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Quantitative Studies of the effect of Insecticide on Water Pollution with Chloramine-T Reagent

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Abstract:*The current study shows that the results are concordant for about 6-7 days. Again, to test the sensitivity of the method standard deviation was determined. The value found was around ± 0.01. Similarly, relative standard deviation and coefficient of variation was also determined. The method developed for the determination of pure fenthion was applied to polluted water. Various water samples were collected from agricultural fields, drains and sides of rivers, where the insecticides (fenthion) were sprayed. The samples were weighed and macerated with ethanol water mixture and filtered.*

Background*: Water pollution is the alternation in physical, biological, chemical properties of water. Sometimes it produces harmful effects on human and aquatic biota.1-7 a major concern is the exploding population and increasing industrialization and urbanization. It creates a lot of water pollution through agricultural, municipal and industrial sources. Fenthion is a strong insecticide and acaricide compound. Fenthion's toxic nature, wide applicability and because of its prolonged protective effect, various methods are reported for its determination.*

Materials and Methods*: Samples are collected by using a water sampler or polythene bottles. Two types of procedures are usually adopted for sampling of natural and waste water. These are grab sampling and composite sampling. Grab sample is an ordinary sample which is taken from a particular place representing the whole water quality. This type of sampling is valid only when it is certain that the water quality is not changing in a short time and frequent discharge, if any are fairly regular. A composite sample is the one taken at various times from a locality undergoing fluctuations and combining that to know the average chemical characteristics.*

Results*: It was observed that the maximum absorbance of the coloured solution was 530 run (Figure-l). The Beer's law was obeyed over the concentration range of 1.0-10.0 ug of fenthion in 25 ml of solution (Figure-2). The study of different variables like reagent concentration, effect of pl-l, effect of temperature was also done. It was found that 2 ml of 1.0 M sodium hydroxide is required for complete hydrolysis of fenthion. A lower concentration of alkali does not give reproducible results. A large excess of alkali is also not useful. It was also found out experimentally that 2 ml of DP AAP was the required amount for development of colour and maximum absorbance.*

Conclusion:*The current study shows that the results are concordant for about 6-7 days. Again, to test the sensitivity of the method standard deviation was determined. The value found was around ± 0.01. Similarly, relative standard deviation and coefficient of variation was also determined. The method developed for the determination of pure fenthion was applied to polluted water. Various water samples were collected from agricultural fields, drains and sides of rivers, where the insecticides (fenthion) were sprayed. The samples were weighed and macerated with ethanol water mixture and filtered.*

Key Word*: Insecticide, Water Pollution, Chloramine-T Reagent*

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I. Introduction

Water pollution is the alternation in physical, biological, chemical properties of water. Sometimes it produces harmful effects on human and aquatic biota.[1-7] a major concern is the exploding population and increasing industrialization and urbanization. It creates a lot of water pollution through agricultural, municipal and industrial sources. The quality of water is of vital concern for mankind since it is directly linked with human welfare. It is a matter of history that faucal pollution of drinking water caused water borne diseases, which wiped out entire populations of cities. At present, the menace of water-borne diseases and epidemics still looms large on the horizons of developing countries. Polluted water is culprit in all such cases. The major sources of water pollution are domestic waste from urban and rural areas and industrial wastes which are discharged in to natural water bodies. Water quality characteristics of aquatic environments arise from a multitude of physical, chemical and biological interactions. The water bodies -rivers, lakes and estuaries are continuously subject to a dynamic state of change with respect to their geological age and geochemical characteristics. This is demonstrated by continuous circulation, transformation and accumulation of energy and matter through the medium of living things and their activities. This dynamic balance in the aquatic ecosystem is upset by human activities, resulting in pollution which is manifested dramatically as fish kill, offensive taste and odour, etc. The physico-chemical characteristics of the aqueous phase have direct influence on the types and distribution of aquatic biota. Conversely, they are also influenced by the activity of aquatic biota. These interactions can be readily explained with reference to a thermally stratified lake. In general, deep lakes and marine environments are likely to undergo seasonal thermal stratification into a warm surface layer (epilimnion), an underlying layer where temperature drops fast with depth (thermocline) and a bottom layer of cool water density (hypokinetic). The hypokinetic zone represents a condition where the biological decomposition of organic matter consumes all the dissolved O2, which cannot be made up since these layers are stagnant and cut off from the atmosphere.

Sediments are mostly contributed by soil erosion by natural process, agricultural development, strip mining and construction activities. Suspended solids in water mainly comprise of slit, sand and minerals eroded from the land. Soil erosion by water, wind and other natural forces are very significant for tropical countries like India. It is estimated that out of the total land area of 328 million hectares, 175 million hectares are susceptible to degradation by soil erosion. It is also estimated that the continents are losing 5.8 cm of surface soil every 1000 years. About 6000 metric tonnes of soil are washed away into the sea every year, which means that about 5.37 million tonnes of NPK (Nitrogen, Phosphorous and Potassium) fertilizers are washed away into the sea. This erosion leads to qualitative and quantitative degradation of soil in land area. Thus, soil may be getting removed from agricultural land to areas where it is not at all required, such as water reservoirs. Soil particles eroded by running water ultimately find their way into water reservoirs and such a process is called “siltation”. Reservoir and dams are filled with soil particles and other solid materials, because of siltation. This reduces the water storage capacity of the dams and reservoirs and thus shortens their life. The tremendous problem of soil erosion can be controlled by proper cultivation practices and efficient soil and forest management techniques.

Sediments and suspended particles exchange cations with the surrounding aquatic medium and act as repositories for trace metals such as Cu, Co, Ni, Mn, Cr, and Mo. Suspended solids such as silt and coal may injure the gills of the fish and cause asphyxiation.

Fenthion is a strong insecticide and acaricide compound. Fenthion’s toxic nature, wide applicability and because of its prolonged protective effect, various methods are reported for its determination. A few spectrophotometric methods using reagents like, 4-aminoantipyrine[1], 4-(p-nitrobenzyl) pyridine[2], 3-nitroaniline-4-sulfonic acid[3], benzophenone[4], and p-anisidine[5], have been reported in the literature. These methods suffer from drawbacks such as instability of colour, insufficient sensitivity, absorbance variation of the blank, etc. Here a suitable analytical method based on hydrolysis of fenthion[6-8] to give thiophenol and its subsequent coupling is described. The coupling reagent used in the proposed method is p-aminoacetophenone which on coupling forms violet dye having maximum absorbance at 530 nm. The method has been applied for the determination of fenthion in polluted water samples.

II. Material and Methods

Samples are collected by using a water sampler or polythene bottles. Two types of procedures are usually adopted for sampling of natural and waste water. These are grab sampling and composite sampling. Grab sample is an ordinary sample which is taken from a particular place representing the whole water quality. This type of sampling is valid only when it is certain that the water quality is not changing in a short time and frequent discharge, if any are fairly regular. A composite sample is the one taken at various times from a locality undergoing fluctuations and combining that to know the average chemical characteristics. Composite sampling is divided into time proportional sampling (TPS) depending on time intervals and flow proportional sampling (FPS) depending on flow rate.

The samples are preserved at 4°C until the completion of analysis. Water samples were collected from different areas of Allahabad, e.g. Field water (Mavaiya), Drain water (Karchhana), River water (Naini, Yamuna River), etc. After collection the samples are converted into a form which can be analyzed by suitable analytical methods. This process is known as preparation of sample.In this work, the collected water samples were weighed and macerated with ethanol water mixture and filtered through a Whatman 00-4 filter paper. Now the filtrate was centrifuged and deprived of chlorophyll. Aliquots of these water samples were analyzed by proposed method. Aliquot of test solution containing 1.0 to 1 0.0 □ g of fenthion was taken in a 2S ml graduated tube and to it 2 ml of 1.0 M sodium hydroxide was added. Contents were heated on boiling water bath at temperature of 90-100°Ctor about 15 min. Now the reaction mixture was taken out of water bath and cooled to room temperature. To this solution 2 ml of DP AAP was added. Now the contents were allowed to stand for 2 min. The solution was diluted up to the mark (25 ml) with alkaline solution. The absorbance of this colored solution was measured using a reagent blank.

III. Resultand Discussion

It was observed that the maximum absorbance of the coloured solution was 530 run (Figure-l). The Beer's law was obeyed over the concentration range of 1.0-10.0 ug of fenthion in 25 ml of solution (Figure-2). The study of different variables like reagent concentration, effect of pl-l, effect of temperature was also done. It was found that 2 ml of 1.0 M sodium hydroxide is required for complete hydrolysis of fenthion. A lower concentration of alkali does not give reproducible results. A large excess of alkali is also not useful. It was also found out experimentally that 2 ml of DP AAP was the required amount for development of colour and maximum absorbance.

The pH for the development of colour was an important factor to be maintained. If the solution is alkaline i.e. 12-14 pH, the development of the colour is constant and maximum. The pH in the acidic range doesnot give any colour. For the hydrolysis of fenthion heating is essential (90-100oC on water bath). A temperature lower than this does not give complete hydrolysis, it takes a longer time. However, if the contents are heated directly in name or on sand bath, it give inaccurate results. The precision of the method was checked and it was found that the results are concordant for about 6-7 days. Again, to test the sensitivity of the method standard deviation was determined. The value found was around ± 0.01. Similarly, relative standard deviation and coefficient of variation was also determined. The method developed for the determination of pure fenthion was applied to polluted water. Various water samples were collected from agricultural fields, drains and sides of rivers, where the insecticides (fenthion) were sprayed. The samples were weighed and macerated with ethanol water mixture and filtered. Now the filtrate was centrifuged and deprived of chlorophyll. Aliquots of these samples were taken in a 25 ml graduated tube and analysed and the results were reported.

Figure - 1

Absorption spectra of the dye and regent blank

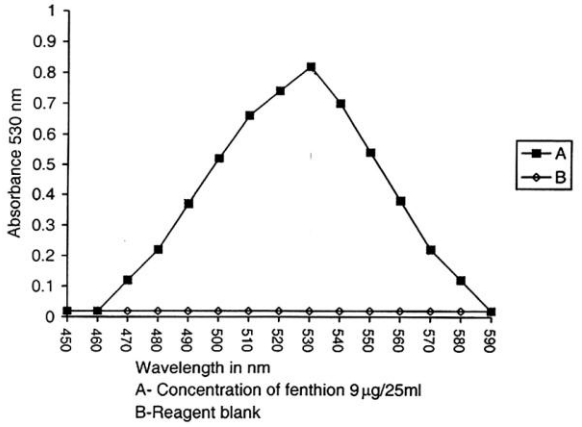
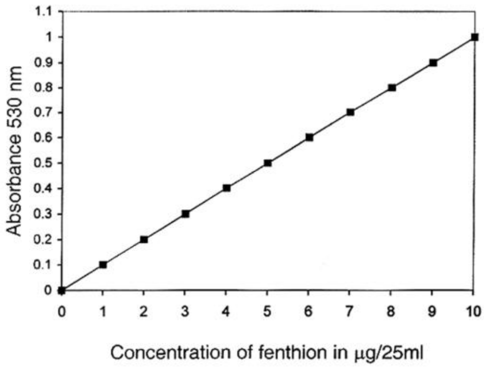


Figure-2

Calibration graph for the determination of Fenthion



IV. Conclusion

The current study shows that the results are concordant for about 6-7 days. Again, to test the sensitivity of the method standard deviation was determined. The value found was around ± 0.01. Similarly, relative standard deviation and coefficient of variation was also determined. The method developed for the determination of pure fenthion was applied to polluted water. Various water samples were collected from agricultural fields, drains and sides of rivers, where the insecticides (fenthion) were sprayed. The samples were weighed and macerated with ethanol water mixture and filtered.

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