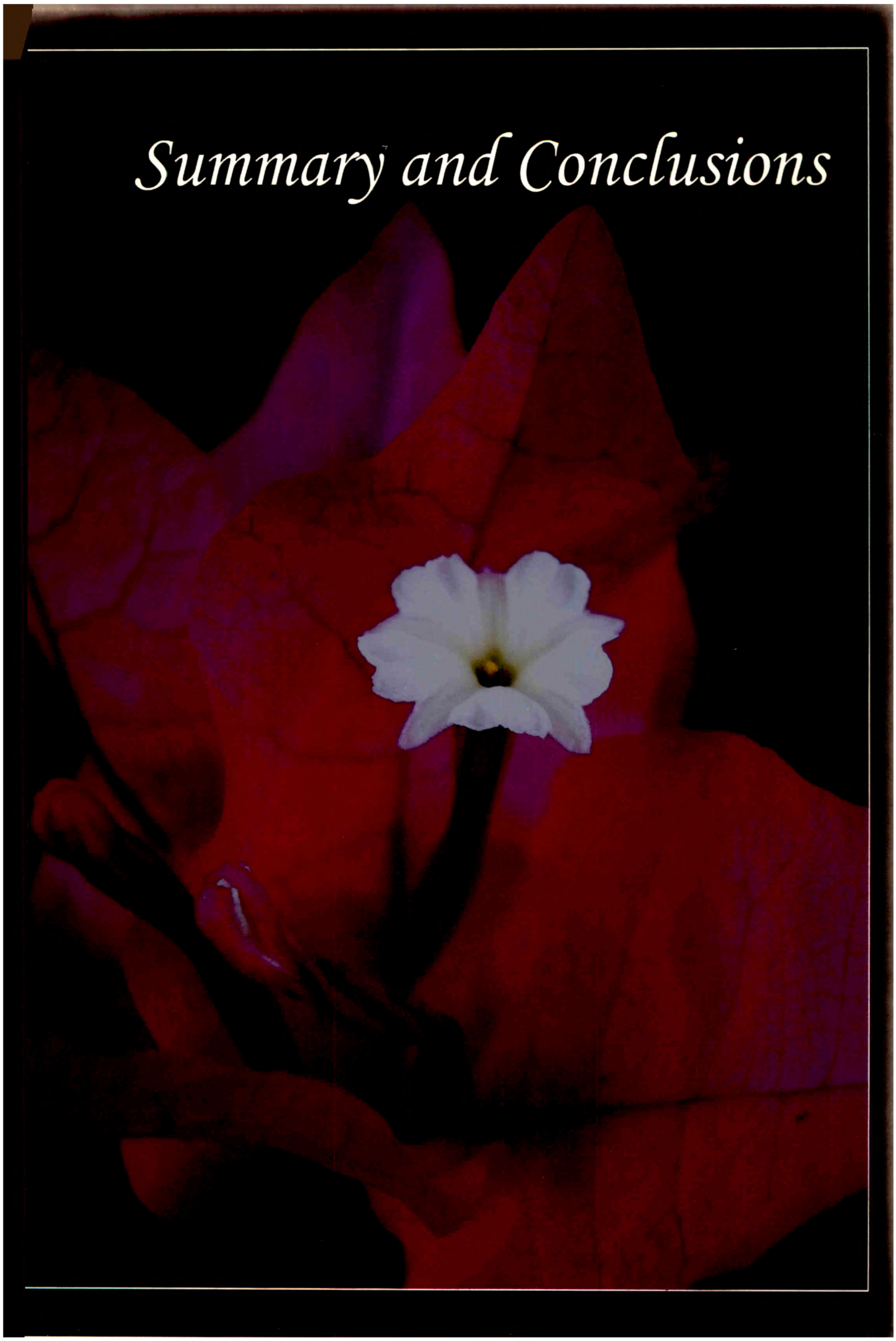
Summary and Conclusions



IV. SUMMARY AND CONCLUSIONS

Bougainvillea spectabilis is a large thorny extensively climbing shrub native of Brazil with pubescent branches and leaves bearing in the hot season. A profusion of pale yellow flowers supported by large purple or magenta coloured bract which render the plant most conspicuous object a perfect blaze of colour in the hot weather. The plant was introduced in Bengal by Sir E. Perry and now common in gardens as a covering to trellises (Cooke, 1799).

Bougainvillea spectabilis has the best performance on dry sides, in full sunshine. It is an important horticultural plant belonging to family Nyctaginaceae. It is a fast growing shrub and has many cultivars; some dwarf and others large and some scrambling shrubs and still others as climbers (Bansal and Nanda, 1983). It increases scenic beauty of formal as well as informal gardens. Dai Bisheng (2007) studied the effect of Carbendazim plus Thiram and Triamedimefon plus Ethylicin on the survival rate of softwood cuttings of *Bougainvillea spectabilis.* Tan *et al.* (1999) studied physiological response of *Bougainvillea spectabilis* to sludge and artificial topsoils derived from flyash, sludge and rengam series subsoil.

Leaf senescence is the sequence of biochemical and physiological events comprising the final stage of development from the mature, fully expanded state (Smart, 1994). Wareing and Seth, (1967) defined senescence as a deteriorative events and according to Thomas and Stoddart, (1980) leaf senescence is as the series of events concerned with cellular disassemblance in

the leaf and the mobilization of the materials released during this process. The term aging or senescence is usually related to accumulation of somatic structure and increase in metabolic failures (Woolhouse, 1967).

In the present investigation some of the aspects related to organic and inorganic status of *Bougainvillea spectabilis* have been studied. The fate of some organic constituents like chlorophyll, polyphenols, carotenoids were studied during the course of senescence.

In the present investigation we found an increase of moisture percentage in the senescent leaves of *Bougainvillea spectabilis.* Dry matter percentage is increased in senescent leaves as compared to young and mature leaves. In case of treated leaves with growth hormones GA, IAA and Kinetin the dry matter increased progressively. This observation is in accordance with the increased Ca^{++} in the senescent leaves of *B. spectabilis* as it is immobile.

Photosynthetic pigments are categorized into essential pigments and accessory pigments. Among the essential pigments chlorophylls contribute major photosynthetic pigments and acts as a reaction centers for the photosynthetic reactions. Accessory pigments are while represents the secondary role in process of photosynthesis. The carotenoids are major accessory pigments which plays photoprotective role.

Influence of GA, IAA and Kinetin on the chlorophyll content at different stages of leaf development of *Bougainvillea spectabilis* is studied in which GA is one of such growth hormone which shows decrease in chl a

content during the mature stage to senescence stage. The effect of kinetin treatment only showed an increase in chl a/b ratio because of retention of chlorophylls and greening (rejuvenation) as a effect of kinetin. This is delaying effect on senescence. Effect of GA, IAA and Kinetin growth regulators on the carotenoids level at different leaf stages of *B. spectabilis* has its impact at the premature stage and senescent stage by increased carotenoids level over to control. The influence of kinetin treatment is observed in all the four stages of leaf development in *B. spectabilis* by an increase and retention of carotenoid content.

Kinetin treated plant leaves shown an increase in polyphenol content at mature and senescent stage. Most of these phenolics are intermediates and derivates of the shikimate and phenylpropanoid pathways (Cheng and Breen, 1991).

Carbohydrates are the potential source of energy, their degradation produces the energy utilized in many of the synthetic reactions of the cells. The level of reducing sugar is increased in all four leaf stages due to the application of GA and IAA. But the decrease in the content of the reducing sugar is observed as effect of kinetin. In case of total sugars a similar kind of pattern as that of the reducing sugar. In case of senescent stage of plant leaves an elevation is noticed due to the action of GA and kinetin, while a slight decrease is noticed due the action of IAA.

Our results also show Na accumulation in senescent leaves of *B. spectabilis*. In the present investigation the effect of growth hormones on Na also studied and the result indicates no accumulation of Na in senescent leaves which may be due to mobilization of Na.

Our results show that there is considerable decrease in potassium content in senescent leaves of *B. spectabilis*. However the effect of GA, IAA and kinetin on K^+ content is studied. GA and IAA treatment shows good mobilization while the kinetin maintains higher level of K^+ in senescent leaves. Potassium and nitrogen are highly phloem mobile elements, and their re-utilization leads to rapid decline in their level in vegetative parts, thereby inducing earlier senescence (Marschner, 1995). Our results show similar trend in the senescent leaves of *B. spectabilis.*

Ca accumulation is also recorded in senescent leaves this is due less mobile nature. Growth hormone has less effect to alter the Ca pattern in *B. spectabilis.* Magnesium content declined with increasing leaf age of *Bougainvillea spectabilis.* Similar pattern is seen in GA, and IAA treated leaves; however kinetin treated leaves showed an increased Magnesium content. This is because of retention of chlorophylls and rejuvenation as a effect of kinetin.

Iron content is increased in the treated leaves of *Bougainvillea spectabilis.* Growth hormone stimulates the metabolism and due to which Fe content increased. GA and IAA treated leaves maintain enough phosphorus

content, which also shows retention at senescent stages of both these treatments.

The activity of enzyme nitrate reductase is stimulated due the application of all the three growth regulators (GA, IAA and Kinetin) in all four leaf stages as compared to control.

The activity of enzyme peroxidase is enhanced in all the four stages of *B. spectabilis* of leaf development due to application of GA, IAA and kinetin growth regulators. Vora *et al.,* (1976) observed increase in peroxidase activity due to GA treatments. The activity of peroxidase has been reported to increase with senescence advancement (Grover and Sinha, 1985). Mukharjee and Rao (1993) showed that POD activity during maturation and in the stage of senescence of the leaves continuously increased in the *Cajanus cajan* leaves. Our results in the present investigation are quite similar to above authors.

The activity of enzyme polyphenol oxidase is increased in all leaf stages of *B. spectabilis* due to the application of GA and IAA growth regulators.

In the present investigation the activity of enzyme Superoxide dismutase is increased in *B. spectabilis* during the course of senescence. Our results are similar to Hrvoje *et al.,* (2008) who stated that the increase in ROS level as well as in SOD activity during natural senescence of maple leaves.