SUMMARY AND CONCLUSIONS
SUMMARY

The adverse effects of SO₂ on plants are reflected by changes in important physiological processes like photosynthesis, transpiration, stomatal function, reproduction and growth. The phytotoxic effects of SO₂ varies in different species of plants. Studies carried out so far have been mostly on response of plants to SO₂ stress but very few attempts have been made to study the recovery of plants after withdrawing the stress. In order to determine SO₂ sensitivity of plants, their capacity to recover from the given stress needs to be given due consideration. Information regarding recovery response of tree species which are perrenial and for whom recovery studies have a greater relevance, is extremely limited. The present investigation was undertaken to study the response of some important tropical tree species to sub-lethal SO₂ concentrations and their recovery following withdrawal of SO₂ stress.

Fumigation of Azadirachta indica, Melia azadirach, Morus alba and Syzygium jambolina saplings with 0.5 ppm SO₂ for 4 hours for six days resulted in characteristic changes in physiological and biochemical parameters.

The reduction in pH of the four tropical tree species is in the following order:
Morus alba > Melia azadirach > Azadiracta indica > Syzygium jambolina.

Recovery in terms of increase in cell sap pH was in the following order:
A.indica > M.alba > S.jambolina > M.azadirach.
According to the changes in membrane permeability after SO₂ fumigation, the four species are arranged in decreasing order:

\[ M.\text{alba} > M.\text{azadirach} > S.\text{jambolina} > A.\text{indica} \]

Recovery in terms of membrane remeability was in the following order:

\[ A.\text{indica} > S.\text{jambolina} > M.\text{azadirach} > M.\text{alba} \]

Exposure of plants to SO₂ invariably caused reduction in the chlorophyll content in all the four species. Reduction in chlorophyll a content in the four species was in the following order:

\[ A.\text{indica} > M.\text{azadirach} > M.\text{alba} > S.\text{jambolina} \]

The four species arranged in terms of reduction in chlorophyll b content have the following sequence:

\[ M.\text{azadirach} > A.\text{indica} > M.\text{alba} > S.\text{jambolina} \]

Maximum decrease in carotenoid content was in \( M.\text{azadirach} \) followed by \( M.\text{alba}, A.\text{indica} \) and \( S.\text{jambolina}. \)

Recovery in terms of restoration of chlorophyll a, chlorophyll b and carotenoid content was maximum in \( S.\text{jambolina} \) and least in \( M.\text{azadirach}. \)
Fumigation with SO$_2$ induced stress ethylene emission and it was in the following sequence:

\[ M.azadirach > M.alba > S.jambolina > A.indica \]

Based on the time taken to attain 100% recovery, the four tree species are arranged in the following order:

\[ A.indica > S.jambolina > M.azadirach > M.alba. \]

The initial burst of ethylene was maximum in \( M.azadirach \), which exhibited prolonged ethylene emission even after twelve days of termination of SO$_2$ fumigation. On the other hand, in \( A.indica \) ethylene emission was minimum and it exhibited fastest recovery in terms of cessation of ethylene emission.

The emission of stress ethylene represents an early event in the metabolic disturbance caused by SO$_2$ before any permanent damage or visible injury is observed.

Relatively speaking, SO$_2$ sensitive species show greater inhibition than SO$_2$ tolerant species in those of parameters which are normally inhibited under SO$_2$ exposure, for example, leaf pH, buffering capacity, photosynthetic pigments, proteins, ascorbic acid. On the other hand, in parameters which are enhanced by SO2 exposure, for example, enhancement of SOD, POD and GSH was less in SO$_2$ sensitive species than in SO$_2$ tolerant species. A large native pool size of parameters that confer tolerance to plants and which also increase upon SO$_2$ exposure invariably show higher enhancement.
in relatively higher in tolerant species as compared to the sensitive ones.

From the response of various parameters examined, it can be seen that recovery was more in *S.jambolina* and *A.indica* as compared to *M.azadirach* and *M.alba*. In terms of ethylene emission and ascorbic acid content, *S.jambolina* and *A.indica* exhibited faster recovery than *M.azadirach* and *M.alba*.

The response of fully mature trees growing under field conditions to SO$_2$ stress was compared with that of saplings by measuring emission of ethylene in twigs of the field grown trees of the same species.

In quantitative terms, ethylene emission in twigs of the four species was more than the ethylene emission from saplings of the same species. However, ethylene emission from twigs corroborates with the trend and the relative difference in the ethylene emission in the saplings of the four species.

The results of this study indicate that twigs respond in a similar manner to SO$_2$ stress as saplings. The response of twigs of adult trees may provide a fairly reliable way to assess response of plants to SO$_2$ stress. Ethylene emission from SO$_2$ fumigated twigs may provide a quick responsive method which can be used to assess the relative SO$_2$ sensitivity of a large number of plant species.