CHAPTER 1

INTRODUCTION

1.1 Importance of Bougainvillea

Bougainvillea is a genus of flowering plant belonging to the family of Nyctaginaceae native in South America (Sławomir *et al.,* 2010; Kent *et al.,* 2007). It has about eighteen species and generally used in the arid landscapes for beautification, horticulture, pharmaceutical industries, agriculture and environmental industries on account of the large flexibility in different agro climatic regions of the world (Suxia *et al*., 2009; Simon, *et al.,* 2006). Besides its ornamental value in landscaping, recently it has been discovered that bougainvillea is a pollution tolerant plant and can help in the mitigation of air pollution (greenhouse gases) (Kulshreshtha *et al.,* 2009; Sharma *et al.,* 2005). On the basis of physical experiment in bougainvillea leaf, it can be referred that this plant is a dust mitigator and it absorbs the pollutants from the environment where it grows. Therefore, this plant was highly recommended for plantation in urban and industrial areas where particulate is a problem. Being well adapted to different growing techniques, it can be planted in traffic island, central verge, polluted soil and various other places (Kulshreshtha *et al.,* 2009). It is grown in tropical and subtropical zones and is enriched with different varieties having attractive shades. Considering its vast scope, introduction and alteration of flower color and size are highly desired and sought after traits. It's wide adaptability and multifarious usage has made this plant very popular all over the world (Fatma *et al.,* 2007).

1.2 Propagation and Promotion of Flower

The phenomena of flowering is a complex developmental process consisting of at least five sequential phases namely flower induction, initiation, flower opening, pollination

and flower senescence. Flower induction or the influence of flowering time depends on some known factors such as physiological stress, nutrient availability, light, day length and temperature. The timing of the transition from vegetative growth to flowering is of paramount importance in agriculture, horticulture and plant breeding because flowering is the first step of sexual reproduction (Koning, 1982, Georges *et al.,* 1993). Many studies are carried out to understand how this transition was controlled and have occupied countless physiologists during the past half century and have produced an almost unmanageably large amount of information.

A majority of plant use environmental cues to regulate the transition to flowering because all individuals of a species must flower synchronously for successful out crossing and because all species must complete their sexual production under favorable external conditions. Any environmental variable exhibiting regular seasonal changes is potential factor that control the transition to flowering.

Many environmental factors, such as stress and nutrient availability influence flowering time, but perhaps the most important are light intensity, day length and temperature (Ana *et al.,* 2004). With regards to light, the quantity, quality and duration are all important variables. During the control of flowering photoperiod and temperature are perceived in different parts of the plant (Stirling *et al.,* 2002; Smedt *et al.,* 1996).

Besides environmental factors, some other factors have been found to induce flower earlier or frequent flowering such as plant growth regulating hormones, pruning, dwarfing, phloemic stress and water stress (Saifuddin *et al.,* 2009). The most reliable method of flower promotion has been found to be the application of plant growth regulators such as gibberellin, cytokinins, auxins, abscisic acid and ethylene. In most experiments, the best results have been achieved with application of GA_3 mixture along with some additional treatments, girdling, root pruning, fertilization and water stress. Results might vary from

year to year, from clone to clone and from experiment to experiment. Because, each species would have particular requirements regarding types, dosage of hormone and timing of treatment for better establishment and economize the use of plants (Yoshiko *et al.,* 1999).

1.3 Delaying Flower Abscission

It has been well documented that the commercial value of flowers is very dependent on its longevity or vase life (Hye and William, 2008). Other factors include flower color and size. In the case of bougainvillea, a plant well known for its beautiful flowers as a potted plant and in landscaping activities, yet relatively little study has been carried out to study its flower potential.

The quality of potted flowering plants is often greatly reduced by improper shipping and handling, during which the specimen encountered poor environmental conditions, such as low light intensity, high or low temperature and water stress (Koji *et al.,* 2005). Recently, it has been reported that the self life and commercial value of bougainvillea flowers are affected by its early shedding (Hossain *et al.,* 2007). Its commercial value could be improved by prolonging flower longevity and increasing its quality in terms of size and color (Tjosvold *et al.,* 1994). Generally, flower longevity or vase life is related to flower and leaf senescence and it is caused by the plant hormone, ethylene (Serek *et al.,* 2006*)*.

Ethylene is responsible for early senescence in many flowers such as orchids, bougainvillea and roses (Leiv and Hans, 2005). For bougainvillea flowers vase life could be improved by delaying senescence using ethylene synthesis and receptor inhibitors such aminooxyacetic acid, NAA and silver thiosulfate (Chang and Chen, 2001). In the greenhouse, fully opened flowers are retained for two to three weeks. However, when plants are taken indoors, these flowers abscise very rapidly. This drop of mature flowers

can be delayed two to three weeks by spraying NAA to the plants at the time of bract opening. In addition, in potted plants, flower longevity could be improved also by using growth regulating hormones, such as GA_3 and ethylene inhibitor hormone NAA individually or its combination in low concentration at the different developing stages, flowering time and transported periods (Hye and William, 2009). Therefore, the effect of hormone spray, pruning and shading on the plant growth, flowering process as well as biochemical and physiological changes of bougainvillea plant need to be investigated to promote flower size and delay flowers drop.

Hence, the present investigation was planned to observe the effects of plant hormones (GA_3 and NAA) and physiological stresses (phloemic stress, pruning and shading) on the growth, development and delaying flower drop of *Bougainvillea* spp.

1.4 Research Objectives

The objectives of this study are to improve the flowering process in *Bougainvillea* spp and consequently its appreciable longevity by applying hormones and physiological stresses. In the first experiment, the effect of physiological stress such as pruning on the growth and flowering process of *Bougainvillea glabra* was studied. The objective of the second experiment was to evaluate the effect of shading on flowering and flower vase life in *Bougainvillea glabra*. Subsequently, the effects of GA_3 hormone and phloemic stress on flower blooming and flower enlargement were evaluated in *Bougainvillea spectabilis*. Finally, an experiment was conducted to identify the appropriate concentration of NAA hormone for flower longevity and delay of discoloration in *Bougainvillea spectabilis* flowers because it has a much shorter vase life.