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A REVIEW ON PESTICIDES IN YAMUNA RIVER AND ITS IMPACT ON VEGETABLES GROWN NEARBY AREAS

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ABSTRACT

Pesticides are particularly toxic and deadly for animals and humans alike. They pose hazards to customers, pedestrians, and staff during manufacturing, transportation. Pesticides are hazardous for animals and also for food crops even after washing and peeling. Pesticides decrease soil fertility and, in the absence of pesticides, the quality of soil has been found to be more with the added benefit of increased water preservation. Various pesticides are highly poisonous and these pesticides may contribute to the death of humans and animals except in quite small quantities, while exposure to a vast quantity of nearly any pesticide will trigger long term illness. As they are less stable and potentially harmful compared to organochlorine pesticides, this has increased the use of organophosphorus pesticides. This paper examines the status of pesticides and their effect on vegetables in Yamuna River. Farmers use a larger range of pesticides for high crop yields. A recent research confirmed that the excessive usage by farmers on the Yamuna floodplains of fertilizers and pesticides leads to poison the river water, its floodplains and groundwater, as well as vegetables and fruits grown nearby. This paper addresses the status of pesticides in Yamuna River and their impact on vegetables (Central Population Control Board).

***Keywords*:** CPCB, fertilizers, sewage, organ phosphorus fertilizers, DDT, DDE

Introduction

Yamuna's catchment area is highly urbanised, and many drains in the stretch of Delhi discharge into the river directly or indirectly (Atul *et al*., 2014). Frequent media reports highlight metal and pesticide pollution of vegetables grown along the banks of the Yamuna River in Delhi (Suruchi and Pankaj Khanna, 2011). In addition to being a popular water source, the Yamuna River is also a sacred symbol as part of eternal culture, and is worshipped in Indian Culture as a goddess. There are several temple towns along its bank which have their characters based on the river. Plant effluents and untreated waste are discharged into surface water bodies in Delhi and nearby (Singh *et al*., 2012). Water scarcity, forcing farmers to use wastewater to irrigate their grain and vegetable fields (CPCB, 2019). Metals such as silver, copper and manganese were present in the river when the groundwater contained large amounts of iron and manganese (Singh *et al*., 2012). Aluminum, arsenic, and chromium were found to be above acceptable levels in certain areas, according to a senior CPCB official. The apex pollution control body has proposed controlling floodplain farming, and farmers are prevented from growing these vegetables and fruits usage of sustainable cultivation and biological management of pests along with training of farmers to eliminate the use of toxic substances has also been promoted by CPCB.

The below pictures show the crop conditions and the area affected by the pesticides. The treatment of sewage water in Delhi's major and its dangerous effects are compounded over time because untreated sewage water is used to grow crops in the urban environment (Parmar *et al*., 2012). Owing to its resistance to insects and diseases, pesticides are commonly used in fruit and vegetables. They have been commonly used around the world for their various benefits since the middle of the last century. Pesticides have been used to eradicate pests in livestock and in animal production (Karol *et al*., 2000). To increase the productivity of both animals and crops, boost food quality and reduce the Occurrence of insect transmitted diseases (Tyagi Mohit *et al*., 2015). They are added directly to the seeds, and some can even be found in the fruit and vegetables as residues after their harvest. Although many of the pesticides and fungicides are harmful substance but they provide a significant result in the cultivation of fruits and vegetables for generating commercial marketable goods (Kumar *et al*., 2011). Such inappropriate use, however has sometimes, been followed by threats to human being and also to environment. Residues of certain pesticides are contained in all compartments of the agro-ecosystems (EFSA, 2009)but maybe the most significant human danger is through the ingestion of residues as vegetables and fruits in food (Arsenault *et al*., 2000). Some pesticides are extremely strong, and very prone to microbial degradation. Since 1970's usage of pesticides with high toxicity has made restricted and even though banned in various countries (Kaushik *et al*., 2008). Various harmful pesticides like organophosphate, organochlorine are causing paralysis and death by blocking nerve activity (Boon *et al*., 2008). Chronic exposure entails effects on the neurotics and behaviour. Pesticides may have serious effects including

asthma, allergies, cancer and hypersensitivity, central and peripheral disruption to the nervous system (Gilden *et al*., 2010). Reproductive disorders and immune system disruption, while many developing countries are still using these pesticides as they are banned in developed countries.

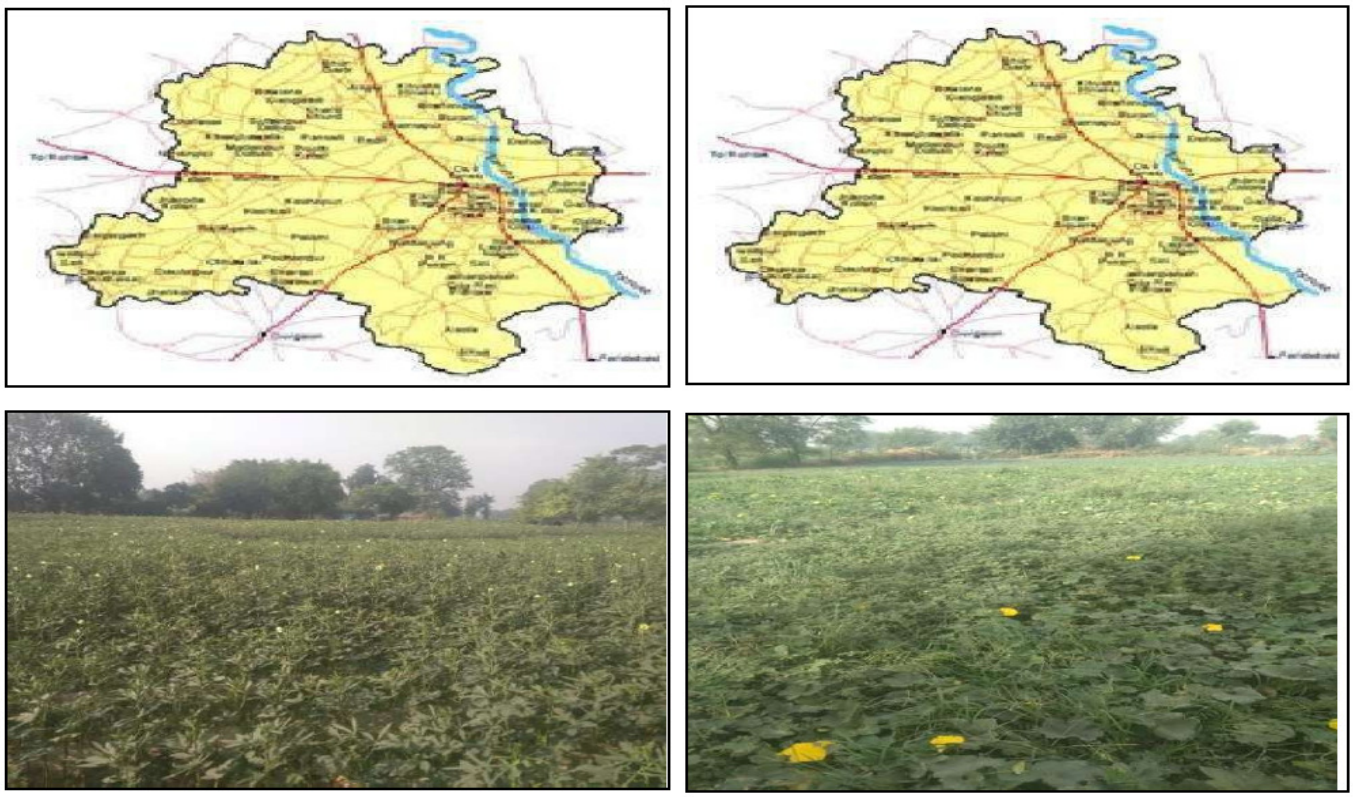

Fig. 1: Yamuna River located nearby Delhi and Vegetables grown in the bank of it.
Source: CPCB, August 2019.

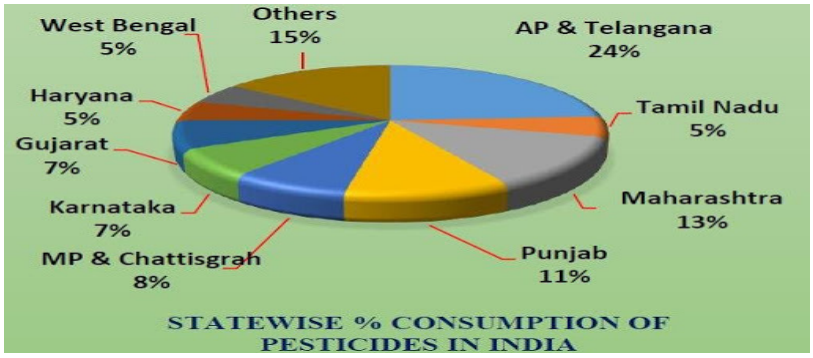

Fig. 2 : States are using the pesticides in the various proportions shown in the pie chart
Sources: http://news.agropages.com/News/NewsDetail---21374.htm

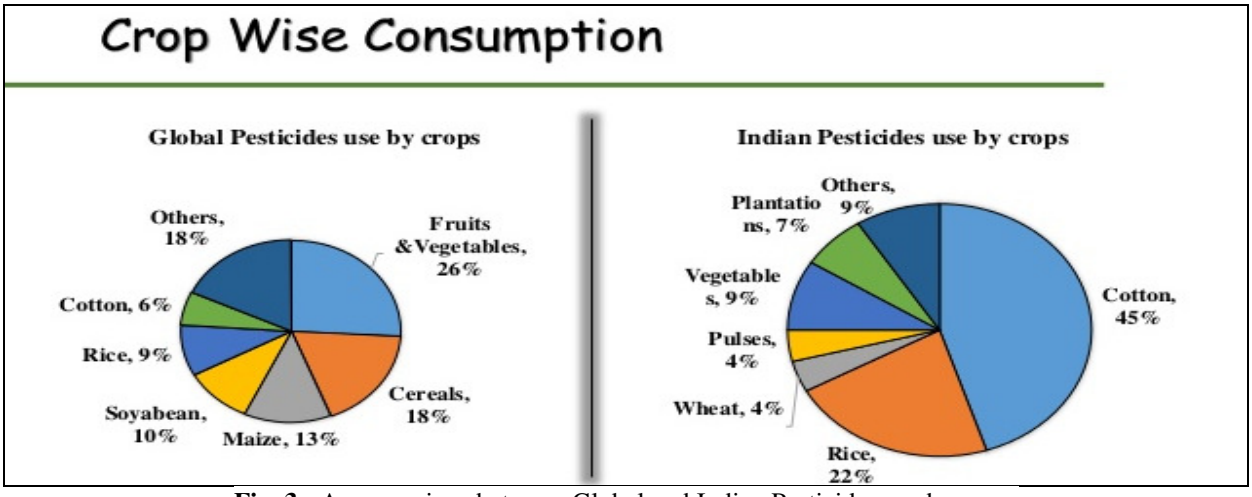

Fig. 3 : A comparison between Global and Indian Pesticides use by crops
Sources: http;//www.ficci.com

In a variety of use s several legal pesticides are also used. Moreover, in several third world nations there are records of significant contamination of diverse environmental components with dichlorodiphenyltrichloroethane and their hexachlorocyclohexane (BHC) residues. Due to presence of dangerous potential of such pesticides in developed countries have adopted policies to control and track pesticides in the environment, environmental pollution concerns are not well established in those countries. As a result, periodic survey studies and surveillance systems were performed on pesticide residues (Ecobichon *et al*., 2001).

Fig. 4: Farmers using illegal groundwater pits in New Delhi that farm around the Yamuna River
Source:https://www.hindustantimes.com/india-news/excessive-fertiliser-use-is-poisoning-yamuna-river
Farmers who farm illegal groundwater in New Delhi around the Yamuna River (Hindustan Times).

Pollution control body study finds metals in the Yamuna River, such as manganese, copper, lead. Groundwater also had a high iron and manganese content (Munendra Singh *et al*., 2001). Many other heavy metals have been detected in the Yamuna River (Darshan Malik *et al*., 2014)

Fig. 5: Working farmers in their farm on the banks of Yamuna River
Source: https://www.hindustantimes.com/delhi-news/studies-to-check-ifvegetables-from-yamuna-floodplain

As to make the people aware about not to consume the contaminated fruits and vegetables grown near the banks of Yamuna River, an awareness campaign was intended by the Delhi government. This was declared after a meeting between the Government of Delhi and the monitoring committee of two members on December 24. In 2015 the NGT banned vegetable cultivation on the floodplains.

The various types of disease associated with vegetables

The aim of pesticide application is to keep the plague under control (Rai Swapnil *et al*., 2016). To prevent economic loss of crop yields the insect population must be kept controlled to reduce biological activities (niphm.gov.in). Comprehensive pest killing or plague eradication is neither feasible nor necessary. Besides keeping the pest population under control, the purpose of pesticide application should also be to avoid contamination and harm to the non-targets. The application of pesticides is aimed at keeping the plague under control. The insect population must be kept under control to avoid economic loss of crop yields in order to minimize biological activity (Ashita Sharma *et al*., 2016). Comprehensive killing or eradication of plague pests is neither feasible nor necessary. Besides keeping the insect population under control, the application of pesticides should also seek to prevent pollution and damage the non-targets (https://niphm.gov.in/Recruitments/PHE-ASO-Manual-22042013.pdf).

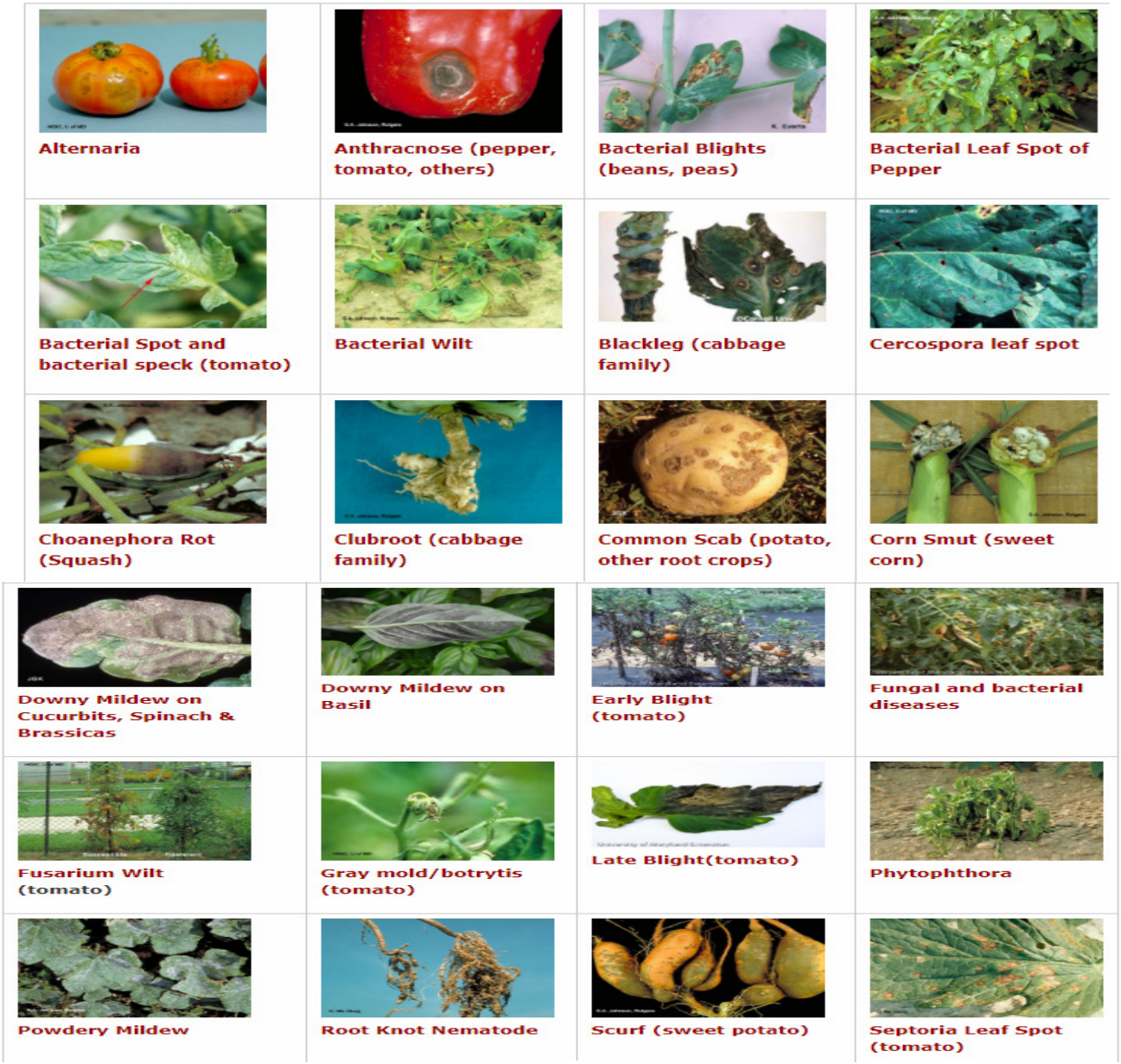

Fig. 6: Different types of disease in the vegetables

Sources: https://extension.umd.edu/hgic/topics/vegetable-diseases

Removal of pesticides

More residues have been continuously detected on raw materials over the past decade than on the goods manufactured accordingly. This lead to the assumption that specific household preparation and processing can help to mitigate the pesticide residues. Hypothesizing that rinsing can play some role in reducing residue levels during the process (Holland *et al*., 1994). The study suggests the impact that rinsing produces under tap water have on residue levels of pesticides (Holland *et al*., 2004). In recent times various fruit and vegetable wash items have appeared on the market.

Rinsing Fruits and Vegetables with Tao Water

While rising fruits and vegetables prior to consumption has been believed for several years to reduce the quantity of residues of pesticides (Rajesh Kumar Sharma *et al*., 2008). In the scientific literature there are numbers of studies that have analyzed the effect of washing produce as a step in commercial crop processing to remove pesticide residues. These results are of no practical interest to consumers who want to know what effect household preparedness can have on reducing the level of pesticides residue. Residues of DDE, a DDT metabolite, have also been reported. While several persistent organic halogen pesticides (POPs), such as DDT, were prohibited for use on food crops in the United States from 1972 to 1978, they remained in the environment where they continue to be integrated into plant biomass (Hamilton D. and Crossely S). The data provided in a study of CPCB indicates that a quick rinse in tap water eliminates pesticide residues on several types of items. The vinclozolin, bifenthrin, and chlorpyrifos residues were not reduced. The study also shows that there is no important role in the observed decrease in the water solubility of pesticides. Most residues of pesticides tend to remain on the surface of the substance, where they are extracted by the rinsing mechanical action (Celik *et al*., 1995).

Washing of vegetables and fruits

The efficacy of four commercially available fruit and vegetable wash solutions in the elimination of pesticide

contaminants from solutions was compared with the Palmolive one percent solution and tap water rinsing. A number of those from previous study included the nine pesticides analysed in this report. Including the herbicide DCNA, the three fungicides chlorothalonil, iprodione, and vinclozolin, was studied (https://www.neeri.res.in). Each batch has been split into seven treatment classes. One group was analysed as obtained from the field, in an unrinsed state; one group was rinsed for one minute under tap water. Detailed statistical analysis indicated at least one category was different from the others in all situations. Comparison on a par showed that the unrinsed product was the category that was different.

Table 1: Results of Tap WaterRinsing in reducing residues

Pesticides	Pairs of Data	Water Solubility	Significantly Solubility (mg/L @ 20 ° C)
DDE	21	Yes	<1
Diazinon	22	Yes	40
Permethrin	37	Yes	0.2
Endosulfan	61	Yes	0.32
Befinthrin	7	No	0.1
Malathion	7	Yes	1.30
Chloropyrifos	13	No	2
Methoxychlor	12	Yes	0.1
Fungisides			
Catan	34	Yes	3.3
Chlorothalonil	9	Yes	0.6
Vinclozolin	23	No	3.4
Iprodione	13	Yes	1.3

Source: "https://portal.ct.gov/CAES/Fact-Sheets/Analytical-Chemistry/Removal-of-Trace-Pesticide-Residues-from-Produce"

Table 2: Pesticides used for analysis which has been considered under the restricted use and banned category by Central Insecticides Board & Registration Committee.

Sr. No.	Pesticides	**Banned from**
1	Aldrin	19.03.2019
2	Dieldrin	(vide S.O. 682 (E) dated 17th July 2001)
3	Endosulfron	(vide ad-Interim order of the Supreme Court of India in the Writ Petition (Civil) No. 213 of 2011 dated 13th May, 2011 and finally disposed of dated 10th January, 2017)
4	Endrin	19.03.2019
5	Heptachlor	19.03.2019
6	Lindane (Gamma-HCH)	19.03.2019
7	Methyl Parathion	(vide S.O 3951(E) dated 8th August, 2018)
8	Phosphamidon 85% SL	S.O. 3951 (E), 31st December, 2020
9	Alachlor	S.O. 3951 (E), 31st December, 2020
10	Phorate	S.O. 3951 (E), 31st December, 2020
11	Phosphamidon	S.O. 3951 (E), 31st December, 2020

Sources: CPCB 2019

While the use of pesticides has yielded substantial economic benefits by increasing the production and yield of food and fibre, and by avoiding vector-borne diseases, research shows that their use has adversely affected the health and climate of the human population. Pesticides have spread extensively and can be present in all natural habitats (air, water, and soil). While DDT and HCH are prohibited in India, they are still in use in domestic and agricultural settings. In the Indian region, the position of persistent organic pesticides is being studied to emphasise the global distribution of persistent organic pesticides and their impact on neighboring countries and regions (Yadav *et al*., 2015). Based on an analysis of research papers and models of modeling, it can be inferred that India is one of the main contributors to the global persistent delivery of organic pesticides

Conclusion

River supports all forms of life, from coastal, aquatic and transitional (riparian) ecosystems. Yamuna is a reservoir that influences the recharge of ground water, edaphic factors, faunal, floral distribution and Countryside of its catchment area. The load of heavy metals and pesticides in Yamuna River water is of concern as Delhi population is reliant on Yamuna water. Farmers use Yamuna water polluted for irrigation Application which results in accumulation of heavy metals. Pesticide exposure can cause a number of neurological health effects such as memory lack, loss of coordination, reduced speed of stimulus response, reduced vision ability, impaired or uncontrollable mood and general activity and decreased motor skills. These symptoms are also very slight, and the medical profession does not understand them as a clinical result. Other possible health consequences include asthma, allergies and hypersensitivity, and pesticide use is also associated with cancer, hormone disturbance, and

problems related to reproductive and foetal development issues and pesticides in the food chain. The higher levels of such chemicals as a result, aquatic flora fauna died and human effects. Yamuna River's prevalent dire state is severe issue. Yamuna River's prevailing dire condition is a serious problem and Delhi governments urgent initiative is needed to prevent further deterioration of the population of Delhi and nearby markets. This review also discusses the health impacts of persistent organic pesticides, the legislative measures for persistent organic pesticides and the state of India's attempts to eliminate persistent organic pesticides. Government should take urgent preventive measures to stop these heavy risks over the human health .Organic farming should be promoted to reduce the harmful impact of chemical fertilisers and pesticides in River Yamuna's Delhi flood plain.

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