerance limit.

It was also evident from Table 2 that oranges and figs were free of insecticide. The maximum DDT residue were recorded in banana, *i.e.* 4.40 mg/kg followed by guava (313 mg/kg). For other fruits the residue value recorded for DDT was less than the PFA tolerance limit.

Hence from the above investigation, it can be concluded that the residue levels of BHC & DDT were within the acceptable limit for human consumption in almost all the vegetable and fruit samples.

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(Received: 1 January 1992; Accepted: 19 March 1992)

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