

Name of the Scholar: SUMBULRAIS
Name of the Supervisor: PROF. MASOOD ALAM
Department: APPLIED SCIENCES & HUMANITIES
Title of the Thesis: The Studies of Persistent Organic Pesticides/other pollutants in different milk and water samples of Delhi using HPLC/AAS and Other Techniques.

Abstract

In recent years the newer environmental issues regarding hazardous waste, global climate change, stratospheric ozone depletion, groundwater contamination, disaster mitigation and removal of pollutant have become the focus of environmental attention.

The pesticide contamination is becoming a great problem in water bodies especially in the underground water. It is reported by several agencies that the underground water of those areas, which are developed in agriculture, contains pesticides. Pesticides of different chemical nature are widely used for agricultural and nonagricultural (such as public health) purposes worldwide. Because of their widespread use, pesticide residues are currently present in various environmental matrices. Lately, considerable scientific interest and public concern has arisen worldwide due to the occurrence of pesticides of different chemical origin in water sources with multiple possible effects on humans and the environment in general.

This thesis contains eight chapters, **first** chapter describes briefly about pesticides, their classification, their discovery along with the some common pesticides and their properties like DDT, HCH, Endosulfan, Malathion, Chlorpyrifos, Aldrin, Simazine, Atrazine etc. Pesticide usage in India along with the statistical data is well described.

Second chapter deals with the previous studies done on pesticide contamination in water and milk along with some studies on Groundwater Pollution studies in India.

In third chapter, sampling locations of Delhi for both water and milk samples are described with the hydrogeology of Delhi. Various physico-chemical parameters for drinking purpose have been explained briefly. Analytical methods for Pesticide Analysis are explained with detailed extraction, clean up and instrumentation details like column used, detector and temperature program for GC and HPLC conditions.

The chapter fourth deals with the “**Detection of Atrazine and Simazine in ground water of Delhi using High Performance Liquid Chromatography with Ultraviolet Detector**”. The procedure involves liquid-liquid extraction with dichloromethane and the extract was evaporated to dryness and redissolved in 5 ml of Methanol. Isocratic and gradient analysis was carried out by means of High Performance Liquid Chromatography. A Perkin Elmer Spheri-10 RP-18-column with UV-detector at 235 nm and 60:40% (v/v) acetonitrile/water as mobile phase (isocratic) was used to determine the content of simazine and atrazine. The compounds are separated with good resolution and sharp peak by gradient HPLC using a simple mobile phase. In the present study, highest concentration of atrazine was recorded in the north region of Delhi. Sample from the central Delhi did not reveal contamination from any of the herbicides being monitored. The total mean concentrations of atrazine and simazine ranged from 0.00072 to 0.0173 mg/l and 0.00091 to 0.04097 mg/l respectively.

Chapter five deals with the “**Gas Chromatographic Determination of Organochlorine & Organophosphate Pesticide Residues in Groundwater of Delhi, India**”. The present study was undertaken to evaluate the magnitude of contamination of pesticide residues including organochlorines and organophosphates in groundwater samples collected from Delhi, India. A

total of twenty water samples were randomly collected under normal conditions and analyzed for various pesticide residues such as HCH, DDT, aldrin, methyl parathion, endosulfan by using GC. Total DDT was detected in 70% samples, endosulfan α + β + sulfate and HCH in 55%, aldrin in 35%. The analyzed results showed the water pollution with pesticides is moderate in Delhi, and a few pesticide residues are present considerably high at few sites. The residual levels of pesticides found varying from place to place and from pesticide to pesticide.

In chapter sixth **“Estimation of Organochlorine pesticide residues in milk samples of Delhi, India” was carried out.** The fact that pesticides exist at trace levels in aquatic samples, set the demand for developing fast and simple analytical methods, capable of detecting within a short time as many pesticides as possible. Thus, reliable and very sensitive analytical methods for monitoring pesticides and their conversion products in aquatic systems are required. Because of the aforementioned reasons, gas chromatography (GC) is the key detection technique, as it possesses a very high resolving power (detection is attained at the ng/L levels) in combination with a range of sensitive and highly selective detectors such as the electron-capture (ECD) was employed for this study. Liquid Liquid Extraction with n-hexane-acetone (1:1, v/v) is used with sulphuric acid cleanup. The frequency distribution of organochlorine pesticide residues detected in the analyzed milk samples proved that all milk samples collected from the buffalos of different regions of Delhi State are contaminated with the presence of one or more of the investigated pesticides.

The heavy and toxic metal contaminants in aqueous waste streams can cause serious water pollution problems being faced the world over. The heavy metal such as chromium, copper, cadmium, nickel, zinc, and lead are among the most common pollutants found in industrial effluents. Delhi is one of the most important industrial complexes in the state of India. Keeping the above in view, the study area has rightly been selected. The problem of heavy metal pollution in water and aquatic organisms needs continuous monitoring and surveillance as these elements do not degrade and tend to biomagnify in man through food chain. This is the main reason for carrying out study on milk samples of Delhi in chapter seven. **Evaluation of “essential” and “toxic” heavy metals in milk samples of Delhi, India.** The results obtained show pollution caused due to heavy metal is ever more frequently found in milk samples, not only in regions with great industrial activity. The study reported the presence of some heavy metals in buffalo milk at nearly all the sites of study pollutes raising serious concern. As a result the locals are facing considerable risk of heavy metals poisoning.

Chapter eight deals with the “Hydro-chemical survey of Ground water of Delhi, India”. Though all the segments of environment are being polluted in various ways, the study of water pollution is selected as it is not an ordinary liquid but is the elixir of life. Moreover, water is the most common liquid but it is also one of the most unusual because of its little unique property. The physico-chemical parameters of periphery area are also analyzed. The menace of pollution is necessary day by day. In some places the problem of water pollution is very high and in some places it is approaching towards the permissible limit. In this chapter physico-chemical and trace metal contents of water samples from Delhi were assessed. A total of 20 water samples were collected from boring, tube well, hand pump and analyzed for the various physico-chemical parameters like pH, Conductivity, Total Dissolved Solid, Total Alkalinity, Ca^{2+} and Mg^{2+} hardness, Chloride ion, Dissolved Oxygen, Biochemical Oxygen Demand, Sulphate and heavy metal contents like Cu, Cr, Cd, Co, Zn and Ni. The results of ground water were compared with BIS standards for drinking water. Most of the ground water samples in Delhi are hard, alkaline with one or two parameters higher than the maximum permissible limit. It thus makes Delhi water unfit for human consumption without suitable treatment.