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Seasonal Variation in Physico-Chemical Parameters and Incidence of Pesticides Residues of Poha Dam Reservoir, Karanja (Lad), Dist. Washim (M.S.)

N.S.THAKARE[1], S.D. BHAGAT[2], R.M. JUMALE[3]

[1]Department of Chemistry, M.S.P. Arts, Science & K.P.T. Commerce College, Manora
[2]Research Fellow, Department of Chemistry, M.S.P. Arts, Science & K.P.T. Commerce College, Manora
[3]Shivaji Science College, Akot

Abstract

In the recent investigation, water samples are collected from various locations of Poha dam of Karanja (lad) Tahsil Dist. Washim in Maharashtra state of India for observation of physico-chemical Parameters and Pesticide residues analysis during the year 2013. The invitro test of the collected water samples were performed for analysis of different parameters such as water temperature, pH, dissolved oxygen, total solids, total hardness, Conductance, Salinity and ORP and Organochlorine Pesticides. The obtained data were compared with standard units. The results of this recent study reveal that physico-chemical parameters are within maximum permissible limits of WHO. Therefore, water is safe and suiTable for domestic, irrigation purposes and drinking purpose after some treatment.

Key Words: Physico-chemical analysis, Pesticides, Poha dam.

Introduction

The pesticides are chemical or biological substances that are designed to kill or retard the growth of pests interfering with the growth of crops, shrubs, trees, timber and other vegetation desired by humans. The term pesticide includes substances intended for use as plant growth regulators, defoliants, desiccants or agents for thinning fruit or preventing the premature fall of fruit. The substances applied to crops either before or after harvest to protect the commodity from deterioration dur- ing storage and transport also come under the category of pesticides [1]. Pesticides are conventionally synthetic materials that directly kill or inactivate the pest. They are classified ac- cording to the type of organisms they act against as for example i) insecticides, ii) herbicides, iii) fungicides, iv) rodenticide and v) nematicides [2]. Insecticides include or-ganophosphates (TEPP, parathion. trimesters of phos- phates and phosphoric acids), carbamates (aldicarb), organochlorines (dichlorodiphenyltrichloroethane, chlor- dane, aldrin, dielrin, lindane, endrin) and botanical insec- ticides (nicotine, rotenoids, pyrethrum). Herbicides are used to destroy other weeds that interfere with produc- tion of the desired crop. Based on their structure they are grouped into chlorophenoxy compounds (e.g.: 2,4-D, 2, 4,5-T), dinotrophenols like 2-methyl-4,6-dinitrophenol (DNOC), bipyridyl compounds like paraquot, carbamate herbicides, substituted urea, triazines and amide herbi- cides like alanine derivatives. Fungicides include a num- ber of structurally different chemicals like cap tan, folpet, pentachlorophenolziram, nambam etc. Fungicides con-taining

mercury are known to cause nerve disorders . Rhodenticides are designed to kill rodents, mice, squir-rels, gophers and other small animals. They vary from highly toxic one with the ability to kill an organism with one-time dose or less toxic ones requiring repeated in-gestion over a period of time.

Even though pesticides play significant role in agri- culture they are the most important environmental pol-lutants. This is due to their wide spread presence in water, soil, atmosphere and agricultural products. The effectiveness of pesticides, coupled with their relatively cheap cost encourages farmers to use more of these pesticides when growing their field crops. Yet, these pesticides pose severe risks to the farmers' health. Recidues and metabolites of many Organochlorin pesticides are very sTable with long half lives in the environment [3]. The pesticides' residues are discharged into the air and water. Through the consumption of foods containing these pesticides at a level of 0.1 µg/L, these residues can affect the human body [4]. The widespread use of pesticides may contaminate the environment and freshwater fish [5], which ultimately are consumed by humans. Moreover, moderate to severe respiratory and neurological damage can be caused by many of these compounds, which are genotoxic and carcinogenic [6]. Studies have shown that DDT is still in its highest concentration in biota of some areas. Many other recent works have indicated the presence of Organochlorine pesticides residues in surface waters, sediments, biota and vegetation [7-11].

Poha dam reservoir is located near about 3 kms from Poha village. This reservoir was built for irrigation purpose for farmers. Poha dam reservoir is an earthfill and rockfill reservoir. The determination of Organochlorine residues in water may give indication of the extent of aquatic contamination and accumulation characteristics of these compounds in the tropical aquatic biota that will help in understanding the behavior and fate of these persistent chemicals. This work, therefore, seeks to provide baseline information on levels of pesticides residues including DDT, DDE, Lindane, Endosulphone, Heptachlor and chlorodane in surface waters of Poha dam reservoir through four seasons that will assists in a scientific assessment of the impact of pesticides on public health, agriculture and the environment.

Methods and Materials

Water samples were taken from 0.3 m below the surface with a pre-cleaned glass bottle. For sampling turbulent midstream position of water bodies were chosen to approximate mean concentration of river water. All foreign bodies were removed and the samples were stored in ice during transport and were kept at 4^0 C in the laboratory until the solid phase extraction.

Sample extraction:

The procedure applied for the extraction of pesticides was similar to those reported by Laabs *et al* and Steinwandter. Water samples were extracted using ultrasonic extraction. Sox let extraction was done with 20 ml of hexane: dichloromethane (3:1) for 30 min. The extract was concentrated with the aid of rotator

evaporator. Pre-elution was carried out with the HPLC methanol. The concentration solvent extract was then analyzed for Pesticides.

The solvent of the mobile phase of the HPLC is methanol and water (1:1). This was prepared by measuring 250ml of HPLC grade methanol into a 500ml flask and made up with 250ml of distilled water. The HPLC model CECIL 1010 was switched on. The wavelength of the system was determined by using UV visible equipment. Little quantity of stock solution was diluted with methanol and its wavelength determined nu scanning. A peak of 202nm was reached. The system wavelength was then set at 202nm and the sensitivity of the 0.05 nm of the UV detector component set. The flow rate was set at 1ml/min, afterwards, the purging of the system commenced by allowing the system to run for some time. The purging was carried out through a washing solution of 30% methanol, 70% water. Bubbling helium gas into the solution carried out degassing of the mobile phase was then set up and connected with HPLC system and allowed to run through the system of 20min.

Each sample residues was dissolved in 1ml methanol. The extracted residue was the loaded and injected into the valve of the chromatography system. The resulting chromatograph for each sample was printed out. The various retentions time noted, concentration determined and recorded.

Result and Discussion

Poha dam reservoir is surrounded by farm lands. A large amount of chemicals (Fertilizers and pesticides) are used there by farmers which can enter the reservoir through running waters and subterranean canals. Also, garbage and wastewaters are poured in the reservoir by inhabitance. All of these factors may lead to the contamination of Poha dam reservoir.

Results from the study have been shown in Table no. 1 which is related to the concentration of Organochlorine pesticides residues in water, and Table no.2 is related to the physicochemical properties of water. The associated figure for mean concentration for pesticide DDT was in the range of 0.01-0.05µg/L. The ratio of incidence as well as concentration of DDE, a metabolite of DDT, in these water samples were lower than those of recorded for DDT. This observed trend could be attributed to the decomposition and bioaccumulation of the DDT used in the past. DDE is more sTable than DDT and decomposes more slowly by micro-organisms, heat and ultraviolet rays. The pesticides chlorodane, Lindane and heptachlor was not detected in the water samples showing that the farmers around the reservoir do not use them in their farming activities. Endosulfan, a broad spectrum contact insecticide and acaricide, is another pesticide used by many farmers. The associated figure for mean concentration of Endosulfan was in the range of 0.01-0.0205µg/L.

Based on the ANOVA and Duncan tests, the mean concentration of Organochlorine pesticides in water samples of site I & site II showed significant differences. However, this was not observed in the site I. Generally, the highest concentration of Organochlorine pesticides was seen at site I. It may be due to the

abundance of farm lands around this site which have sharp slopes toward this part of the reservoir so pesticides and other chemical material can enter there more easily. However lowest concentration of organochlorine residue was related to site III. Because there is a slow current toward this part and the contamination cannot accumulate there.

Organochlorine pestcidies residues in the reservoir are likely to originate from nonpoint source via runoff, atmospheric deposition and leaching due to agriculture application and vector control practices. The lake sediments act as a sink for the persistent contaminants, whose resuspension during the reservoir's mixing may increase pesticides bioavailability and accumulation in the fishes. Pesticide pollution to the reservoir is therefore, likely to pose danger to both aquatic organism and humans.

Table 1: Levels of organochlorine pesticides in water samples of Poha dam reservoir.

	DDT			DDE			Endosulphone			Chlorodane			Lindane			Heptachlore		
Pesticide station	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Summer season (2014)	.05	.04	.04	.06	.04	.04	.02	.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Winter season (2014)	.02	.03	.03	.04	.03	.02	.01	.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average mean	.035	.04	.04	.05	.035	.03	00	.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Standard deviation	.015	.00	00	.01	.00	.01	.015	00	-	-	-	-	-	-	-	-	-	-
Range	.01-.05	.01-.04	.01-.04	.01-.04	.01-.06	.01-.04	.01-.02	.01-.02	-	-	-	-	-	-	-	-	-	-

The seasonal values of various physico-chemicals parameters of Poha dam reservoir water are given in Table 2. There is a close relation between the atmospheric temperature and water temperature. Air temperature is one of the most important ecological factor which controls the physiological behavior of aquatic systems and hence the quality of water. In the present investigation, the water temperature in an average of Poha dam reservoir was recorded in the summer and winter season was 23.12^0C and 24.3^0C respectively. pH is the measure of the concentration of hydrogen ions, which provides the range of the acidity or alkalinity of a solution. During the study period the average value of pH for summer season was found to be 7.6 and for winter season 7.5.

Table 2: Physicochemical properties of water samples of Poha dam reservoir.

Sites	PH		TDS (mg/L)		Conductance (M mhos)		Salinity (ppt)		DO (mg/L)		ORP (mV)		Temperature (^{0}C)	
	S	W	S	W	S	W	S	W	S	W	S	W	S	W
I	7.5	7.4	235	230	0.3	0.3	0.2	0.1	8.8	8.7	025	036	22.4	23.3
II	7.8	7.6	230	240	0.3	0.4	0.2	0.2	8.5	8.9	032	033	23.5	22.8
III	7.5	7.3	270	250	0.6	0.5	0.4	0.2	8.1	8.2	029	025	22.8	22.5
IV	7.6	7.9	220	230	0.2	0.3	0.1	0.1	8.2	8.4	028	030	23.8	24.1
Average	7.6	7.5	238.7	237.5	0.35	0.3	0.2	0.1	8.3	8.5	28.5	31	23.12	23.3

Dissolved oxygen content indicates the health and ability of water body to purity itself through biochemical processes. Oxygen is also needed for many chemical reactions that are important to lake functioning, such as oxidation of metals, decomposition of dead and decaying matters etc. During the study period average dissolved oxygen recorded in summer season was 8.3 mg/L and in winter season 8.5mg/L.

Total dissolved solids refer to matter suspended and dissolved in water. Waters with high total solids generally are of inferior palatability and may induce an unfavorable physiological reaction in the transient consumer [12]. In present investigation total dissolved solids in an average was in summer 238.7mg/l and in winter 237.5 mg/l. The conductance in present investigation sample in summer and winter was found to 0.35 M mhos &0.3 M mhos. And the salinity was found to be 0.2 ppt and 0.1ppt sol. for winter and summer seasons.

Conclusion

The analysis of water quality parameters of Poha dam reservoir showed that the values are well within the permissible limits. The result of study reveals that the quality of dam water is though fit for domestic, irrigation purpose and also for drinking purpose after some treatment need continuous monitoring of physico-chemical parameters to improve the quality of water.

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References

[1]. "International Code of Conduct on the Distribution and Use of Pesticides," Hundred and Twenty-Third Session of the FAO Council, November 2002.

[2]. B. K. Sharma, "Environmental Chemistry," Goel Pub- lication House, New Delhi, India, 2006

[3]. El-Mekkawi, H., M. Diab, M. Zaki and A. Hassan, Determination of chlorinated organic pesticide residues in water, sediments and fish from private fish farms at Abbassa and Sahl Al-Husainia, Sharkia Governorate. Aus. 3(4): 4376-4383, 2009.

[4]. Wang, D.F.; Sun, J.P.; Du, D.H.; Sun, L.P.; Chen, Z.D.; Xue, C.H. Degradation of extraction from seaweed and its complex with rare earths for organophosphorous pesticides. J. Rare Earths 2007.

[5]. Rahman, M.M. Pestcides: Their Uses and Problems in Context of Bangladesh. In Proceedings ofthe National Workshop on Conventional and Nuclear Technique for Pesticide Residues Studies in Food and Environment at IFRB, Savar, Bangladesh, October 2000.

[6]. Hayat, K.; Ashfaq, M.; Ashfaq, U.; Saleem, M.A. Determination of pesticide residues in bloodsamples of villagers involved in pesticide application at district Vehari (Punjab), Pakistan. Afr. J.Environ. Sci. Technol. 2011.

[7]. Afful, S., A.K. Anim and Y. Serfor-Armah, Spectrum of organochlorine pesticide Residues in fish samples from the Densu Basin. Res. J. Environ. Earth Sci., 2(3): 2010.

[8]. Dem, S.B., J.M. Cobb and D.E. Mullins, Pesticide residues in soil and water from four cotton growing areas of Mali, West Africa. J. Food Environ. Sci., 1: 1-12, 2007.

[9]. Haozheng, W., H. Mengchang, L. Chunye, Q. Xiangchun, G. Wei and Y. Zhifeng, Monitoring and assessment of persistent species organochlorine residues in sediments from Daliaohe River watershed, Northeast of China. J. Environ. Monitor., 133: 231-242, 2007.

[10]. Imo, T.S., M.A. E. Sheikh, T. Oomori and F. Tamaki, Contamination by organochlorine pesticides from rivers. Int. J. Environ. Sci. Tech., 4: 1-9, 2007.

[11]. Ize-Iyamu, OK., I.O. Asia and P.A. Egwakhide, Concentrations of residues from organochlorine pesticide in water and fish from some rivers in Edo State Nigeria. Int. J. Phys. Sci., 2: 237-241, 2007.

[12]. Standard methods for the examination of water and waste water. APHA-AWWA-WPCF, Washington, DC.