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Topic of Research: Drug Residue Contamination in Aquatic
Environment and their
Bioaccumulation in Green Leafy Vegetables
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Findings

India is ranked third globally for its pharmaceutical industry, following North America and Europe, with an estimated revenue of 38 million INR by 2020. Due to its significance in the industry, India is considered a "country of concern" when it comes to issues related to pharmaceutical chemicals, along with other major producers. Pharmaceuticals that affect the environment include antibiotics like enoxacin, gentamicin, neomycin, and ciprofloxacin, as well as antidepressants like citalopram and escitalopram and various other drugs belonging to different classes. Drug residues such as antibiotics, are a growing concern as they are frequently found in sewage from urban runoff.

The analysis of pharmaceutical residues like antibiotics in various environmental samples is becoming increasingly difficult due to low levels of the target compounds and complex matrix effects. Pretreatment is often required to effectively separate the analyte from other matrix components and concentrate it for analysis. This helps to improve the accuracy of the analysis. The need for precise determination of trace levels of various compounds with different physical and chemical properties in environmental samples calls for careful selection of experimental conditions. Hence, designing effective analytical methods is crucial for efficient, sensitive, and targeted analysis. Different techniques based on liquid chromatography (LC-MS/MS) and Gas Chromatography (GC-MS) for the evaluation of antibiotics have been reported. The separation of liquid chromatograms was performed using a Waters UPLC H-Class separation module in Milford, MA, USA. The UPLC column used was the ACQUITY UPLC BEH C18 with a particle size of 1.7 μm and a diameter of 2.1 mm.

This study was aimed to identify and quantify the major targeted drugs in the 22km long stretch of river Yamuna, New Delhi. According to reports of the CPCB the Yamuna river's water quality is good all the way upstream to Wazirabad in Delhi from its source. Once it enters Delhi, it becomes one of the most polluted river length stretches from Wazirabad to Okhla, which makes up less than 2% of the river's entire length, and it receives the majority of its pollution load from sewage and industrial discharges.

The study will be covered in the following chapters:

Chapter 1 gives an overview of the research study. This chapter will cover the need for the study, the motivation for the study, aim, objectives and method to achieve the objectives of this study and the organisation of the thesis.

Chapter 2 discusses the sources of antibiotic residues in the aquatic environments along with their locations and fate, common emerging pollutants in aquatic environment, drug residues in surface water, wastewater, soil and vegetables, their bioaccumulation, toxicity, and health effects due to their bioaccumulation, and the impact they have on aquatic environment.

Chapter 3 describes the principles and analytical techniques used for the extraction of commonly antibiotics, selection of criteria for identifying the pharmaceuticals of environmental relevance, identification of analytical techniques, liquid-liquid extraction, advantages and limitations of different extraction techniques, chemicals, standards and reagents used in the extraction process,

Chapter 4 address antibiotics and their profiling in surface water and wastewater environment of river Yamuna. This chapter will highlight a study area, site description and sample collection locations selected to carry out the research analysis, method development by using UPLC-MS/MS, characterisation of the selected drugs.

Chapter 5 deals with the identification, occurrence, and quantification of selected drug residues in soil and leafy vegetable irrigated via pharmaceutical contaminated waters. Pharmaceutical persistence in soil along with the factors that effects their persistence.

Chapter 6 address the bioaccumulation and bioconcentration of selected drugs in the different environmental matrices like soil and leafy vegetables. Calculations of bioconcentration factor and their risk concentration factor, exposure to living organisms by the consumption of pharmaceutical contaminated vegetables, chronic toxic effects.

Chapter 7 summarises all that has been discussed in the earlier chapters, mention the limitations faced and make suggestions for further studies on the subject.