LIST OF FIGURES

1.1 Schematic arrangement of polypeptide in thylakoid membrane (appressed). 9
1.2 Model of PS II core complex in thylakoid membrane. 11
1.3a Model of D1 and D2 protein showing five trans-membrane alpha-helical. 13
1.3b Model of D1 polypeptide showing cleavage sites due to photodamage. 13
1.4 Processes showing possible pathway of distribution of absorbed energy. 38
1.5 Mehler reaction. 47
1.6 Initiation and propagation reaction of lipid peroxidation. 53
1.7 Enzymatic scavenging system of oxygen radical in chloroplast. 57
1.8a The Xanthophyll Cycle. 64
1.8b Mechanism of forward and reverse transfer of light energy in xanthophylls. 64
1.9 Xanthophyll Cycle and its regulation and relationship with other non-enzymatic scavenging of oxygen radicals. 66
1.10 ABA biosynthetic pathway in higher plants. 68
1.11 Network of interconnected reaction coupled with photosynthesis. 72
2.1 Spectra of light sources used in the study. 78
2.2 Oxygen electrode trace for calibration. 86
2.3 A typical fluorescence induction curve. 90
3.1 Effect of photoinhibition of intact leaves at 1000 and 2200 μmol m$^{-2}$ s$^{-1}$ PAR on light saturated PS I+PS II activity.

3.2 Effect of photoinhibition of intact leaves at 1000 and 2200 μmol m$^{-2}$ s$^{-1}$ PAR on light saturated PS II activity.

3.3 Effect of photoinhibition of intact leaves at 1000 and 2200 μmol m$^{-2}$ s$^{-1}$ PAR on light saturated PS I activity.

3.4 Effect of photoinhibition of isolated chloroplasts at 1000 and 2200 μmol m$^{-2}$s$^{-1}$ PAR on light saturated PS I+PSII activity.

3.5 Effect of photoinhibition of isolated chloroplasts at 1000 and 2200 μmol m$^{-2}$s$^{-1}$ PAR on light saturated PSII activity.

3.6 Effect of photoinhibition of isolated chloroplasts at 1000 and 2200 μmol m$^{-2}$s$^{-1}$ PAR on light saturated PS I activity.

3.7 Effect of photoinhibition of leaves and isolated chloroplasts on light saturated photosynthetic electron transport.

3.8 Effect of photoinhibition of leaves at, 3600 μmol m$^{-2}$ s$^{-1}$ PAR, fed with distilled water on chlorophyll fluorescence.

3.9 Effect of photoinhibition of leaves, at 3600 μmol m$^{-2}$ s$^{-1}$ PAR, fed with ascorbate on chlorophyll fluorescence.

3.10 Effect of photoinhibition of leaves at 3600 μmol m$^{-2}$ s$^{-1}$ PAR fed with DTT on chlorophyll fluorescence.

3.11 Effect of photoinhibition at,3600 μmol m$^{-2}$ s$^{-1}$ PAR and 5°C, of leaves fed with distilled water, ascorbate and DTT on chlorophyll fluorescence.

3.12 Effect of photoinhibition, at 3600 μmol m$^{-2}$ s$^{-1}$ PAR and 30°C, of leaves fed with distilled water, ascorbate and DTT on chlorophyll fluorescence.

3.13 Effect of photoinhibition, at 3600 μmol m$^{-2}$ s$^{-1}$ PAR and 50°C, of leaves fed with distilled water, ascorbate and DTT on chlorophyll fluorescence.

3.14 Effect of photoinhibition, at 3600 μmol m$^{-2}$ s$^{-1}$ PAR, of chloroplast on chlorophyll fluorescence.
| 3.15 | Effect of photoinhibition of leaves and isolated chloroplasts at 3600 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) at 5°C, 30°C and 50°C on chlorophyll fluorescence. | 135 |
| 3.16 | TLC profile of plant pigments. | 138 |
| 3.17a | Spectrum of individual carotenoid peak (N, A and V). | 140 |
| 3.17b | Spectrum of individual carotenoid peak (L, Z and \( \beta \)-carotene). | 141 |
| 3.18 | HPLC profile of photosynthetic pigments in control and photoinhibited plants. | 143 |
| 3.19 | Effect of photoinhibition of chloroplasts added with \( \beta \)-carotene on chlorophyll fluorescence. | 148 |
| 3.20 | Effect of photoinhibition of chloroplasts added with ascorbate and glutathione. | 150 |
| 3.21 | Effect of photoinhibition at 3600 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) of intact leaves on MDA formation in thylakoid. | 155 |
| 3.22 | Effect of photoinhibition at 2200 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) of intact leaves on MDA formation in thylakoid. | 157 |
| 3.23 | Effect of photoinhibition at 3600 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) at 5, 30 and 50°C on intact leaves fed with ascorbate and DTT. | 159 |
| 3.24 | Effect of photoinhibition of intact leaves and chloroplasts isolated from leaves fed with distilled water, ascorbate and DTT on peroxidation of thylakoid lipids. | 162 |
| 3.25 | Effect of photoinhibition at 3600 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) of intact leaves fed with distilled water, ascorbate and DTT on super-oxide dismutase activity. | 167 |
| 3.26 | Effect of photoinhibition at 2200 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) of intact leaves fed with distilled water, ascorbate and DTT on super-oxide dismutase activity. | 169 |
| 3.27 | Effect of photoinhibition at 5, 30 and 50°C in distilled water, ascorbate and DTT fed leaves on superoxide dismutase activity. | 171 |
| 3.28 | Effect of photoinhibition at 3600 \( \mu \text{mol m}^{-2} \text{s}^{-1} \) of intact leaves fed with distilled water, ascorbate and DTT on ascorbate peroxide activity. | 175 |
3.29 Effect of photoinhibition at 2200 μmol m⁻² s⁻¹ of intact leaves fed with distilled water, ascorbate and DTT on ascorbate peroxide activity. 177
3.30 Effect of photoinhibition at 5, 30 and 50°C in distilled water, ascorbate and DTT fed leaves on ascorbate peroxide activity. 179
3.31 Effect of photoinhibition at 3600 μmol m⁻² s⁻¹ of intact leaves fed with distilled water, ascorbate and DTT on catalase activity. 182
3.32 Effect of photoinhibition at 2200 μmol m⁻² s⁻¹ of intact leaves fed with distilled water, ascorbate and DTT on catalase activity. 184
3.33 Effect of photoinhibition at 5, 30 and 50°C in distilled water, ascorbate and DTT fed leaves on ascorbate peroxide activity. 185
3.34 Effect of photoinhibition of intact leaves at 5, 30 and 50°C on the activity of SOD, APX and CAT. 187
3.35 Effect of photoinhibition of intact leaves at 5°C on the activity of SOD, APX and CAT. 188
3.36 Effect of photoinhibition of intact leaves at 30°C on the activity of SOD, APX and CAT. 189
3.37 Effect of photoinhibition of intact leaves at 50°C on the activity of SOD, APX and CAT. 190
3.38 SDS-PAGE profile of thylakoid protein. 197
3.39 Densitometer scan of SDS-PAGE. 199