



Estd. 2005

JOURNAL OF ULTRA CHEMISTRY

An International Open Free Access Peer Reviewed Research Journal of Chemical Sciences and Chemical Engineering

website:- www.journalofchemistry.org**Assessment of Pesticides in Betwa River near Mandideep Industrial Area**MOHITA KULSHRESTHA¹, BIRJESH SINGH² and SUBRATA PANI³¹Department of Chemistry, Bonnie Foi College, Bhopal (India)²Department of Chemistry, AISECT University, Chiklod, Raisen (India)³Environmental Research Laboratory, EPCO, Bhopal (India)Corresponding Author Email : Mohita.kulshrestha@gmail.com<http://dx.doi.org/10.22147/juc/160201>

Acceptance Date 11th March, 2020,

Online Publication Date 25th March, 2020

Abstract

The present study was conducted in Betwa River near Mandideep Industrial Area extending from origin up to a stretch of 200 kms downstream to assess the presence of selective pesticides in the river water. Quarterly analysis was carried out during 2016-17 for water samples collected from surface and bottom waters at stations of Betwa River in Mandideep area. The study reveals the presence of few pesticides viz. Aldrin, Endosulphan and HCH, in traces at all the stations except its origin. Presence of Pesticide, though in low concentration suggests primary entry of it into river water which may be attributed to run offs from nearby agricultural fields. The present study emphasizes the need for alternative agricultural practices with application of organic bio-pesticides instead of depending heavily on chemical pesticides.

Key words: Betwa River, Catchment, Pesticides, Water quality, toxicity

Introduction

The term "pesticide" is a composite term that includes all chemicals that are used to kill or control pests. In agriculture, this includes herbicides, insecticides, fungicides, nematocides, and rodenticides (FICCI report, July 2016). Pesticides are being used all over the world for pest control to

prevent the damage and increase the productivity of crops affected due to pest infestation³. Most of the pesticides may be inherently toxic, not only to the pests, against which they are used, but also to other organisms as well as the niche of a stabilized ecosystem¹⁰. In last few decades after the green revolution, long term and rampant use of pesticides resulted in persistence, bioaccumulation and long

range transport of these hazardous chemicals⁸. The manifestation of toxic effects of these hazardous chemical in disrupting the ecological balance and resultant severe health hazards to human beings have been reported by many workers¹. These changes occur, so slowly, that the problem becomes visible only after it has taken a serious turn, making it very difficult to reverse the trend. India is the fourth largest producer of agrochemicals in the world after USA, Japan and China. The 60% of the total pesticides used in India is insecticide, herbicides (16%) and fungicides (18%) are lesser used (FICCI report, July 2016).

As application of the pesticides in last few decades has attend an alarming level, therefore, there is an utter need for continuous monitoring of pesticide pollution on our aquatic resources, so that some corrective measures can be taken before its severe manifestation. The objective of present study is to determine the concentration levels of organic pesticides in Betwa river which is one of the major rivers in Central Indian state, Madhya Pradesh so that suitable corrective measures may be taken by the regulatory agencies whenever and wherever necessary.

Description of Study Area :

Betwa, an important River in central part of Madhya Pradesh is considered as the life line of Madhya Pradesh along with river Narmada. It is a tributary of River Yamuna. Betwa known as the Vetravati arises from the Vindhyan Range, just north of Hoshangabad district of Madhya Pradesh and flows towards north-east through the industrial belt of Mandideep and Bhojpur. After traversing several cities of Madhya Pradesh, it enters the neighboring state Uttar Pradesh at Hamirpur and finally joins Yamuna River. Thus, this river is of immense importance to the people of both Madhya Pradesh and Uttar Pradesh. However, the river has become subjected to various degree of pollution at many places⁶ with the increase in anthropogenic and industrial activities.

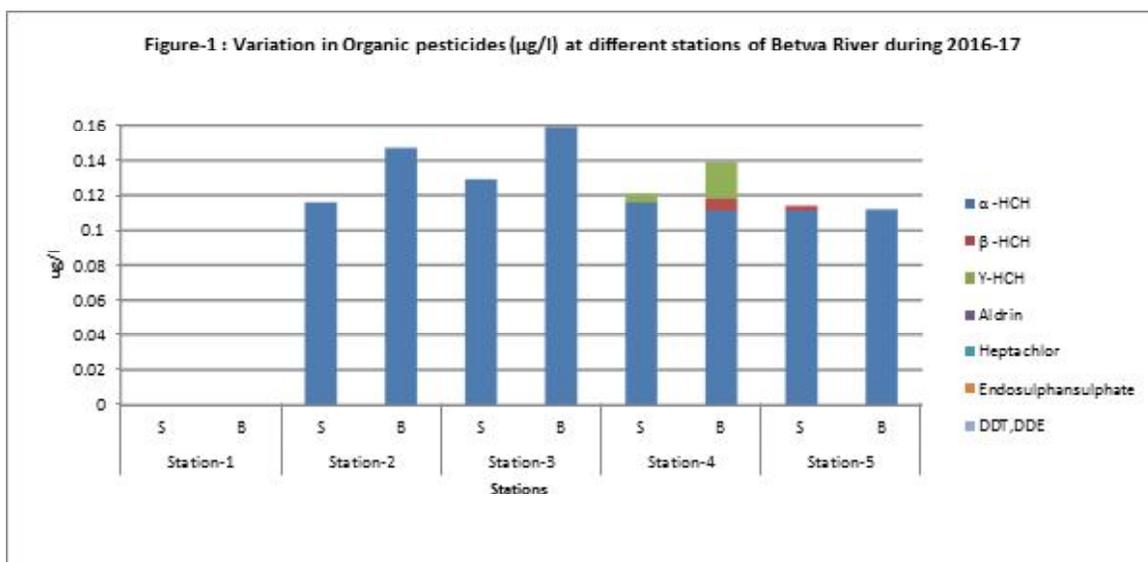
Research Methodology :

Sampling Technique :

The present study was conducted during the year January, 2016 to December, 2017 to assess the water quality of the River from its origin up to a stretch of about 200 Km at different places of its flow. During the period of investigation quarterly water samples were collected from surface and bottom waters of five identified sampling stations using Ruttner Water Sampler following the standard methods (APHA, 2010). Water samples were collected in dark glass bottles and after collection of the samples the bottles were tightly capped and were immediately transported to the laboratory to avoid any leaching and degradation. Suitable preservation techniques were adopted as per the standard methods. The parameters were analyzed in the laboratory following the methods described in APHA (2010). For extraction Rota - Evaporator was used. A water sample of 500ml was taken in a one liter separator funnel and 10 gm of NaCl was added. The funnel was shaken to dissolve NaCl and thereafter 50ml of 15% dichloromethane in n-Hexane was added for extraction. The extracts were concentrated to remove the traces of dichloro-methane and finally taken in n-Hexane for analysis in Gas Chromatography (Varian 500) following the methods prescribed in Handbook of Nollet and Rathore,⁵. The compounds were identified by comparing their chromatographs after calibration with those of standard compounds. Results are expressed in ug/liter.

Results and Discussion

Concentration of pesticides observed at various stations is shown in Figure-1. Analysis of surface and bottom water samples of Betwa River showed presence of traces of pesticides like HCH, Aldrin, Endosulphan sulphate in all four stations except station-1 where no trace of these chemicals were found.



The concentration of α & β , HCH were found more than the other isomers. This may be attributed to stability of this isomer especially to microbial degradation as effluent discharged from the industrial clusters also contain discharges of ETP from Pharmaceutical companies. Similar observation was also reported by Panday *et al.*,⁹.

At station 2 & 3, the concentration of pesticide is more in bottom waters than surface waters which may be due to higher retention time in this area since the flow of the river is very poor to moderate. At station -1 no traces of pesticide was observed. The findings in general indicate that agricultural activities in the catchment of the river wherein a substantial part is used for cultivation may have resulted in increasing the pesticide concentration through run off from these fields. Industrial and domestic uses of pesticides may also have contributed to entry of these hazardous chemicals into the river.

Conclusion

The assessment clearly shows that the river water near Mandideep region is contaminated with toxic pesticides. Hence there is utmost need to conduct more awareness programme as well as developing an

efficient monitoring mechanism for restricting unauthorized use of synthetic organic pesticides in agriculture activities. Use of alternative pesticides like bio-pesticides needs to be promoted to avoid further damage and pollution.

Acknowledgement

The first author is grateful to HOD, department of Chemistry, Ravindra Nath Tagore University for providing all the facilities in conducting this study.

References

1. Ajay, Kaushik and Siby, John., Review on Pesticide Drainage from Agriculture Practices, Journal of Agriculture and Water Works Engineering, Mantech Publications, 2017.
2. American Public Health Association (2010), Standard Methods for the Examination of water and waste water 19 Edn, American water works Association water Environment Federation Washington. Chapman and Donald, 2010.
3. Daisy Bhat and P.Padmaja (2014), Assessment of Organic Pesticides in Ground and Surface Water in Bhopal India, IOSR Journal of Environmental

- Science, Toxicology and Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402, p-ISSN: 2319-2399. Volume 8, Issue 5 Ver. III (May. 2014), PP 51-52 www.iosrjournals.org
4. Indian Agrochemical Industry, FICCI report, July 2016.
 5. LM L, Nollet and HS Rathore (2010), Handbook of Methods of Pesticide Residues Analysis, CRC Press Taylor & Francis Group, 2010.
 6. Mohita Kulshrestha, Birjesh Singh and Subrata Pani (2017) Toxicological Studies of River Betwa with respect to selective physico-chemical parameters, World Journal of Pharmaceutical and Medical Research, wjpmr, 3(8), 279-284 (2017).
 7. O, Wurl and J.P Obbard (2005), Organichlorine pesticides, Polychlorinated and Polybrominated Diphenyl Ethers in Singapore's, Marine Sediments, Chemosphere 58 (11), 925-933 (2005).
 8. Om Prakesh, S. Mrutyunjay, R. Vishakha, C. Dogra, R. Pal and Ruplal (2004), Residues of HCH isomers in soil and water samples from Delhi and adjoining areas, 87C1, 73-77 (2004).
 9. P. Panday, P.S. Khillare and K. Kumar (2011), Assessment of organochlorine pesticide residue in surface sediments of river Yamuna, Delhi, India, Journal of Environmental Protection, 2, 511-524 (2011).
 10. R.R. Babus, T. Imagawa, H. Tao and R. Ramesh (2005), Distribution of PCBs, HCHs DDTs and their ecotoxicological implications in Bay of Bengal, India, Environmental international 31, 503-512 (2005).