INTRODUCTION

India had a rich heritage of ornamental plants which plays a vital role in maintaining delicate ecological balance and checking environmental pollution around towns, cities and dwellings and whenever practiced. Ornamental plants are associated with mankind from the dawn of civilization. It is said that in India, man is born with flowers, lives with flowers and finally dies with flowers.

Flowers are symbolic of beauty, love and tranquility and from the soul of garden and convey the message of nature of man. In our country, flowers are sanctified and are commonly used in worship in homes and temples. We are intimately associated with flowers and on all festive occasions, interior decoration, in marriages, religious ceremonies and social functions, the use of flowers and garlands has become almost essential. Flowers are also adorn the hair of women, particularly in south India.

Some of the flowers are used to convey the human feelings such as rose for love, Pansy for thoughts, Carnation (white) for women's love, French marigold for jealousy or sorrow, African marigold for vulgar minds, Narcissus for self esteem, Daffodil for regard, Amaryllis for pride, Iris for message, Snapdragon for
presumption, Jasmine for amiability, Lily for purity, Stock for luxury and Sweet peas for departure etc.

Besides their beauty and aesthetic value, flowers are also important for their economic value such as role of flowers (loose as well as cut blooms), dry flowers, extraction of perfumes and making the economic products like gulkand, rose water, rose otto and medicines. The flowers are also useful for extraction of essential oils which are highly valued throughout the world and used in soap and cosmetic industries.

At present the position of Horticulture in India is not as bright and lucrative as it is in European countries and USA. The Indian share in the world flower market is very negligible, while small developing countries like Israel, Columbia, Thailand, Kenya and Singapore etc. are able to export their flowers to the biggest exporting countries like USA, Germany, Holland and France etc.

In India, the flowers trade is gaining the top priority in the world market. Holland is the biggest importing country of Indian flowers which export them to the other countries like England, Switzerland, Italy, Belgium, Canada, Australia, Denmark etc. and earn about 4500 lac pounds foreign currency per annum. A survey carried out by ICAR has revealed that about 10, 500 tonnes of cut flowers worth Rs. 9.26 crores were sold in five metropolitan cities like Bombay, Madras, Calcutta, Delhi and Bangalore (Sampth, 1962). This figure must have been more than doubled by now and such a survey, if made at national scale,
will show that the annual turnover may not be less than Rs. 40 crores (Khoshoo, 1974).

In our country, according to an estimate, rose and chrysanthemum occupied an area of 2974 ha which produces about 2000 tonnes rose and 2470 tonnes chrysanthemum per year. Jasmines occupies an area of about 8000 ha with an annual production of flowers, worth Rs 80-100 million (Muthuewami and Khadar, 1975). Mungonia and marigold occupies about 1650 ha are with annual production of flowers of about 1200 tonnes.

Gladiolus is one of the leading commercial cut flowers in the world and ranks next to tulip in Holland and some other countries. Its majestic flower spike having florets of varying shapes, sizes, colours and excellent keeping quality have been started around big cities for regular supply of cut flowers. This flower possesses a great potential for the export market.

Gladiolus belongs to the family Iridaceae, sub-family Ixioideae. The word gladiolus is derived from the Latin, gladiolus means a sword. Leaves of gladiolus resemble the sword and hence, it is commonly known as “Sword lily”. The genus gladiolus comprises about 300 species of half-hardy bulbous flowering plants in which 250 are wild and 50 of garden origin. Most of the species are native of South Africa, west and central Europe, Mediterranean to south, west and central Asiatic regions. The cultivated gladiolus belongs to species resulted from the hybridization between G. primulinus and after spp. such as G. byzantinus, G. psittaccinus, G. cardinalis and G. candavensis.
Gladiolus was brought into cultivation from its native habitat from South Africa, perhaps during the ancient Greek period. The exact date of introduction in India is not confirmed but the development of gladiolus in India started only in the early years of the century after the discovery of primulinus gladioli (G. primulinus). The different types of gladiolus show marked distinction in various characters and it is impossible to place them under one or another group. The Royal Horticulture Society of England classified gladiolus into the following groups—like early flowering type Primulinus, Irlandiflorus and large flowered types, large flowered types (Swarup, 1984) classified into two most important types like butterfly and miniature gladioli. In both the groups are early, midseason late flowering cultivars.

Improvement in gladiolus has been started since 1806 in England where they did inter specific hybridization to develop Gandavensis hybrids in Belgium, modern gladioli have benefited a lot with Belgium, modern gladioli have benefited a lot with this work in the year 1902 the work done on hybridization and resulted the hybrids with large hooded flowers of light colours. In India, there is an impressive collection and maintenance of wide array to indigenous and exotic cultivars and species at various places like- IARI New Delhi, NBRI Lucknow, IIHR Bangalore, IBG Calcutta, HAU Hisar, PAU Ludhiana and BCKVV Kalyani and other private nursery men particularly in Darjeeling and elsewhere too.
Gladiolus is more popular for its attractive, having florets of huge form, dazzling colour, varying sizes of flowers and spikes and long keeping quality. In recent time it is cultivated for participating in exhibition, garden display, home decoration, cut flowers arrangements and other useful purposes, all over the world. The use of gladiolus as cut flowers in North America developed from European hybrids in 1870, upto 10,000 spikes/day shipped to New York from local fields (Gandavensis and primulinus types were the first that firstly used for the purpose of cut flowers).

The demand for a gladiolus flower is increasing day by day for its beautiful and long life of cut flowers in the vase. It has been appropriately called “Queen of the bulbous flower”.

The flowers of gladiolus may be different in size. They may be large, medium and small. The colour of flower petals may be ranging from white, pink, purple, salamen, red, scarlet, greenish, orange, maroon, yellow, lilac, mauve and violet etc. It present some bicolour cultivars are also developed which are highly commercial for cut blooms and long keeping quality in America and European countries.

Gladiolus thrives best in temperate to subtropical climate. Growing of gladiolus in tropical climate is also not uncommon. In India, it can be grown successfully in plains as well as on hills. In hills it can be grown upto 2400 mt latitude. The best temperature for its better growth and spike production is 15-25°C,
while it can also tolerate extremely high temperature (50°C).

Gladiolus may be grown on a wide range of soils. sandy loam soil is proved to be the best for its corm yield as well as cut flowers. The most suitable pH range is 6.5-7.5. Heavy soils are not suitable for successful cultivation of gladiolus. Heavy soils cause poor drainage and rooting of corms in the soil.

As regard the site, gladiolus responds well to open sunny places. There should be well drained plot free from soil borne diseases.

The gladiolus is mainly propagated vegetatively by corms, cormels or from corm division. It can be propagated sexually by seed to evolve a new variety by hybridization. Gladiolus can also be proposed successfully by tissue culture technique in vitro inflorescence, cormel, corm, stemtip, vegetative shoot and axillary bud etc.

To complete life cycle normally, all green plants requires a supply of organic and inorganic substances from outside, known as mineral nutrition. Some elements are necessary for the growth and development which are needed by the plants in comparatively large amounts, are called as macro elements like N, P and K and those required in very small amounts are called as micro nutrients or trace elements like Zn, B, Mo, Mn, Mg, Cu, Co and Cl etc.

These inorganic nutrients can be given to the plants by soil
growth and inducing flowers, corms and cormels production of gladiolus. Keeping the above facts in mind, the present investigation was carried out to investigate "Effect of trace elements as foliar spray on the performance of gladiolus cv. American Beauty" at Horticultural Experimental and Training Centre, Saharanpur, Ch. Chhotu Ram P.G. College, Muzaffarnagar (U.P.) during the year 1996-97 and 1997-98 with the following objectives:

1. To study the influence of foliar spray of B, Mn and Cu for getting the better vegetable growth.

2. To obtain the maximum number of spikes and flowers.

3. To obtain the maximum number of biggest size corms and cormels.

4. To study the effect of these elements on post harvest physiology with special reference to determine the colour imparting pigment of flower (spike).
application as well as by foliar spray. There could be a lot of saving both on the material and finances, especially when it is desired to use micro nutrients. They are soluble in water and are sprayed on the foliage to provide an effective method of applying nutritional support to plants. Micro nutrients are especially useful when responses are demanded with in short growing seasons.

The foliar penetration of the micro nutrients may occur through stomata or even diffuse through cuticle. Sometimes there are wounds, breaks, sutures in the leaves and these micro nutrients may enter through them. The role of ectodesmata in the translocation of micro nutrients applied as foliar sprays also seems feasible. Foliar uptake may also be accompanied by leaching of some nutrients also. Once leached, they may be reabsorbed by the roots and used by the plants.

There is a general feeling that either the climate is not favourable for growth and development of bulbous plants or deficiency of some micro nutrients do not permit it to grow normally. The latter possibility is considered to be most important growing has been found to be a paying enterprise. Experimental evidence regarding nutritional requirements is very meagre. Besides the NPK, micro nutrients like B, Mn and Cu have great influence on growth formation of quality spike, corms and cormels (Chin et al. 1982).

A very little research work has been done on the effect of different micro nutrients like B, Mn, Cu and Co on vegetative