International Journal of Theoretical & Applied Sciences, 10(1): 247-252(2018)

ISSN No. (Print): 0975-1718
ISSN No. (Online): 2249-3247

Water Pollution due to Pesticides and its Impact: A Review

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(Received 12 February 2018, Accepted 26 April, 2018)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Pesticides are widely used all over the globe in order to kill the pests. Pesticides don't only kill the pests but may also target other species as well. The pesticides accumulate in human body and may cause dangerous health impacts on the humans. Solution to the pesticide use and applications seems difficult as very few people in developing countries rely on bio pesticides. The aim of this study is to review the concentration of pesticides, their impact on water bodies and human health.

Keywords: Pesticides, water body, human health, alterations

I. INTRODUCTION

Water is solution of life and all living being on the Earth can keep on existing without it. The primary piece of water on earth is marine water which can't be utilized without preparing by people. The percent volume of it that nature has provided to human beings is adequate to meet the need of the living creatures. Water quality is vital in our lives since it is basic need to help physiological exercises of any organic cell. Water contamination might be characterized as any impedance in its local qualities by expansion of anthropogenic contaminants to the degree that it either can't fill to people for drinking needs and additionally to help the biotic groups. Water contamination is the defilement of water bodies, for example, lakes, waterways, seas, and groundwater by human intervention. All water contamination influences living beings and plants that live in these water bodies and in all cases the impact is harming to the individual species and populaces as well as to the characteristic organic groups. It happens when contaminations are released specifically or in a roundabout way into water bodies without sufficient treatment to expel unsafe constituents (Agarawal *et al.,* 2010). The toxicity of a pesticide is a measure of its capacity or ability to cause injury or illness. The toxicity of a particular pesticide is determined by subjecting test animals to varying dosages of the active ingredient (a.i.) and each of its formulated products. The active ingredient is the chemical component in the pesticide product that controls the pest. By understanding the difference in toxicity levels of pesticides, a user can minimize the potential hazard by selecting the pesticide with the lowest toxicity that will control the pest.

The aim of this study is to review the concentration of pesticides, their impact on water bodies and human health.

A. Concentration of pesticides in water bodies

The River Jhelum is a popular stream situated in the northern locale of India i.e. in Kashmir valley. It is a tributary of the Chenab River which streams in India and Pakistan with an aggregate length of 505miles (813km). The stream Jhelum has been subjected throughout the years to huge weight because of release of untreated sewage, modern effluents, buildups of pesticides which may bring about effect of natural wellbeing of the waterway. The target of this examination was to distinguish and evaluate few pesticides both organochlorine and organophosphorous show in water of Jhelum in Kashmir valley. These pesticides are chiefly used to control the pollutant and yield hampers in horticultural fields and direct damping of waste into waterway frameworks. These pesticides have some physical and substance properties, for example, low watery solvency; water segment coefficient and industriousness in nature make them able to do long range transport. Accumulation of water tests are taken from three locales upstream, mid stream and down-stream lastly broke down for their pesticide profile. Different extractions like, fluid extractions, GE-ECD where utilized for the assurance of these mixes. Pesticides preferences of endosulfan, methyl parathion and DDT where seen in higher convergence of water tests gathered from stream Jhelum in Kashmir valley of India.

Particularly the grouping of DDT was high which may be because of moderate pollution of DDT in soil *i.e.* 80-100% of every 4-35 years (Shah *et al.,* 2016). The pollution is also added by about 90 villages, situated near Sandran stream, a confluence of river Jehlum in Anantnag, discharge their sewage into the river (Anonymous, 2014).

Pesticides, for example, organochlorines (OCPs) alongside modern based chemicals have been released in expansive amounts into the earth throughout the previous 50 years, principally to control horticultural irritations, creepy crawly borne ailments, and termites (Malik *et al.* 2010). Across the board utilization of these chemicals for farming and nonagricultural purposes in past years has brought about sullying of water, silt, and natural creatures, and is of real worry at nearby, territorial, and worldwide level (Doong *et al.* 2002a, b; Kishimba *et al.* 2004; Ioannis *et al.* 2006; Sarkar *et al.* 2008). OCPs are poisonous to natural living beings, debilitate environment respectability because of their high lipophilic properties (Vashchenko *et al.* 2005), have a tendency to adsorb on particulate issue because of low water solvency (Nowell *et al.* 1999; Yang *et al.* 2005), and are exchanged to higher trophic levels through natural ways of life (Lopez *et al.* 2005; Zhou *et al.* 2006; Malik and Zeb 2009). OCPs, as different contaminants, for example, inorganic chemicals, advance into normal amphibian biological systems by means of mechanical and metropolitan effluents, horticultural and urban nonpoint spillover, and climatic proclamation (Qadir *et al.* 2008), at last collecting and settling in base silt, which go about as a sink (Sarkar *et al.* 2008).

Deposit levels of chlorinated pesticides have declined essentially over the most recent two decades (Zhang *et al.* 2003), yet some OCPs, for example, DDTs, HCHs, cyclodiene, and so forth are as yet utilized as a part of creating nations (Malik *et al.* 2010); although the vast majority of them are prohibited, their ease and illicit utilize can't be disregarded (Tariq *et al.* 2007). DDT was prohibited in 1994 in Pakistan; in any case, a large number of kilograms of DDTs alongside other out of date steady natural contaminations are as yet found in substance distribution centers (Jan *et al.* 2008). As indicated by Malik *et al*. (2010) and Tariq *et al.* (2007), expansive stores of obsolete pesticides exist, evaluated at 3,805 tons in Punjab, 2,016 tons in Sindh, 179 tons in Khyber Pukhtoon Khawa Province, 128 tons in Baluchistan, and an out of date load of 178 tons in the Federal Department of Plant Protection, from where these dangerous chemicals discover their way into different ecological compartments through surface spillover and potentially sullying of groundwater. Then again, illicit utilization of these contaminating chemicals can't be ignored because of poor requirement of ecological laws. Of the pesticides, 74% are utilized as pest sprays, 14% as herbicides, 9% as fungicides, 2% as acaricides, and 1% as fumigants. Of all pesticides utilized as a part of Pakistan, 65% are connected on cotton, while others are utilized on products, for example, rice, sugarcane, maize, organic products, vegetable, and tobacco (Economic Survey of Pakistan 2005– 2006). As far as anyone is concerned, few investigations have evaluated OCP deposits in different natural compartments from Pakistan (Jabbar *et al.* 1993; Tehseen *et al.* 1994; Munshi *et al.* 2004; Saqib *et al.* 2005; Tariq *et al.* 2007; Malik *et al.* 2010). Notwithstanding, there is no data accessible in regards to OCP focuses in dregs of River Chenab, which is one of the biggest streams of the Indus Basin.

The levels of dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE), endosulfan, endosulfan sulfate, carbofuran, and cartap which were evaluated in the tissue of catla tested from ten locales of Ravi River between its extends from Shahdara to Head Balloki were concentrated to know the level of pollution of the chose pesticides by GC-ECD strategy. All fish tests were discovered tainted with various convergences of DDT, DDE, endosulfan, and carbofuran; be that as it may, DDT and DDE focuses were more than the most Maximum required limits (MRLs) about sustenance measures, while endosulfan sulfate and cartap were not distinguished. Pesticide focuses in the fish tissue were run from 3.240 to 3.389 for DDT, 2.290 to 2.460 for DDE, 0.112 to 0.136 for endosulfan, and 0.260 to 0.370 $\mu g\, g^{-1}$ for carbofuran. The discoveries uncovered that the pesticide fixations in the fish tissue diminished in the application: DDT > DDE > carbofuran > endosulfan. After Degh fall and After Hudiara nulla fall stream examining locales were discovered seriously sullied. It is suggested that steady checking programs are should have been started to conquer the present disturbing circumstance (Rather *et al.,* 2010).

The high level of pollutants in the Himalayas are confronting a consistently expanding risk from different anthropogenic weights which require better comprehension of the spatial and transient changeability of toxins, their sources, and conceivable cures. A study examined the multi-disciplinary approach using the multivariate measurable strategies, information from remote detecting, lab, and field-based perceptions for evaluating the effect of gigantic land framework changes on water nature of the waterway Jhelum.

Land framework changes over a time of 38 years have been measured utilizing multi-phantom satellite information to outline the degree of various anthropogenically determined land utilize types that are the primary non-point wellsprings of contamination. Fifteen water quality parameters, at 12 examining locales disseminated consistently along the length of the Jhelum, have been evaluated to distinguish the conceivable wellsprings of contamination. Our examination demonstrated that 18% of the forested region has debased into scanty woods or scrublands from 1972 to 2010, and the territories under croplands have diminished by 24% as individuals moved from water system concentrated horticulture to plantation cultivating while as settlements demonstrated a 397% expansion amid the perception time frame. One-way ANOVA uncovered that all the water quality parameters had noteworthy spatio-fleeting contrasts ($p < 0.01$). Bunch examination (CA) helped us to characterize all the inspecting locales into three gatherings. Factor examination uncovered that 91.84% of the aggregate fluctuation was for the most part clarified by five variables. Radical changes in water nature of the Jhelum since the previous three decades are showed by increments in nitrate-nitrogen, TDS, and electric conductivity. The particularly abnormal amounts of nitrogen (858 ± 405 μgL^{-1}) and phosphorus (273 ± 18 μgL^{-1}) in the Jhelum could be credited to the rash utilization of composts, pesticides, and spontaneous urbanization in the zone.

The pesticides have a place with a class of chemicals utilized worldwide as herbicides, pest sprays, fungicides, rodenticides, molluscicides, nematicides, and plant development controllers so as to control weeds, pests and maladies in crops and additionally for medicinal services of people and creatures. The positive part of use of pesticides renders improved yield/nourishment profitability and extreme lessening of vector-borne infections. Be that as it may, their unregulated and aimless applications have raised genuine worries about the whole condition by and large and the strength of people, flying creatures and creatures specifically. In spite of restriction on use of a portion of the earth constant and minimum biodegradable pesticides (like organochlorines) in numerous nations, their utilization is ever on rise. Pesticides cause genuine wellbeing risks to living frameworks in view of their fast fat dissolvability and bioaccumulation in non-target living beings. Indeed, even at low fixation, pesticides may apply a few unfriendly impacts, which could be observed at biochemical, atomic or behavioral levels. The elements influencing water contamination with pesticides and their buildups incorporate waste, precipitation, microbial action, soil temperature, treatment surface, application rate and the dissolvability, versatility and half existence of pesticides. In India organochlorine pest sprays, for example, DDT and HCH constitute over 70% of the pesticides utilized at introduce. Reports from Delhi, Bhopal and different urban communities and some rustic regions have demonstrated nearness of critical level of pesticides in new water frameworks and in addition packaged drinking mineral water tests. The impacts of pesticides contamination in riverine frameworks and savoring water India has been examined in this audit.

Organochlorine pesticides (OCPs), viz. b-hexachlorocyclohexane (b-HCH), c-HCH, aldrin, dieldrin, endrin, heptachlor, endosulfan-I, endosulfan II, heptachlor endoepoxide, heptachlor exoepoxide, mirex, dicofol, o,p0 - dichlorodiphenyltrichloroethane (o,p0 - DDT), p,p0 - dichlorodiphenyltrichloroethane (p,p0 - DDT), dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyltrichloroethylene (DDE) and 12 other physicochemical parameters were estimated in surface silt from River Chenab amid two inspecting seasons (Summer and Winter, 2007) to assess spatial and transient patterns of residue contamination. Various leveled agglomerative bunch examination recognized three gatherings of locales in light of spatial likenesses in physicochemical parameters and OCP leftover fixations. Spatial discriminant work examination (DFA) isolated 14 parameters, viz. dicofol, endosulfan-I, heptachlor endoepoxide, dieldrin, DDD, DDE, endosulfan-II, o,p0 - DDT, p,p0 - DDT, pH, electrical conductivity (EC), Cl-1, add up to P (%), and residue, which clarified 96% of aggregate change between spatial gatherings. c-HCH was the most as often as possible identified (63%) pesticide, trailed by DDD (56%). The proportion of DDTs to their metabolites demonstrated current information and anaerobic biodegradation. Worldly DFA featured aldrin, heptachlor endoepoxide, Cl-1, add up to P, and EC as essential factors which caused varieties amongst summer and winter. DDTs were moderately more pervasive when contrasted with different OCPs in the silt tests amid the two seasons. DDT metabolites were recognized at more prominent frequencies and focuses in winter, though DDT isomers were more pervasive in summer residue tests. Factor examination distinguished farming and mechanical exercises as real wellsprings of residue OCP tainting. Centralizations of c-HCH, heptachlor endoepoxide, dieldrin, and DDTs (isomers and metabolites) in all residue tests were well above break dregs quality rules (ISQGs) and likely impact limits (PEL) given by Canadian Sediment Quality Guidelines (CSQGs).

Organochlorine pesticides (OCPs), viz. β-hexachlorocyclohexane (β-HCH), γ-HCH, aldrin, dieldrin, endrin, heptachlor, endosulfan-I, endosulfan-II, heptachlor endoepoxide, heptachlor exoepoxide, mirex, dicofol, o,p′-dichlorodiphenyltrichloroethane (o,p′-DDT), p,p′-dichlorodiphenyltrichloroethane (p,p′-DDT), dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyltrichloroethylene (DDE) and 12 other physicochemical parameters were estimated in surface silt from River Chenab amid two examining seasons (Summer and Winter, 2007) to assess spatial and transient patterns of dregs contamination. Various leveled agglomerative bunch examination distinguished three gatherings of locales in view of spatial likenesses in physicochemical parameters and OCP lingering fixations. Spatial discriminant work investigation (DFA) isolated 14 parameters, viz. dicofol, endosulfan-I, heptachlor endoepoxide, dieldrin, DDD, DDE, endosulfan-II, o,p′-DDT, p,p′-DDT, pH, electrical conductivity (EC), Cl−1, add up to P (%), and residue, which clarified 96% of aggregate change between spatial gatherings. γ-HCH was the most regularly distinguished (63%) pesticide, trailed by DDD (56%). The proportion of DDTs to their metabolites showed current information and anaerobic biodegradation. Fleeting DFA featured aldrin, heptachlor endoepoxide, Cl−1, add up to P, and EC as critical factors which caused varieties amongst summer and winter. DDTs were moderately more pervasive when contrasted with different OCPs in the dregs tests amid the two seasons. DDT metabolites were recognized at more prominent frequencies and focuses in winter, while DDT isomers were more pervasive in summer residue tests. Factor investigation distinguished agrarian and mechanical exercises as significant wellsprings of silt OCP sullying. Convergences of γ-HCH, heptachlor endoepoxide, dieldrin, and DDTs (isomers and metabolites) in all residue tests were well above break dregs quality rules (ISQGs) and likely impact limits (PEL) given by Canadian Sediment Quality Guidelines (CSQGs).

The pesticides have a place with a class of chemicals utilized worldwide as herbicides, pest sprays, fungicides, rodenticides, molluscicides, nematicides, and plant development controllers keeping in mind the end goal to control weeds, irritations and infections in crops and additionally for social insurance of people and creatures. The positive part of utilization of pesticides renders improved harvest/sustenance profitability and intense decrease of vector-borne maladies. Be that as it may, their unregulated and unpredictable applications have raised genuine worries about the whole condition as a rule and the strength of people, winged creatures and creatures specifically. In spite of restriction on use of a portion of the earth determined and slightest biodegradable pesticides (like organochlorines) in numerous nations, their utilization is ever on rise. Pesticides cause genuine wellbeing dangers to living frameworks due to their quick fat dissolvability and bioaccumulation in non-target creatures. Indeed, even at low focus, pesticides may apply a few antagonistic impacts, which could be checked at biochemical, sub-atomic or behavioral levels. The variables influencing water contamination with pesticides and their buildups incorporate seepage, precipitation, microbial action, soil temperature, treatment surface, application rate and the dissolvability, versatility and half existence of pesticides. In India organochlorine pest sprays, for example, DDT and HCH constitute over 70% of the pesticides utilized at introduce. Reports from Delhi, Bhopal and different urban communities and some rustic zones have demonstrated nearness of huge level of pesticides in crisp water frameworks and additionally packaged drinking mineral water tests. The impacts of pesticides contamination in riverine frameworks and savoring water India has been talked about in this survey.

B. Impact of pesticides on human health

Suspected chronic effects from exposure to certain pesticides include birth defects, toxicity to a fetus, production of benign or malignant tumors, genetic changes, blood disorders, nerve disorders, endocrine disruption, and reproduction effects. Water Quality Concerns Drinking water for people from tainted wells is presented to pesticide and manure buildups. A known human wellbeing hazard from nitrate tainting is baby methemoglobinemia, a condition where nitrates are changed over into nitrites in the stomach related framework, weakening the capacity of newborn children's blood to convey oxygen. Nitrites are additionally viewed as cancer-causing (tumor causing) by a few investigators. Grouping of nitrates or pesticides in drinking water might be underneath levels at which intense wellbeing impacts have been watched. In any case, proceeded with presentation may bring about endless impacts (i.e., regenerative debilitations, disease, and so on.) to people or different creatures. The level of wellbeing hazard related with drinking water containing hints of pesticides or nitrates at, or beneath, levels where human wellbeing could be imperiled is ineffectively comprehended. A few pesticides are viewed as cancer-causing in substantial measurements, and accordingly, the United States Environmental Protection Agency (EPA) has issued wellbeing gauges characterizing most extreme admissible pollution levels for 26 pesticides.

Defiled groundwater that reemerges additionally influences nontargeted plants, feathered creatures, or sea-going living beings (some of which are jeopardized) in the earth. Because of quite a while of control endeavors, the offer of contamination from point sources, for example, releases from sewage treatment plants or modern sources, seems, by all accounts, to be diminishing. As indicated by the EPA, the non-point source contamination coming about because of farming culturing, pesticide application, and urban advancement destinations is the main source of surface water debasement today. Rural spillover is the absolute most broad wellspring of surface water contamination, representing 55 percent of impeded stream miles and 58 percent of disabled lake sections of land evaluated by the States in 1986 and 1987. In a current report by USDA's Economic Research Service (ERS), how much farming overflow added to conveyance of supplements and silt to lakes and streams were figured. Out of 99 watersheds inspected, 48 had over the top levels of supplements or dregs. The investigation observed farming to be a "prime source" (characterized as contributing in excess of 50 percent of contamination release) of nitrogen in nine watersheds. Agrarian wellsprings of silt were critical in 34 watersheds. Thirty-one watersheds had noteworthy horticultural release of phosphorus. Another current ERS think about distinguished the degree and criticalness of farming commitments to seaside water contamination. For the 78 estuarine frameworks considered, rural spillover provided a normal of 24 percent of aggregate supplements and 40 percent of aggregate silt. Farming contributed in excess of 25 percent of aggregate supplements in 22 of the 78 estuaries. High rates of pesticide misfortunes to surface waters were found in 21 frameworks. Fifteen estuarine frameworks demonstrated both noteworthy agrarian supplements and high pesticide misfortunes.

The degree to which the country's groundwater assets are influenced by farming chemicals is less notable. Disclosures of compound residuals in groundwater amid the late 1970's and mid 1980's dissipated the usually held view that groundwater was shielded from agrarian chemicals by impenetrable layers of shake, soil, and mud. Groundwater may likewise be debased by different sources, including nonagricultural utilization of pesticides and composts, and releasing underground stockpiling tanks.

The atmosphere of valley of Kashmir is perfect for new and dry natural product generation. Huge amounts of pesticides, pest sprays and fungicides (chemicals like chlorpyriphos, mancozeb, captan, dimethoate, phosalone, and so on.) are being utilized by the plantation agriculturists to shower the plants, foods grown from the ground leaves each year. The expanding pattern in the frequency of essential threatening cerebrum tumors in plantation ranchers of Kashmir is disturbing. Retrospectively case records alongside death endorsements of 432 patients of essential harmful cerebrum tumors and 457 controls (non-tumor neurologic sicknesses), conceded for treatment at the same time finished a time of 4 years from January 2005 to December 2008, to the Department of Neurosurgery, Sher-I-Kashmir Institute of Medical Sciences (SKIMS), Kashmir, were contemplated. Development and family contact was set up. The serum cholinesterase action was estimated by active/DGKC calorimetric strategy and ethylenediaminetetraacetic corrosive (EDTA) tests were sent to the lab.

Investigation uncovered that 90.04% (389 out of 432) patients were plantation cultivate laborers, plantation inhabitants and plantation playing kids presented to the elevated amounts of various sorts of neurotoxic and cancer-causing (chlorpyriphos, dimethoate, mancozeb and captan) chemicals for more than 10-20 years. Around 31.9% (124 out of 389) of these from both genders were more youthful than 40 years starting presentation at an early age and had higher (<6334 U/l) serum cholinesterase (SCE) levels. The 9.96% (43 out of 432) patients were not presented to pesticides. Then again, just 119 patients out of 457 controls had written history of pesticide presentation and 338 were irrelevant to pesticides. Out of 389 patients, 71.7% (279 out of 389) were guys and 28.3% (110 out of 389) including 7 individuals from three families, 6 were females and 1 male. All the 389 patients had high review tumors when contrasted with the non-pesticide tumors. Mortality in pesticide uncovered tumors was 12%. Larger amounts of SCE were found in 31.9% (124 out of 389) patients and diminished levels in just 45.3% (176 out of 389) plantation related patients. The critical case/control chances proportion (OR) of 0.28, clinic control SCE OR of 1.1 and family control SCE OR of 1.5, indicates the finger of doubt the connection amongst pesticides and cerebrum tumor (Bhat *et al.,* 2010).

CONCLUSION

The amount of pesticides that enter into the different water bodies cause varied changes in the physical, chemical and biological properties of water. Subsequently, the most negative impact that is cause of concern is the contamination of pesticides in water that is used for drinking purposes. The contamination may cause different health problems among the consumers that may range from mild to health threatening conditions.

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