ASSESSMENT OF DDT LEVELS IN THE ENVIRONMENTAL SAMPLES OF ELOOR INDUSTRIAL AREA*

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The need for pesticides in Indian Agriculture and Public health has been well recognized in protecting the crops from pests and human health from vector borne diseases. But their injudicious and indiscriminate use leads to contamination of environment and subsequent entry to ecosystem. Pesticide Industries also contribute substantially to environmental pollution. Dichloro diphenyl trichloroethane (DDT) is generally classified under persistent organic pollutant (POP). Its chemical, physical and biological stability makes it available for storage and recycling in the various segments of environment like air, water, soil, plants and animals. DDT and its principal metabolites DDD (1,1- dichloro -2,2- bis [p-chlorophenyl] ethane) and DDE (1,1-dichloro- 2,2-bis [chlorophenyl] ethylene) are widespread pollutants (Durham *et al.*, 1963) and contamination of straw and green fodder with DDT sprayed for mosquito control was reported by Battu *et al.* (1989). Hence the present study was undertaken to assess the environmental pollution with DDT from Industrial effluents.

Materials and Methods

The study was conducted in Eloor Industrial belt of Ernakulam district in Kerala. A total of seven major industrial units are located within the limited area of five sq. km contributing to its highly polluted environment. Compared to other pesticide residues, DDT is highly bioaccumulative in nature and moderately toxic to living beings.

The study was undertaken to detect and quantify the DDT residues present in environmental samples. The environmental samples like fodder, sludge and water were collected as per the sampling techniques suggested by Lorgue *et al.* (1996).

Fodder samples were collected from open grazing lands and local vegetation which were used as fodder to animals. These materials were collected, dried and stored in containers. Surface sludge was collected from various locations within the study area. Water samples were collected from wells, paddy fields, canals, ponds and marshy areas of Eloor. Collected samples were stored in glass bottles and kept under deep freezing conditions (-20ºC).

Extraction of residues from fodder, sludge and water were made as per the methods specified by FDA (1997) and Sherma (1979).

Quantification of DDT residues in the collected environmental samples was done using Gas Liquid Chromatography (GLC). GLC analysis was performed using Hewlett-Packard Agilent 6890 Series GC with Electron Capture Device (ECD) having ^{63}Ni as radioactive source.

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Fodder, sludge and water collected from Mannuthy were also analysed for comparison.

Results and Discussion

The mean total DDT level in fodder collected from Eloor Industrial area was 1.567 ± 0.947 ppm (Table 1) and that of University Livestock Farm, Mannuthy was 0.062 ± 0.021 ppm (Table 2). DDT contamination of fodder plants from Nainital area with levels varying from 0.16 mg/kg to 0.63 mg/kg was noted by Kaphalia and Seth (1982). Pesticide residues may be found in fodder plants due to accidental or incidental contamination or spillage or volatilization of residues from contaminated soil, through wind blown dust or direct absorption via roots and leaves (Kalphalia and Seth, 1982). The high concentration of DDT in fodder samples of study area may be due to contamination of pastures by effluents from the pesticide manufacturing factories.

Sludge samples from Eloor Industrial area shown a mean total DDT level of 48.295 ± 31.85 ppm (Table 1) whereas the sample from Mannuthy showed a level of 0.011± 0.006 ppm (Table 2). The values of DDT in the study area were very high when compared to Mannuthy. Dogheim *et al.* (1996) reported high levels of P, P' DDT in soil compared to other DDT isomers from Kafr El-Zayat Governate which has one of the biggest pesticide factories in Egypt. A similar hike in DDT level was seen in sludge samples from Eloor.

The total mean DDT level in water from Eloor Industrial area 0.000245 ± 0.00084 (Table 1). This value is higher when compared to the value of DDT in water from Mannuthy area (Table 2). But the level of DDT in water samples is very low when compared to other environmental samples. Organochlorine compounds are very soluble in fatty tissues but has low solubility in water. This lipophilic and hydrophobic character was largely responsible for their accumulation and persistence in aquatic biota than in water (Livingston, 1977). This may be the reason for low level of DDT in water samples. But the DDT residues detected in water samples from Eloor exceeded the WHO permissible limit of 5 ppb for drinking water (WHO, 1979).

Table 1. Total DDT level in ppm in fodder, sludge and water from Eloor Industrial Area

Sample	1	2	3	4	5	6	Mean
Fodder	0.235	0.360	0.779	2.328	0.140	5.560	1.567 ± 0.947
Sludge	9.366	0.097	0.026	0.223	89.460	190.600	48.295 ± 31.85
Water	0.00039	0.00065	0.00007	0.00009	0.00010	0.00017	0.000245 ± 0.00084

Table 2. Total DDT levels in ppm in fodder, sludge and water from ULF, Mannuthy, Thrissur

Sample	1	2	3	4	5	6	Mean
Fodder	0.129	0.095	0.060	0.086	0	0	0.062 ± 0.021
Sludge	0	0	0.008	0.026	0.032	0	0.011 ± 0.006
Water	0.00002	0.00008	0.00041	0	0	0	0.000082 ± 0.0007

Summary

This study was conducted to assess the environmental contamination of DDT in the Eloor Industrial area. Samples like fodder, sludge and water were collected from the area and analysed for its DDT content using Gas Liquid Chromatography and these values were compared with the DDT content in the samples collected from Mannuthy area. On analysis it was found that the DDT level in fodder, sludge and water collected form Eloor Industrial area were 1.567 0.947 ppm,

48.295 ± 31.85 ppm and 0.000245 ± 0.00084 ppm respectively. The corresponding values from Mannuthy area were 0.062 ± 0.021. 0.011 ± 0.006 and 0.000082 ± 0.0007 ppm. These observations indicate a significant environmental contamination with DDT in Eloor Industrial Area.

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