Chapter-VI

Summary and Conclusions
Senescence is connected with massive mobilization of nutrients in a highly ordered and regulated manner from senescing leaves to new leaves, developing fruits, seeds and buds, thus contributing to the nutrient cycling. The leaf, at late stage of senescence causes rapid loss in photosynthetic activity and relatively high respiratory rate and becomes a respiratory burden for plants. The most remarkable event in the leaf senescence is the disassembly of the photosynthetic apparatus with in chloroplast and thus concomitant decrease in photosynthetic activity. It has been shown to modify the structural components of thylakoid complexes like PS II, PS I, Cyt b6f, ATP synthase and cause their quantitative loss. The drastic decline in electron transport activities has been shown in several senescing systems. For instance, the factors which modulate electron transport during leaf senescence are not clearly explored. Hence an attempt has been made to characterize dark induced alterations in pigments, proteins and electron transport activities and to show the senescence retardant effect of Ca\(^{2+}\), Al\(^{3+}\), GA either alone or in combination (GA + Al\(^{3+}\)) using detached wheat primary leaves as experimental material. The conclusion made out of the above study is summarized below.

Ca\(^{2+}\) and Al\(^{3+}\) delayed the degradation of pigments, proteins and maintained the photosynthetic electron transport activities of wheat primary leaves during dark incubation. Al\(^{3+}\) was more effective than Ca\(^{2+}\) indicating valency dependent protection of pigments, proteins and electron transport activities during dark incubated senescence. The activities of WCE, PS II were drastically declined when compared to that of PS I. The losses in room temperature absorption and fluorescence emission properties were
marginalized by $\text{Al}^{3+}$ when compared to that of $\text{Ca}^{2+}$ during dark incubation. The increase in LPO levels, SOD and CAT activities were reduced by $\text{Ca}^{2+}$ and $\text{Al}^{3+}$. Degradation of LHC II (43 kDa), WOC (33 kDa, 23 kDa, 17 kDa) polypeptides of PS II and polypeptides in the region of 68 kDa of PS I were protected by $\text{Ca}^{2+}$ and $\text{Al}^{3+}$. Hence $\text{Ca}^{2+}$ and $\text{Al}^{3+}$ response is evident in terms of stabilization of thylakoid membranes due to their variation in cation valency.

$\text{GABA}$ retarded the loss of pigments, proteins, electron transport activities, spectral properties. The restoration of WCE activity by $\text{GABA}$ was closely associated with the restoration of PS II activity compared to that of PS I. $\text{GABA}$ reduced the increase in LPO levels, SOD and CAT activities during dark incubation. $\text{GABA}$ protected the degradation of WOC polypeptides (33, 23, 17 kDa) of PS II and slightly protected the PS I polypeptides. Complete disappearance of 43 kDa polypeptide was not protected by $\text{GABA}$. $\text{GABA}$ delayed the dark incubated senescence at least in part by maintaining the LPO levels, SOD and CAT activities.

The combined effect of $\text{GABA} + \text{Al}^{3+}$ suggests the additive effect in delaying loss of pigments and proteins during dark induced senescence when compared to that of individual application. They also delayed the loss of WCE, PS II, PS I activities spectral properties. Polypeptides of LHC II (43 kDa), WOC (33 kDa, 23 kDa, 17 kDa) of PS II and polypeptides in the region of 68 kDa of PS I were protected more due to additive effect.
In conclusion Ca²⁺, Al³⁺, GA delayed the loss of pigments, proteins, electron transport activities and restore absorption and fluorescence emission properties at room temperature during dark incubated senescence. In combination GA + Al³⁺ restored the photochemical activities and stabilized the thylakoid membranes during dark incubated senescence and the protection is more pronounced than that of their individual application during dark induced senescence.
Literature Cited