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RESEARCH PAPER Asian Science (June & December, 2011) Vol. 6 Issue 1 & 2 : 93-102

Pigment profile and chlorophyll degradation of selected road side plant species

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ABSTRACT

Urban air pollution is rapidly becoming an environmental problem of public concern worldwide. It can influence public health and local/regional weather and climate. Photosynthetic pigments in plants were shown to be very sensitive to various environmental influences. Changes in chlorophylls and carotenoid content were investigated in the selected plant species on the road side area. Pigments were extracted by the absolute acetone and quantified spectrophotometrically. All the measured pigments were reduced in polluted site compared to control. This was due to deceleration of biosynthetic process rather than degradation of pigments. The percentage of reduction in chlorophyll 'a' was maximum at the polluted sites in *Ficus religiosa* L. (34.71%) and minimum in *Pongamia pinnata* L. (22.42%) from 15- days to 75- days interval in comparison with control. The most sensitive pigments of chlorophyll 'b' was reduced at maximum percentage at the polluted sites in *Delonex regia* L. (37.72%) and minimum in *Azhadirachta indica* L. (20.42%) compared to control in the study period. There was a maximum and minimum percentage of reduction in total carotenoid in *Ficus religiosa* L. and *Polyalthiya longifolia* L. are 35.68 per cent and 14.14 per cent, respectively at various days. Total carotenoids needed a longer period of time to reach nearly the same level as in control. The concentration of total chlorophyll in the selected plant species at the polluted sites were maximum reduction in *Delonex regia* L. 34.46 per cent and minimum in *Pongamia pinnata* (20.86%) compared to control in the study period. It might thus be concluded that the *Azhadirachta indica* L. and *Pongamia pinnata* L. had sufficient biosynthetic capacity to prevent irreversible damage by the air pollution. Chlorophyll degradation measurements were intended as a parameter of air pollution experiment. From the result, it was found that chlorophyll degradation was highest in all the plant species after exposure to air pollutant for 30-days.

Thambavani, D. Sarala and Kumar, R. Sarvana (2011). Pigment profile and chlorophyll degradation of selected road side plant species. *Asian Sci.*, **6**(1 & 2):93-102.

Key Words : Air pollution, Assimilating pigments, Carotenoids, Chlorophyll degradation, Pigment profile, Photosynthetic pigments, Total chlorophyll

INTRODUCTION

The use of plants as monitors of air pollution has long been established as plants are the initial acceptors of air pollution. They act as the scavengers for many air borne particulates in the atmosphere. Demand of rapid modes of transportation has increase many folds during the last few decades because of the continuous rise in the human population. This in turn has led a tremendous increase in the number of different types of vehicles, which now has become a major source of air pollution throughout the world. Motor vehicles account for 70 per cent of the pollution found in an urban environment (Singh *et al.*, 1995; Dwivedi *et al.,* 2008). The combustion of fuel in engines of motor gives rise to sulphur dioxide, nitrogen oxides and carbon monoxide as well as suspended particulate matter. These pollutants when absorbed by the leaves because a reduction in the concentration of photosynthetic pigments *viz.,* chlorophyll and carotenoids which directly affect to the plant productivity. Chlorophyll is the principal photoreceptor in photosynthesis, the light-driven process in which carbon dioxide is fixed to yield carbohydrates and oxygen. Carotenoids are a class of natural fat-soluble pigments found principally in plants, algae and photosynthetic bacteria, where they play a critical role in the photosynthetic process (Ong and Tee, 1992; Britton, 1995) and also protect chlorophyll from photoxidative destruction (Siefemann-Harms, 1987). According to a study by Dwivedi and Tripathi (2007), the distribution of plant diversity is highly dependent on presence of air pollutants in the ambient air and sensitivity of the plants. During the last few decades' increased human interference, urbanization and heavy vehicular activity in Madurai city has resulted the changes air quality. Air pollution can directly affect plants via leaves or indirectly via soil acidification. It has also been reported that when exposed to air pollutants, most plant experience physiological changes before exhibiting visual damage to leaves (Dohmen *et al.*, 1990). Air pollution has become

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