Chapter 5

CONCLUSIONS

5.1 SALIENT FEATURES OF THE STUDY AREA

One of the principal objectives of this study was to assess the impact of gaseous pollutants at field level. Salient features of the present study area taken were -

Localities with a wide range of pollutants with variable concentrations and number.

Sources of pollutants were wide ranging (inclusive of mobile sources) which is a marked feature of any industrial area.

Greater concentration of industries (at locality 5) in a small area revealed the impact of congestion. This increase in pollutant concentrations in a small area has been continuously exposing the flora and fauna to various gaseous pollutants which is threatening their healthy survival.

The seasonal effect was clearly seen which revealed their influence on the impact of air pollution on biota.

5.2 GRADIENT ANALYSIS

Gradient analysis conducted for the distribution of herb and shrub species showed that near the source, species distribution and diversity was almost same on all the directions showing that wind direction has little influence close to the source of pollution. As the distance increased, species distribution and diversity increased and this was more on leeward direction as compared to the windward's. But beyond certain distance, species diversity was more on windward direction revealing that some species adapted to the ambient pollutant concentration and/or due to less distribution of individual species reducing the competition. Xerophytic species were better adapted because of the better stomatal regulation

and relatively less leaf area exposed to pollutants than mesophytes. Wind direction had a major influence on the distribution and diversity of species when all other conditions were same.

5.3 TREE SPECIES SURVEY

The three tree species selected were having different growth rates, two were deciduous and one was an evergreen species. Phenology of the tree species was studied. Emphasis was laid in assessing the differences in species behaviour to similar environmental conditions, which species exhibited a better survival rate and how it can be used as a biological filter in planting for green belts.

Tree species selected had shown a cumulative effect as they were continuously exposed to pollutants. Canopy cover was distorted in deciduous species and reductions in various growth parameters was high. Accelerated leaf fall and greater leaf area damage decreased biomass production which aggravated the reductions in various growth parameters. Evergreen species showed less damage owing to the well-spread canopy cover and better leaf retention capacity.

Impact on reproductive cycle started from the inception of flowers. Premature fall reduced the flowering. Fruit production was inhibited and premature fruit fall was maximum in Azadirachta. Comparatively evergreen species showed less damage.

5.3.1 Biochemical Observations

Parameters chosen were of a broad range which play a major role in various metabolic processes and some give resistance to plants under stress conditions.

Reductions in various parameters such as chlorophylls, ascorbic acid, total proteins and acid phosphatase were more in deciduous species. Chlorophyll content was high in Tamarindus and acid phosphatase, ascorbic acid showed an increase at some points over reference. Less reduction in total proteins showed that the turnover rate was high. Greater reductions in total sulphydryl groups and glutathione seen in deciduous species revealed that their metabolic processes were highly influenced by air pollutants. Better maintenance of these groups in Tamarindus showed its resistivity against air pollution.

Higher peroxidase content in Tamarindus showed its adaptability to stress conditions. Its manifold increase seen in the deciduous species over reference revealed their sensitivity to air pollution.

Uptake of SO_2 which was seen as an increase in foliar sulphur content was observed in all the three species. Increase in foliar sulphur content was maximum in the evergreen species (Tamarindus) followed by the two deciduous species.

As the concentrations of pollutants increased from one locality to another the damage also increased. Seasonal effects were clearly seen. Analysis of variance clearly showed that variations between species, between localities, between seasons and interactions were significant.

5.4   POTTED PLANT EXPOSURE STUDY

Growth rates of all the three species studied were adversely effected. Correlations against pollutant concentrations were found to be significant. Recovery rate was maximum in Moringa. Pollutant uptake/unit area was high in evergreen species as compared to the deciduous species.

5.5 ARTIFICIAL FUMIGATION STUDY

This was carried out to see the impact of short-term, relatively high concentrations of SO_2 under simulated conditions. The deciduous species were more susceptible as compared to the evergreen species. Ascorbic acid was used as the mitigating agent. Between the two deciduous species sulphur uptake was high in Moringa and was in contrast to field level observations. This showed that behaviour of the species under in vitro conditions was different. Pollutant uptake was more in Tamarindus.

5.5.1 Mitigation Study

Results of the ascorbic acid treated and ascorbic acid untreated saplings clearly showed that ascorbic acid acts as a mitigating agent. Greater content of ascorbic acid in the treated saplings showed that uptake of exogenously supplied ascorbic acid had occured. '

5.6 ANATOMICAL OBSERVATIONS

Absence of wax distribution in Azadirachta revealed that it did not have any primary barrier for pollutant entry. Higher amount of cuticular wax seen in Tamarindus revealed that it has a better mode of protection against the excess entry of pollutants. Damage to cuticular wax was seen in trees growing in high pollution zones. Greater damage to stomata in deciduous species revealed their sensitivity to air pollution. The response of Tamarindus showed its resistivity.,

Cells of the SO_2 - treated Azadirachta saplings were greatly disorganised and most of the chloroplasts were damaged. Ascorbic acid treatment seems very effective as an antidote to SO_2 damage as far as the ultrastructure of Azadirachta was concerned.

Overall the study revealed that the evergreen species chosen is resistant to air pollution as compared to the two deciduous species. Greater pollutant uptake showed that the threshold concentration for severe damage was comparatively high and the tree can be used as a biofilter for the atmospheric contaminants. Impact on various parameters investigated revealed the degree of adaptability to pollution induced stress conditions.