INTRODUCTION

The indiscriminate dumping of urban and industrial effluents is leading to accumulation of heavy metals in soils to toxic. These contaminants not only impair physiological processes of plants leading to reduced productivity but also pose serious health risks to animals and humans by entering into food chain via soil-plant-animal/human route. Heavy metals in sewage water are important due to their bio-accumulative nature in various plant parts, adversely affecting plant growth and metabolism; plants which absorb to heavy metals from sewage water stunt grown, and chlorosis, necrosis, leaf epinasty, and discoloration are symptoms of phytotoxicity. Plants are the pathways to move these heavy metals from water to human beings. The possible adverse effect of heavy metals and their phytotoxic effect have been reported by several workers.

A variety of leafy vegetables are used in a balanced diet (116 g/day) because they are rich in minerals and vitamins A and C. Amongst all types of pollution, agricultural utilization of sewage water in urban cities deserves special attention as it is making the environment quite unsuitable for human health. The impact of sewage water use has long been recognized as a risk factor for human health.

Heavy metal potentially endangers soil, air and water, thus plants and especially animals and human health. The highly labile behavior of heavy metal in soil and especially in those contaminated with relatively
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Studies on Accumulation of Heavy Metals in vegetable crops grown on polluted soils

high concentrations of the metals, is an important factor in the accumulation of heavy metals and its consequences to human health.

The mobility of heavy metals in the soil to land system is influenced by several factors, e.g. the heavy metal content pH, clay and organic matter content of soil, and plant characteristics.

Enrichment of soil with heavy metals is a problem that has global dimensions and is increasing. The discharge of heavy metals as a byproduct of various human activities has been accompanied by large scale soil pollution.

Municipal solid waste (MSW) is one of the most important anthropogenic sources of heavy metals for soils. These heavy metals can leach into the deeper layers of the soil at ground water or can be incorporated into food web and have a significant effect on environmental quality. These metals are known to be persistent in soil over long time periods.

The unscientific disposal of untreated or under-treated effluents has resulted in accumulation of heavy metals in land and water bodies. Heavy metals contamination due to the sewage and sludge application to soils imposes a major limitation on potential land use. Cultivated areas under Peri-urban agriculture are worst affected by this problem. The heavy metals are accumulating in soil may get entry into the human and animal food chain through the crops grown on it.

Earlier studies revealed that vegetable crops grown in peri-urban or suburban areas of a developing or developed cities of India have been contaminated with toxic heavy metals reach as Cd, Ni, Pb, Cr etc. The
level of heavy metals in vegetables depend on the exposure time, heavy metals concentration in soil, air, irrigation water, species and their morphological matter.

Unlike organic compounds, metals cannot degrade, and therefore effective cleanup requires their immobilization to reduce or remove toxicity. In recent years, scientists have started to generate cost effective technologies that include use of microorganisms, biomass or live plant to clean polluted areas.

The indiscriminate dumping of urban and industrial effluents is leading to accumulation of heavy metals in soils to toxic levels. These contaminants not only impair physiological process of plants leading to reduced productivity but also pose serious health risks to animals and humans by entering into food chain via. Soil-plant-animal/human route.

Soil may get polluted by a number of ways but it is interesting that soil is still the only place, where crops can be produced. Heavy metals potentially endanger soil, air and water, thus plants and especially animal and human health. Although several adverse effects of the toxic metals have been known for a long time, exposure to heavy metals continuous, and is even increasing in some parts of the world in particular in less developed countries.

Cadmium and lead are considered as environmental hazards, as they are toxic for human being and other organisms. Although, cadmium and lead aren’t necessary elements for plant, the plants absorb these elements from soil and concentrate them on different edible organs. These elements are not only toxic for human, but their concentration and absorption in plant organs also causes toxicity. Controlling of the input of
heavy metals to the plant, especially plant’s edible organs, is very important in order to make sure of the food’s health. A study of several researches in the field of the effects of heavy metals on the absorption of toxic and nutrient elements in plants shows that many researchers have been done in this field. But, in comparison to one element researches, fewer investigations have been performed in field of the interaction of heavy metals in plant. Mostly, chemical pollutions are found in the form of combinations and mixtures of some contaminants in the environment and in between soil pollution is a multi-elements problem in many areas, which are caused by heavy metals.

There is a concern about the long-term effects of heavy metals. Disposal of sewage-sludge has received much attention as increasing amounts of these wastes are being produce by urban and industrial activities. Much research work has been carried out on the possible adverse effects of metals on crop yields, their uptake.

Heavy metals in agricultural concern because of their potential to bioaccumulate along the food chain and their capability to cause harm to plants, humans and other animals. Heavy metal contaminated land is increasingly becoming an environmental, healthy, economic and planning issue in India. Vegetation of an area is prominent indicator of the deteriorating soil conditions and natural habitat and is quite sensitive to such an extent that any change in physical and chemical properties of soil due to agricultural exploitation or contaminant addition by effluents and waste disposal, can alter its structure and composition.
Vegetables grown at environmentally contaminated sites could take up and accumulate metals at concentrations that are probably toxic to human health. Vegetables show the highest ability to accumulate heavy metals due to the assimilation of the metals from soil by the plants. Vegetables are one of the most important components of food diet which contain essential elements and maybe contaminated with heavy metals. Thus, contaminated vegetables by heavy metals can be threat for human health.

Cadmium is easily assimilated through both the root system and above ground parts. The significant factors influencing the availability of heavy metals are soil pH and the soil organic matter content. It has been observed by several workers that plants are limited in the amount of Cd that they can accumulate, even when chelates are used to solubiliz the Cd for uptake. Consequently, phytoremediation will be of limited use in removing Cd from the soil.

If these metals move too rapidly in a particular soil, they can pollute ground water supplies especially in areas with high water tables. While it has generally been assumed that these metals are retained in agricultural soils, some factors that reduce their retention and therefore enhance their mobility can result in more plant uptake or leaching of these metals to ground water. These factors include the properties of the metals, soil texture, pH and competing actions in the soil solution.
Keeping in view the adverse effect of heavy metal accumulation in soil and their uptake by vegetable crops, the present investigation was carried out with following objectives:

1. To find out the heavy metals contents in polluted soils.
2. To study the accumulation of heavy metals in vegetable crops grown on polluted soils.
3. To study the effect of organic matter (compost) and phosphate fertilizers (SSP) on the uptake of heavy metals through plants.