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# Persistent HCH and DDT residues in green fodders of Varanasi

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**Abstract**
The ill effects of green revolution include residues of extensively used chemical pesticides in various environmental components. The present study was designed to analyze the levels of organochlorine pesticide residues in green fodder samples collected from different localities of Varanasi. α-HCH concentration (mg/kg) in green fodder obtained from different blocks were 0.00193 (Baragaon), 0.00036 (Cholapur), 0.00067 (Arazilie) and 0.00187 (Harhua). Among HCH isomers γ-HCH was more persistent and α-HCH was less persistent. DDT and its isomers present in all blocks but far below from the MRL. highest concentration of 4,4'DDE and 2,4'DDD, were present in Harhua, Araziline block respectively whereas 2,4'DDT and 4,4'DDT were present in Baragaon. Among all blocks Baragaon showed highest concentration for DDT isomers.

**Keywords:** green revolution, pesticides, organochlorine, DDT, HCH

## Introduction
India with about 4% of the world's cropped area shares around 1.7% of global pesticide consumption of the total 54,135 MT technical grade pesticide consumption in India in agriculture during 1999–2000, 60% were insecticides, 21% fungicides, 14% herbicides and 5% others. The percentage of organochlorines during this period has decreased from 40 to 14.5% accompanied by a sharp increase in consumption of organophosphates from 30 to 74% (Agnihotri, 2000) [1]. The work reported from various parts of country has shown the presence of persistent and fat soluble organochlorine pesticides (OCPs) such as DDT and HCH isomers in dairy milk (John, Bakore, & Bhatnagar, 2001; Mukherjee & Gopal, 1993) [7, 10]. The most hazardous pesticides are still used in developing countries while many of these are now banned or heavily regulated in developed countries. For example, Thailand imports large quantities of World Health Organization (WHO) I and II (most hazardous) pesticides (Poapongsakorn *et al*., 1999) [15]. Hazardous pesticides are mostly prevalent in sub-Saharan Africa, where regulations are relatively weak (Paarlberg, 1993) [13]. India is now both the largest manufacturer and consumer of pesticides in southern Asia. Despite the proliferation of different types of pesticides, organochlorines such as HCH (α-HCH, β-HCH, γ-HCH, δ-HCH) and DDT still account for two-thirds of the total consumption in the country because of their low cost and versatility in action against various pests. Since these compounds are highly persistent and strongly lipophilic, they tend to accumulate in body fats including breast milk (Yakushiji, 1988) [18]. In spite of their toxicity and adverse human health effects, many developing nations continue to use these chemicals to combat the pests of agricultural and public health importance. A few studies indicated previously the contamination of Indian food and feeds by HCH and DDT (Noronha *et al*., 1980, Dikshith *et al*., 1989a,b, Battu *et al*., 1989, Kaphalia *et al*., 1990) [12, 4, 5, 2, 8]. These works were concerned mainly with HCH and DDT in limited cases of foodstuffs from a few locations.

## Material and Methods
Total 60 green fodder samples collected from four blocks of Varanasi. From each of the 4 blocks 5 villages were selected randomly for sample collection. From each of the selected 5 villages green fodder samples were collected one time in each season (winter, rainy and summer). Approximately, 250 g of fodder samples were collected in sterilized polyethylene packs, packed and transported to lab. Samples were subjected to analysis within 24 h from their arrival. Fodder samples were chopped, and 7.5 g of sample was taken into 50 ml centrifuge tubes and 30 ml of acetonitrile was added and shaken well. The sample was homogenized at 14000-15000 RPM for 2-3 min then 3 g of sodium chloride was added, mixed well by shaking gently then it was centrifuged at 2500-3000 RPM for 3 min to separate the

organic layer, approx. 16 ml of organic layer was taken into a test tube and 9 g of anhydrous sodium sulfate was added to remove moisture (Benbrook, C.M. 2002) [3]. Taken about 0.4 g PSA sorbent and 1.2 g anhydrous magnesium sulfate into 15 ml centrifuge tubes. The 8 ml of organic layer extract was transferred into this 15 ml centrifuge tube, capped and vortex for 30 s, then tubes were centrifuged at 2500-3000 RPM for 5 min then 2 ml of extract was transferred into test tubes and the solvent (Acetonitrile) was evaporated turbovap concentrator for GC analysis. Gas Chromatograph Mass Spectrophotometer was standardized by giving several injection of standard (working standards prepared) simultaneously. A volume of 1 ml sample was injected into the GC; peaks were identified by comparing their retention times with those of standards under the same injection conditions.

## Results and Discussions

Total 60 fodder samples collected from different blocks of Varanasi district in different seasons and were analyzed for HCH isomers and DDT isomers. Calculations of these residues in each sample were calculated in (mg/kg). In the present study, the average recoveries of OCPs in fodder were from 87.05% at 0.05 and 86.17% at 0.1 ppm. α-HCH concentration (mg/kg) in green fodder obtained from different blocks were 0.00193 (Baragaon), 0.00036 (Cholapur), 0.00067 (Arazilie) and 0.00187 (Harhua) and presented in table 2. The mean level of α-HCH concentration was found to be 0.00121 mg/kg whereas β-HCH concentration was found to be 0.00084 mg/kg throughout the year. The maximum β-HCH concentration was found to be in Arazilie block. The mean of γ-HCH concentration throughout the year in green fodder has been 0.00227 mg/kg observed. In our observation, the maximum (0.00391 mg/kg) γ-HCH concentration was found in Baragaon while the minimum (0.00104 mg/kg) γ-HCH level was found in Harhua. The data obtained for difference in γ-HCH concentration in three seasons was found to be non significant (P=0.131; P≥0.005) whereas difference from block was observed significant (P=0.005; P≤0.005). The mean level of δ-HCH concentration was found to be 0.00103 mg/kg. The result of green fodder from the present study with concentration of 0.0054 mg/kg is in conformity with the result obtained by the Panseri (2013) [14] with concentration of 0.002 ppm. Reddy and Reddy (2015) [16] found that fodder was contaminated by HCH. The result from present study was found to lower than the result obtained by Marco and Kishimba (2005) [9]. The reason for the deviation in the mean concentration of HCH could be because of the difference in the geographical and climatic conditions where the studies have been carried out.

DDT and its isomers present in all blocks but far below from the MRL. Results presented in table 2 showed that mean concentration (mg/kg) 0.08337, 0.09561, 0.15964, 0.10894 for 4,4'DDE, 2,4'DDD, 2,4'DDT and 4,4'DDT respectively. Among all DDT isomers 2, 4' DDT was present in highest concentration with mean residue level of 0.15964 mg/kg. From the table 3B highest concentration of 4, 4' DDE and 2, 4' DDD, were present in Harhua, Araziline block respectively whereas 2, 4'DDT and 4, 4'DDT were present in Baragaon. Among all blocks Baragaon showed highest concentration for DDT isomers. Result presented in table 1 showed that total DDT concentration in fodder samples with mean residue level of 0.44756 mg/kg that is below the MRL recommend by FSSAI. The prevalence of residues of p,p' DDE, p,p' DDT and total DDT in fodder was 5%, 60% and 3% respectively, was reported by Nagra (2006) [11]. Panseri S. *et al*., (2013) [14] reported the residue level of o,p' DDT was 0.006 ppm which was lower than the present findings. The mean concentration of total DDT was in conformity with findings of Nagra (2006) [11] that reported the total DDT of 0.17 ppm in fodder. Marco J. A. *et al*., (2005) [9] conducted a study on pesticide residues in grasses in Tanzania and observed that concentration of total DDT in *p. purpureum* ranged from 68 ng/g in leaves to 405 ng/g in stem which was almost similar to the present observations. The concentrations of DDTs and their metabolites were higher in stems than in leaves, because the stems are more exposed to the soil-bound pesticide residues than the leaves; the residues enter via root uptake followed by translocation to the stem. The findings indicate contamination by technical DDT and perhaps DDD as a pesticide of its own (Tomlin, 2000) [17] and are consistent with the previous findings in soil at the point source (Elfvendahl *et al*., 2004) [6].

**Table 1:** HCH and DDT Isomers Residues in Green Fodder during Different Seasons of the Year (mg/Kg).

| | α-HCH | β-HCH | γ-HCH | δ-HCH | 4,4DDE | 2,4 DDD | 2,4 DDT | 4,4 DDT |
|---|---|---|---|---|---|---|---|---|
| Winter | 0.00156 | 0.00103 | 0.00299 | 0.00142 | 0.10947 | 0.12187 | 0.21398 | 0.15091 |
| Rainy | 0.00072 | 0.00060 | 0.00151 | 0.00071 | 0.05470 | 0.05940 | 0.09962 | 0.06150 |
| Summer | 0.00134 | 0.00088 | 0.00231 | 0.00095 | 0.08594 | 0.10556 | 0.16533 | 0.11440 |
| Mean | 0.00121 | 0.00084 | 0.00227 | 0.00103 | 0.08337 | 0.09561 | 0.15964 | 0.10894 |
| P value | 0.431 | 0.699 | 0.131 | 0.308 | 0.383 | 0.322 | 0.167 | 0.198 |

**Table 2:** HCH and DDT Isomers Residues in Different Blocks in Green Fodder (mg/kg).

| | α-HCH | β-HCH | γ-HCH | δ-HCH | 4,4DDE | 2,4 DDD | 2,4 DDT | 4,4 DDT |
|---|---|---|---|---|---|---|---|---|
| Baragaon | 0.00193 | 0.00073 | 0.00391$^{b}$ | 0.00116 | 0.04585 | 0.08631 | 0.22681$^{b}$ | 0.13724 |
| Cholapur | 0.00036 | 0.00071 | 0.00187$^{a}$ | 0.00131 | 0.08592 | 0.06501 | 0.06364$^{a}$ | 0.07105 |
| Araziline | 0.00067 | 0.00096 | 0.00225$^{a}$ | 0.00059 | 0.08032 | 0.15825 | 0.12837$^{ab}$ | 0.09777 |
| Hahua | 0.00187 | 0.00094 | 0.00104$^{a}$ | 0.00106 | 0.12138 | 0.07287 | 0.21975$^{b}$ | 0.12969 |
| Mean | 0.00121 | 0.00084 | 0.00227 | 0.00103 | 0.08337 | 0.09561 | 0.15964 | 0.10894 |
| P value | 0.080 | 0.960 | 0.005 | 0.579 | 0.435 | 0.215 | 0.053 | 0.650 |

## Conclusion

It could be concluded that HCH and DDT were present in all blocks of Varanasi district and contaminate the green fodder. Among HCH isomers γ-HCH was more persistent and α-HCH was less persistent. Nevertheless, the organochlorine residues monitoring studies in fodder as well as in cattle feed and storage condition should be investigated further in order to improve food safety since these compounds represent a potential risk to human health.

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**References**

1. Agnihotri NP. Pesticide consumption in agriculture in India -An update. Pesticide Research Journal. 2000; 12(1):150-155.
2. Battu RS, Singh PP, Joia BS, Kalra RL. Contamination of stored food and feed commodities from indoor use of HCH and DDT in malaria control programmes. Sci. Total Environ. 1989; 78:173-178.
3. Benbrook CM. Organ chlorine Residues pose surprisingly high dietary risks. J Epidemiol. Community Health. 2002; 56(11):822-823.
4. Dikshith TSS, Kumar SN, Raizada RB, Srivastava MK. Organochlorine insecticide residues in cattle feed. Bull. Environ. Contam. Toxicol. 1989b; 43:691-696.
5. Dikshith TSS, Kumar SN, Tandon GS, Raizada RB, Ray PK. Pesticide residues in edible oils and oilseeds. Bull. Environ. Contam. Toxicol. 1989a; 42:50-56.
6. Elfvendahl S, Mihale M, Kishimba MA, Kylin H. Pesticide pollution remains severe after cleanup of stockpile of obsolete pesticides at Vikuge, Tanzania. Ambio. 2004; 33(8):504-509.
7. John PJ, Bakore N, Bhatnagar P. Assessment of organochlorine pesticide residue levels in dairy milk and buffalo milk from Jaipur City, Rajasthan, India. Environment International. 2001; 26:231-236.
8. Kaphalia BS, Takroo R, Mehrotra S, Nigam U, Seth TD. Organochlorine pesticide residues in different Indian cereals, pulses, spices, vegetables, fruits, milk, butter, deshi ghee, and edible oils. J Assoc. Off. Anal. Chem. 1990; 73:509-512.
9. Marco JAM, Kishimba MA. Concentrations of pesticide residues in grasses and sedges due to point source contamination and the indications for public health risks, Vikuge, Tanzania. Chemosphere. 2005; 61:1293-1298.
10. Mukherjee I, Gopal M. Organochlorine pesticide residues in dairy milk in and around Delhi. Journal of AOAC International. 1993l; 76(2):283-286.
11. Nagra RK. Studies on insecticide residues in feed and fodder in Punjab. M.V. Sc. Thesis, GADVAS University, Ludhiana, India, 2006.
12. Noronha ABC, Khandekar SS, Banerji SA. Survey of organochlorine pesticide residues in cereals obtained from Bombay markets and its hinterland. Indian J Ecol. 1980; 7:165-170.
13. Paarlberg RL. Managing pesticide use in developing countries. In: Haas, PM., Keohane, RO., Levy, MA. (Eds.), Institutions for the Earth: Promoting International Environmental Protection. Global Environmental Accords Series. MIT Press, Cambridge, London. 1993, 309-350.
14. Panseri S, Biondi P, Vigo D, Communod R, Chiesa L. Occurrence of organochlorine pesticides residues in animal feed and fatty bovine tissue. In Tech. 2013, 261-283.
15. Poapongsakorn N, Lakchai M, Waibel H, Jungbluth F. Approaches to Pesticide Policy Reform-Building Consensus for Future Action. A Publication of the Pesticide Policy Project, Hannover, Publication Series. 1999, 7.
16. Reddy MVR, Reddy YR. Pesticide Residues in Animal Feed and Effects on Animals and its Products with Special Reference to Endosulfan, Int. J Res. Ayurveda Pharm. 2015; 6(3):371-374.
17. Tomlin C. (Ed.), The Pesticide Manual, 12th ed. Crop protection publications, London, 2000.
18. Yakushiji T. Contamination, clearance, and transfer of PCB from human milk. Rev. Environ. Contam. Toxicol. 1988; 101:139-164.