General Introduction
The ever-increasing population, industrialization and newer agricultural practices have lead to the total deterioration of the available drinking water of Agra region. The city of Agra, the hot-spot of all the tourists from around the globe, is situated on the banks of river Yamuna. This city is in a dire situation in terms of drinking water quality. Two major factors are responsible for the falling drinking water quality: prevalence of pesticide residues and fecal contamination. It is thus important to monitor the quality of drinking water as a continuous process and also to analyze the correlation or interdependence of these pollutants and their possible ecological impacts when present together.

The contamination of soil and water by human and animal fecal matter constitutes a serious environmental and public health threat, as they are likely to contain human-specific pathogens. The direct detection of pathogenic bacteria and viruses, and cysts of protozoan parasites requires costly and time-consuming procedures; moreover, the task would be enormous if one contemplates the monitoring of hundreds of pathogens and parasites on a routine basis in water and wastewater treatment plants, receiving waters, soils, and other environmental samples. *Escherichia coli*, a fecal coliform among many others is generally considered the most reliable indicator, since it is widely distributed in the intestine of humans and other warm blooded animals and its presence directly relates to fecal contamination with its implied threat of the presence of enteric disease agents (Fujoka *et al.*, 2002) Further, the identification of fecal pollution sources employing microbial source tracking techniques is also imperative to aid in the restoration of water quality and reduce the risk of infectious diseases.
In addition to fecal contamination, pesticides also impose a serious threat to the drinking water quality, due their indiscriminant use in various vector control programs as well as agriculture, in this region. If the credits of pesticides include enhanced economic potential in terms of increased production of food and fiber, and amelioration of vector–borne diseases, then their debits have resulted in serious health implications to man and environment. No segment of population is completely protected against exposure to pesticides and their potentially serious health effects. Assessment of human exposure to pesticides and other toxicants through biological monitoring, offers one means to evaluate the magnitude of potential health risk of these chemicals. Toxicity of these chemicals can also be monitored for water effluents by bioassays employing fish and macro invertebrates (Bringmann et al., 1980). Tests on microbial systems to screen toxicants, prove to be better alternatives to animal tests, because these tests are rapid, inexpensive, sensitive and simple. Responding to changes in environment is a fundamental property of living cells and is especially important for unicellular organisms, which directly interact with the changing microenvironment.

*Escherichia coli* was thus, utilized as a model organism and a biomarker to analyze the effect of pesticide residues and the alterations elicited by these anthropogenic perturbances on microbial communities, leading to possible long-term ecological disturbances, could occur if the use of pesticides is not regulated.

The thesis enumerates the prevalence, source tracking and identification of *E. coli* serotypes in drinking water of Agra region on a seasonal basis as well as the persistence of pesticide residues in these waters. The effect of these pesticides on
*E. coli* isolates at the Cellular, Biochemical and the Molecular level has also been ascertained.

The thesis is divided into the following sections:

1. Detection of *Escherichia coli* in drinking water
2. Pesticide residues in drinking water
3. Cellular and Biochemical analysis
4. Molecular Analysis