Volume: I: Issue-2: Aug-Oct -2010 IJABPT ISSN 0976-4550

THE STATUS OF PESTICIDE POLLUTION IN SURFACE WATER (LAKES) OF BIJAPUR

U.S.Pujeri*, A.S.Pujar, S.C.Hiremath and M.S.Yadawe
S.B.Arts and K.C.P.Science College Bijapur, Karnataka India.
mallikarjun_yadawe@rediff.com, shiva4565@rediff.com

ABSTRACT: The paper evaluates and summarizes the results of the pollution of surface waters (lakes) of Bijapur by pesticides. Pesticide classes mostly detected involve herbicides used extensively in cotton, vegetables and grape production, organophosphorus insecticides as well as organochlorines due to their persistence in aquatic environment. The compounds most frequently detected were Endosulphan, 4-bromro-2-chlorphenol, Captan, Chloripyrifosethyl, Fipronil, Oxyfluorfenand monochrotophos respectively. . Nationwide, in many cases the reported concentrations ranged in low levels. However, elevated concentrations were recorded in areas of high pesticide use and intense agricultural practices. Generally, similar trends and levels of pesticides were found in Bijapur lakes. Monitoring of the Bijapur water resources for pesticide residues must continue, especially in agricultural regions, because the nationwide patterns of pesticide use are constantly changing. All these were present above the permissible limits specified by the European Economic Community (EEC), which is the norm used all over the Europe. Moreover emphasis should be placed on degradation products not sufficiently studied so far. Information on pesticide pollution of surface waters in Bijapur is reported.

Key words- Pesticide residues, GCMS, Organochlorines, Organophosphorous, MRL, Lakes.

INTRODUCTION

The concept of pesticides is not new. Around 100 B.C.E Homer referred to the use of sulfur to fumigate homes and by 900 C.E; the Chinese were using arsenic to control garden pests. Synthetic organic chemicals account for nearly one third of the chemical production in industrialized countries and many of these find their way into the environment (CEN 1992). A large number 0f unwanted substances reach to the fresh water systems along with agricultural run off. Among these, pesticides play an important roles in damaging fresh water ecosystems. Pesticides also reach to water bodies either by direct application or along with spray drifts, rain water, sewage and industrial effluents. In addition to the direct impact of pesticides on aquatic life, bioaccumulation of contaminants through food chain in organisms is another important factor to be considered. Extensive investigations have been carried out all over the world including different parts of India for the effects of pesticides on both terrestrial and aquatic organisms (Raman Rao et al.1987; Choudhuary et al. 2008).

In order to protect natural populations of aquatic organisms, it is necessary to understand and predict the adverse effects arising from exposure to chemical contaminants. Chemicals enter aquatic systems via various pathways and in many cases the aquatic organisms are exposed to repeated pulses or fluctuating concentrations (Handy R.D. et al. 1940; Reinert K.H. et al. 2002).

Pesticides are substances that are manufactured, sold or used as a means of directly or indirectly controlling, preventing, destroying, mitigating, attracting or repelling any pest or altering the growth, development or characteristics of any plant that is not a pest (Salau et al. 1993). Thus, pesticides are vitally important to increasing or protecting the quality and quantity of food, commodities, building materials, clothing and ornaments in improving animal health and in combating diseases transmitted to man. They are deliberately designed to alter the balance of ecology. However, the premature release of medicinal, industrial and agricultural chemicals has caused numerous environmental problems at all levels of life. It is imperative that man determines what ecological changes are acceptable or unacceptable (APHA AWWA 1995; Ecobichon et al. 1986). Pesticides constitute an important component in agriculture development and protection of public health in India since the tropical climate is very conducive to pest breeding. There are about 20 major diseases which have been brought under control by the use of pesticides. The major amongst them are malaria,filariasis, dengue, Japanese encephalitis, cholera and louse-borne typhus. In India, DDT spray was instrumental in reducing the annual incidence of malaria from 75 million in 1952 to 2-4 million. Synthetic organic pesticides are used to control weeds, insects and other organisms in a wide variety of agricultural and non-agricultural settings.

The use of pesticides has helped to make the United States the largest producer of food in the world and has provided other benefits, but the use has also been accompanied by concerns about their potential adverse effects of pesticides is through hydrologic systems, which supply water for both humans and natural ecosystems. Water is the one of the primary ways pesticides are transmitted from an application area to other locations in the environment. Pesticide contamination of ground water is a natural issue because ground water is used for drinking by 50% of the population. Concern about pesticides in ground water is especially acute in rural agricultural areas where over 95% of the population relies upon ground water for drinking (Abida Begam et al. 2008).

In view of the above, direct application of organochlorine and organophosphorous pesticides in controlling aquatic weeds and pests, this study was carried out to provide base line information on the level of organochlorine and organophosphorous pesticides in Bijapur water (lakes) to indicate the degree of environmental pollution.

MATERIAL AND METHODS

Materials- All the chemicals used, otherwise stated were of analytical grade and these include ethyl acetate, sodium sulphate, ammonium formate, methanol, N-hexane, sodium chloride, orthophosphoric acid (85%), acetone, potassium hydroxide and glass wool, soaked in N-hexane for 3 hours and air dried.

Instrument- GCMS/MS Thermofisher make with MS/MS detector.

Sample collection and preservation- The water samples analysed were collected were from lakes. Seven samples were collected per lake. Lake sample was employed by Grab sampling technique (Staare J.V. et al. 2000) The water samples were kept in plastic bottle and immediately preserved after collection in ice in order to minimize degradation of pesticides in the field and these samples were transferred to the freezer immediately and brought to the laboratory. The pH of the water samples was taken immediately on the spot.

Sample extraction and clean up- The analytical procedure of the APHA-AWWA-WCPF (standard methods for the examination of water and waste waters (Adjerl P.A. et al. 1986) . with slight modification was used. The water analysis involved the extraction of 15% diethyl ether in hexane. The extracts were cleaned using tetraoxosulphate (vi acid clean up and ethanolic potassium hydroxide base cleanup instead of the column clean up described in APHA_AWWA_WPCF. The cleaned extractants were later injected into the HPLC equipped with 441 model UV detector fitted with 254mm filter.

Analysis were carried out using gas liquid chromatography (GLC) on model 5890A Hewlett-Packard (HP) equipped with ^{63}Ni electron capture detector, capillary column SPB-5(30mx0.32mm i.d.x0.25µm film thickness) of diphenyl 59% dimethyl siloxane for OC and SP. Column temperature: 150ºC initially for 5 min. then programmed at 8ºC/min up to 190ºC for 2 min. and then at 15ºC/min up to 280ºC for 10 min. ; Injector temperature 280ºC and detector temperature 300ºC, nitrogen flow rate : 2ml/min through column and make up 60ml/min with split ratio of 1:10.

For the analysis of OP insecticide, HP gas chromatography equipped with nitrogen phosphorous detector with mega bore column HP-1 (10m x 0.53mm i.d. x 2.65µm film thickness) of polysiloxane was used. Oven-Column temperature:100ºC initially for 1 min then increased at a rate of 10ºC/min to 200ºC and was finally increased at the rate of 20ºC/min to 260ºC; gas flows H_2 1.5ml, N_2 : 18ml and O_2:135ml/min.

In order to ensure the quality assurance information, before taking up analysis of test sample, the analytical method was standardized by processing spiked samples in triplicate of each fruits separately at different fortification levels ranging from 0.01 to 0.50µg/ g. Control samples were processed along the spiked ones

RESULTS AND DISCUSSIONS

The results of pesticide residue analysis of water (lakes) of Bijapur are shown in the Table.1. GCMS chromatograms of representative sample is shown in the figure.1.
It should be pointed out that, the present method was tailor-made in view of the previous information about the most prevalent pesticides in the area (Pujeri et al. 2010). Analysis of pesticides in water yields different information regarding the existence of these compounds in the environment. The water samples from Bijapur lakes contained significantly higher levels of Endosulphan, 4-bromo-2-chlorophenol, chloropyrifos respectively. From the results it can be seen endosulphan was detected in the range of 0.00025 to 0.005mg/L. The concentration of 4-bromo-2-chlorophenol ranged from 0.01 to 0.009mg/L. Thconcentration of captan was bellow the limit of WHO. Theconcentration of chlorpyriphos ethyl ranged from 0.0002 to 0.004mg/L which was above the WHO limit. The Fipronil was detected in only one sample i.e 0.004mg/L. The concentration of oxyfluorfen was 0.0025 mg/L which bellow the limit while monochrotophos was not detected in all the samples.

Table-1 Status of Pesticide Residue in water (lakes) of Bijapur

S.No	Sample No.→ Pesticide↓	EU MRL	1	2	3	4	5	6	7
1	Endosulphan	0.01	ND	ND	ND	ND	0.0025	0.0043	0.005
2	4-bromro-2-chlorphenol	0.01	0.009	0.008	0.001	0.001	0.0003	BLQ	0.0003
3	Captan	0.02	ND	0.02	ND	ND	ND	ND	ND
4	Chloripyrifos ethyl	0.01	0.004	0.003	0.002	0.0002	0.002	ND	ND
5	Fipronil	0.0025	ND	0.004	ND	ND	ND	ND	ND
6	Oxyfluorfen	0.02	ND	0.02	ND	ND	ND	ND	ND
7	Monochrotophos	0.02	ND	ND	ND	ND	ND	ND	ND

Figure.1 GCMS Spectra of Pesticide Residue in Standard

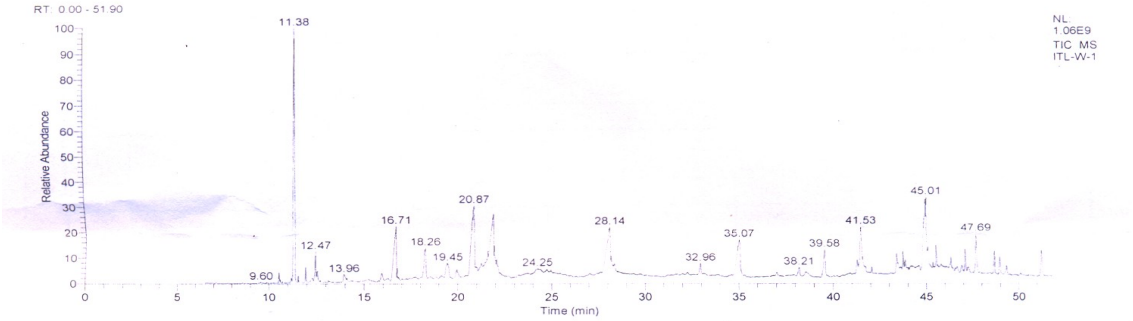
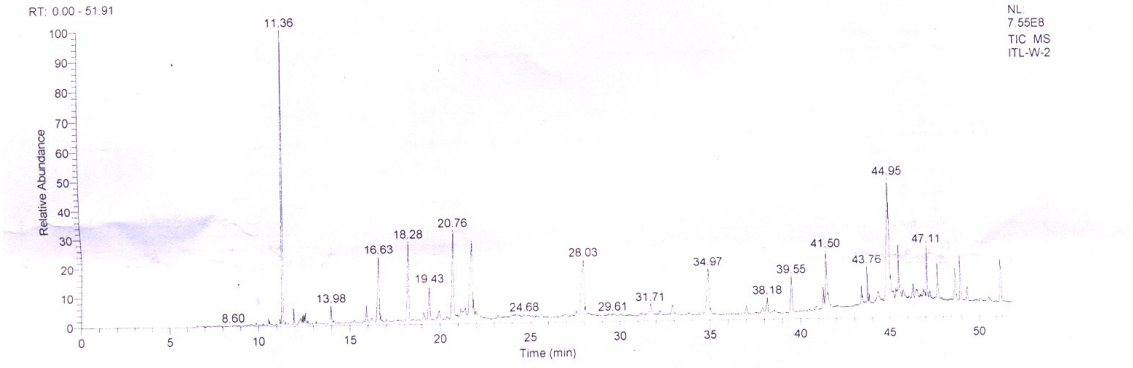


Figure.2 GCMS Spectra of Pesticide Residue in water sample-1



CONCLUSIONS

The study has shown that agricultural area for vegetables, cotton and horticultural crops are the main sources of water pollution due to pesticides in Bijapur. It appears that the types of pesticide contamination are influenced by type of agriculture. The residue levels of most of the pesticides are very much higher than their levels in lake water from areas that were not involved in vegetable or horticulture farming reported in the previous studies.

Acknowledgements

The authors expresses the gratitude to the Management, Administrators, Principal, HOD of chemistry, of SB Arts and KCP Science College Bijapur, for providing research facilities and the UGC New-Delhi for financial assistance

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