INTRODUCTION
Metals are an intrinsic component of the earth’s crust. With the rapid development, the evolution of metal-based industries has led to the contamination of the environment with heavy metals, especially cadmium, lead and mercury that have received considerable attention. Among these myriad of environmental pollutants, cadmium, a heavy metal merits special reference as a potentially toxic element. It exhibits properties of biomagnification and elicits health effects several years after exposure.

Outbreak of cadmium pollution from the use of fertilizers, pesticides and sludge containing cadmium has led to its excessive accumulation beyond the threshold levels in arable soils. Its subsequent uptake by plants leads to biomagnification that has aroused much concern about this heavy metal. Consequently, the man and ecosystem are increasingly exposed to the toxic levels of this metal, presenting a potential health hazard to man as well as the flora and the fauna. The cadmium in fertilizers, pesticides and sludge gets deposited in the soil or water. In the event of flooding or irrigation, cadmium in water might also increase its concentration in soil that in turn leads to an increase of cadmium concentration in agricultural products. The increasing concentrations of this metal in arable soil of industrialized areas create a problem of excessive uptake of this element from soil by plants. Also the cadmium in the soil tends to leach into the ground water creating a problem of its contamination. A recent survey conducted by the Central Ground Water Board in Delhi revealed the
presence of heavy metals like cadmium, chromium and lead in excess of the prescribed standards in the ground water. Hence, a strategy should be worked out to reclaim the heavy metal polluted soils at source, by using the latest technology of bioremediation using biological agents like plants that are hyperaccumulators or cadmium shoot excluders.

A large variety of medicinal plants continue to be gathered from their wild growth in the country of their origin, both for home consumption and export, as they form an important and cheap source of crude herbal drugs. The tropical forests, in particular, often possessed a luxuriant distribution of medicinal plant species. This has served as a natural repository of raw materials for the pharmaceutical industry. The last few decades have witnessed several rapid changes in the land-use pattern in developing countries. It is estimated that about 11 million ha of forests are annually eliminated in the tropical regions of the world for various purposes, rendering large-scale loss of plant life. The second concern is the large-scale and often ruthless exploitation of plants for use in the organized sector of the pharmaceutical industry to meet the sudden surges in demand of selected herbs and herbal products. In this manner several valuable species have come under the virtual threat of extinction, at least in easily accessible forest ranges that served the genuine health care needs of the local population (Gupta, 1977). Some of the widely known drugs such as Rauwolfia serpentina and Dioscorea deltoidea in India, Ephedra sinica in China, and Catharanthus roseus in the West Indies have become endangered species in their original habitats (Farnsworth and Saciarto, 1985).
According to a WHO report, plant derived drugs represent 30 % of all medicine in the clinical use and 80 % of the people in developing countries rely on traditional plant based medicines. Also, with increased awareness people are resorting back to the use of natural resources for the cure of diseases and 40 % of the population of Western countries is now opting for herbal medicine due to the bad side effects produced by the synthetic drugs.

The facts mentioned above, including, limitation of agricultural lands, dwindling forest resources and an ever-increasing demand of raw materials by the growing pharmaceutical industries have aroused a need to cultivate the medicinal plants on the marginal and degraded lands. These lands are characterized by salinity, alkalinity, moisture stress and heavy metal contamination that includes cadmium.

The medicinal plants, *Cichorium intybus* and *Mathuranthrus roseus* were selected as the experimental materials for the present study:

1) *C. intybus* Linna. (Kasri) is an erect perennial herb, 30-80 cm in height, with a fleshy tap root upto 75 cm in length. It is native to the temperate parts of the Old World and is found wild in Punjab and Andhra Pradesh. The cultivated chicory plant is used in Indian medicine as a tonic, curative in acne, opthalmia and inflamed throat. It is reported to be useful in fevers, vomiting, diarrhoea and enlargement of the spleen. The mild form is reported to be tonic, emmenagogue and alyxteric. It forms a component of “Geriforte” and “Liv52”. Liv52 (Himalayan Drug Company Pvt. Ltd. India) is an indigenous preparation containing 24 % *C. intybus*. It is a powerful hepatic stimulant and increases the functional efficiency of the liver considerably. Chicory is also used for jaundice and is reported to be good for rheumatism. Added to
coffee, it counteracts caffeine and helps in digestion. A tea made from chicory is beneficial in stomach upset. An alcoholic extract of the plant was found to be effective against chlorpromazine-induced hepatic damage in adult albino rats.

2) *Catharanthus roseus* G. Don (Sadahahar) is a perennial herb belonging to the family Apocynaceae. It is found throughout India on wastelands and sandy tracks, especially in the coastal areas. It is often grown in gardens for its pink and white flowers that bloom throughout the year. It has erect stem with flexible long branches bearing leaves that are simple, cauline, opposite, exstipulate and peltate.

The plant is also known as periwinkle, and recorded as far back as BC 50 in folk medicine literature of Europe as diuretic, antidiysenteric, antihemorrhagic and wound healing and was considered useful in the treatment of diabetes in Jamaica and India. It, however, gained commercial importance due to the anti-cancer activities possessed by some of the alkaloids present in the plant, especially vinblastine and vincristine.

It may be stated in all fairness that our knowledge related to the physiochemical processes, growth, and the quality of most medicinal plants, as affected by various abiotic stresses including cadmium stress, is rather poor and till date not many reports are available. Henceforth, the present investigation was carried out keeping in mind the following objectives:

(i) to study the effect of cadmium stress on germination, growth and physiochemical processes of *Cichorium intybus* (Kasni) and *Catharanthus roseus* (Sadabahur) plants.
(ii) to study the impact of cadmium stress at the various phenological stages in terms of growth, physiology and biochemistry of these plants.

(iii) to find out the impact of cadmium stress on their medicinal quality.

(iv) to identify the tolerance mechanism(s), if any, operating in these plants, and

(v) to assess the utility of these plants in bioremediation of the cadmium polluted soils.