India supports more than 16% of the world’s population with only 4% of the world’s fresh water resources (Rattan et al., 2005). The agriculture sector in the country has been a major user of water while the share of water allocated to irrigation is likely to be decreased by 10-15% in the next few years. Some of the steps which must be taken up immediately to overcome this deficit are conservation, optimum utilization of fresh water and recycling of wastewater as fresh water resources are adversely affected day by day due to increase in population, industrialization, urbanization, and recurring droughts. In India population has grown far above the normal expectations and so has the amount of water needed to produce food and vegetables and to fill the number of the other needs we have for water. The greatest single use of fresh water here and elsewhere also, is the irrigation which accounts more than 60-70% of the total water consumption. It may be of interest to note that Asia with approximately 31% of its cultivated land under irrigation has surprisingly the maximum irrigation land. The problem arises further in such areas as efficiency of irrigation water use is rather low because of high evaporation, seepage losses and poor drainage systems therefore, in some cases about 40-80% of the water withdrawn for irrigation not reaches to the required destination. The conditions explained above hence forces the farmer to shift towards the waste waters in what ever form it is available to them at the time of their need.

Therefore, the use of sewage in farming seems to have gained the acceptance among farmers of today, although sewage farming is not new as during the middle of the last century, attention was drawn to the fertilizing value of sewage and even recommended for land treatment as the best method of its disposal. Findings of the British authorities considerably helped in the development of sewage farming in England and its irrigation spread very rapidly throughout the Europe. In India also sewage irrigation has been the predominant mode of its disposal ever since sewerage system came to be introduced and large numbers of sewage farms were disposing of sewage satisfactorily in different states of the country (Mahida, 1981).
According to a report published by the Central Pollution Control Board of India (CPCB), 423 class I cities with more than 1,00,000 and 498 class II towns with population between 50,000 to 1,00,000 of the country in which more than 70% of urban population houses, generate about 26,254 million liters per day (ML/d) sewage and the wastewater generated from the major industries has been reported to be approximately 83,048 ML/d (Bhardwaj, 2005). Therefore the farm scientists in India are, suggesting the use of wastewater wherever it is available for irrigation and the farmers are willing to opt for its greater consumption in regions of fresh water scarcity near the urban areas specially for vegetable cultivation. The use of sewage waste water for irrigating the agricultural lands is therefore, on the rise and treated sewage is comparatively a better source of water to minimize the problems of its disposal, and to overcome the lack of fresh water availability to farmers. In addition the nutrients present in it provide fertilizer benefits to crops thereby decreasing the burden on farmers and environment. It may be pointed out that domestic sewage mainly consist of discharges of dirty water from houses. It is complex mixture of mineral and organic matter in various forms including particles of different size in solution, suspension and colloidal dispersion. It also contains living matter, specially bacteria, viruses and protozoa. Most of the bacteria are relatively harmless but some of them are dangerous being pathogenic. Therefore, the farmers as well as the consumers are to be alarmed about them. Another negative aspect of this water may be, in certain instances, nutrients are in excess of plant needs and may cause problems related to excessive vegetative growth, delayed maturity and poor quality in addition to presence of heavy metals and salts.

Vegetables are regarded as an essential constituent of food, because of their richness of carbohydrates, proteins, fats, minerals and vitamins. In India vegetable consumption is many times more than the European countries due to two main reasons, first, the vegetarian food habit of a very large population because of their religious faith and secondly, the lower cost of the common vegetables compared with meat, fish, eggs and milk products. It is also important that compared to other crops many vegetables can be grown throughout the year and can be marketed regularly, because some of them are ready within a short span of two to three months only and can be raised profitably specially the underground vegetables like turnip, radish, potato etc. Among root crops turnip has been used as a vegetable for human
consumption in Europe since prehistoric times as it is rich in vitamin C, dietary fiber, and it has antioxidants low calories. It lowers the risk of high blood pressure and diabetes, cancer of the stomach, pancreas, bladder and lung. It is also a good source of calcium, phosphorus and magnesium. Turnip greens are excellent source of riboflavin, and iron. It contains Water (119.4 g), Protein (1.17 g), Carbohydrates (8.36 g), Fiber (2.3 g), Sugars (4.94,) Total fat (0.13 g), Saturated fat (0.014 g), mono unsaturated fat (0.008), Polyunsaturated fat (0.069), Cholesterol (0 mg) and calories equivalent to 36 g in 130 gm of turnip or one cup of turnip cubes (Anonymous, 2008). The best quality turnips are successfully grown in the Northern plains and hilly terrains of India including Uttarakhand where the city of Roorkee is situated. It grows best in a moderately deep loam, fertile and slightly acid soil and does not do well in soils that are of high clay texture, wet or poorly drained as for good root growth turnip needs a loose and well aerated soil.

Most plants require seventeen essential elements including Ni which was added recently (Hopkins, 1995) among the list of essential elements for their normal growth and development. Of these N, P, and K are the three major macronutrients effective in promoting the crop yields and required in larger quantity. These nutrients are commonly present in sewage wastewater along with some other nutrients like Ca, Mg, S and micronutrients like Cu, Zn, Mn and Fe although these micronutrients are also categorized as heavy metals and may be toxic to plants and disturb a wide range of biochemical and physiological processes, such as photosynthesis, pigment synthesis, protein metabolism and membrane integrity if taken up at excessive levels (Yang et al, 2008). Similarly there may be some heavy metals like Cd and Cr which have not shown any specific functions in plant growth and the former element is toxic to all organisms. Its excessive presence in soil may cause many toxic symptoms in plants, such as reduced growth, especially root growth, disturbances in mineral nutrition and carbohydrate metabolism and may therefore, strongly reduce the biomass production. While Cr toxicity appear as wilting of tops and root injury, and chlorosis in young leaves (Pendias and Pendias, 1992).

Keeping these points in view, and due to the presence of nutrients mentioned above studies have been undertaken to investigate the effect of anaerobically treated sewage wastewater based on four pot experiments with the following aims:
1. To study the physicochemical properties including presence of various essential nutrients, heavy metals and coli forms of sewage wastewater of the two sewage treatment plants.

2. To study the comparative effect of different concentrations of 38 ML/d wastewater and tap water for getting suitable concentration and obtaining the optimum dose of phosphatic fertilizer on the basis of growth performance and heavy metal accumulation in root and leaf (Experiment-I) of turnip.

3. To study the comparative effect of different concentration of 38 ML/d wastewater and tap water with different doses of potassic fertilizer to obtain the suitable concentration and optimum dose of potassic fertilizer on the basis of growth performance of turnip and heavy metal accumulation in root and leaf (Experiment-II).

4. To study the 34 ML/d wastewater under two concentrations and different doses of phosphatic fertilizer and to obtain suitable concentration of wastewater and optimum dose of phosphorus on the basis of growth performance and heavy metal accumulation in root and leaf of turnip (Experiment-III).

5. To study the 34 ML/d wastewater under two concentrations and different doses of potassic fertilizer and to obtain suitable concentration of wastewater and optimum dose of potassium on the basis of growth performance and heavy metal accumulation in root and leaf of turnip (Experiment-IV).

6. To observe if the crop may be suggested as a suitable vegetable for the cultivation under two different wastewaters one generated from 38ML/d located at Saharanpur and another 34ML/d located at Noida on the river Hindon which runs for a short distance between the Ganga and Yamuna and merges in Yamuna, the two major rivers of North India.