IMPACT OF MEDICINAL PLANT SPECIES ON CONTROLLING AIR POLLUTION

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Abstract:

It is well renowned that trees have capacity to reduce the air pollution. It is mandatory to expand tree plantation in industrial area to minimize the threat of pollutants. For green belt development, it is necessary to use plants that are tolerant to air pollution.The role of plants in developing a healthy atmosphere is very desirable in the context of deteriorating environment resulting from increased urbanization, industrialization and improper environmental management. This investigation has attempted to screen plants for their ability to improve the design and development of healthy environment. It is necessary that plants used must be tolerant to air pollution. In this study, dust removal capacities and Air Pollution Tolerance Index (APTI) of plants commonly used for green belt establishment. On the basis of APTI and some biological parameters of plants study of different medicinal plant will be discussed at this paper.

Key words: Air pollution Medicinal plants, Phytoremediation, APTI

Introduction:

Natural air pollution existed around us for millions of years, but during the last century, pollution created by humans has become a major concern. Air pollution is a major environmental health problem the developing and the developed countries alike. It is not only the ambient air quality in the cities but also the indoor air quality in the rural and the urban areas that are causing concern and highest air pollution exposures are in the indoor environment. We are most familiar with visible air pollution like smog; however, many other types of air pollution, including some of the most dangerous, are totally invisible. Air pollutants rarely exist singly; but the combined pollutants may have synergistic, additive or antagonistic. Hese directly the quality of life, human and other beings' health, and climate. Because of its general impact on environment and health, air pollution is continuously monitored worldwide in the bigger cities. A dictionary of Indian raw materials and Industrial products, vol. Medicinal Plants [1]. Pollution control is the process of reducing or eliminating the release of pollutants contaminants, usually humanmade) into the environment. It is regulated by various environmental agencies that establish limits for the discharge of pollutants into the air, water, and land. A wide variety of devices and systems have been developed to control air and water pollution and solid wastes. In order to mitigate environmental pollutant and to protect the biosphere from the adverse effects of pollution four important issues should be highlighted explicitly these issues include changing life style to control or decrease the emission of pollutant developing technologies to avoid or mitigate emission making rule and regulate to reduce emission decontamination of existing pollutant in the environment. gaseous pollutant and particulate once released in the atmosphere

dispersed rapidly mechanical treatment processes in such situation are very energy intensive and costly while plant are driven by solar energy self reproducing and concentrate , detoxify pollutant the ability of plant to clean up dispersed ambient pollutant has been confirmed in a number of studies (1,2,3,4) thus plant is a natural monitor and detoxifier device of toxic pollutant in our ambient environment while adding value to our building, landscapes and communities.

Pollution is released to the atmosphere only the plant are the hope which can move up the pollutant by adsorbing, absorbing and metabolizing them from the atmosphere. Therefore the plants role in pollution abatement has been increasingly recognized in recent years. There are various ways and means to mitigate the urban environmental pollution. Plan-ting of trees and shrubs for abatement of pollution and improvement of environment is an effective way and well recognized throughout the world. Proper planning and planting scheme depending upon the magnitude and type of pollution, selection of pollution- tolerant and dust Scavenging trees and shrubs should be done for bioremediation of urban environment.

MATERIAL & METHODS

The whole study is based on the literary material collected from classical books, Modern books and magazine and internet sources.

Selection of Plant species for pollution

While selecting the species for pollution control the following are the important characteristics could be considered. Plants should be evergreen, large leaved, rough bark, indigenous, ecologically compatible, low water requirement, minimum care, high absorption of pollutants, resistant pollutants, agroclimatic suitability, height and spread, Canopy architecture, Growth rate and habit (straight undivided trunk), Aesthetic effect (foliage, conspicuous and attractive flower color), Pollution tolerance and dust scavenging capacity. Different types of leaves tend to have differences in several aspects of their surfaces. Following are the mechanisms of some medicinal plant are given how they can help to diminish the pollution.

Tamarindus indica Linn

Avenue tree with an intermediate air pollution tolerance index (APTI) .Hence can be used for plantation on roadside. It has been found that tamarind fruit shells both in its natural and acid treated forms are excellent biosorbents for the removal of chromium ions. The twigs and branches of Tamarind are very resistant to wind, making it especially useful as a shade or street tree for breezy locations (5)

Azadirachta indica

Neem has been referred as an "air purifier". It absorbs some of the environmental pollutants (SO2), and act as odorous principles. Neem tree growing in a highly polluted area is not affected by various gases. It has a greater ability to adapt to stress from exposure to air pollution. Neem is tolerant to most soil types including dry, stony, shallow soils, lateritic crusts, highly leached sands and clays. With an extensive and deep root system, the hardy

Neem can grow and flourish even in marginal and leached soils. It is one of the very few shade-giving trees that thrive in the drought prone area. The trees are not at all delicate about the water quality and thrive on the merest trickle of water (5).

Anthocephalus cadamba Miq

It is resistant to gaseous pollutants. It sheds large amounts of leaf and non-leaf litter which on decomposition improves some physical and chemical properties of soil under its canopy. This reflects in increases in the level of soil organic carbon, cation exchange capacity, available plant nutrients and exchangeable bases. It is quick growing, large; has large spreading and grows rapidly in first 6-8 year. The tree is grown along avenues, roadsides and villages for shade. These are suitable for reforestation programmes (5)

Ficus religiosa Linn

It is a common tree of roadside with a good canopy. It is resistant to gaseous pollutants. The leaves of this tree are known to emit a lot of oxygen into the environment. It can be used as biomarkers and mitigators of pollutant coming out of automobile exhaust It is good for plantation on Roadside especially highways (5).

Holoptelea integrifolia planch

It is a fast growing tree with a good canopy. It is resistant to gaseous pollutants. Due to the rough leaf surface it traps dust and particulate pollutants. It is good for plantation on Roadside as well as in the Greenbelt around Thermal power plants.

Plant species	T	P	A	R	APTI
Cassia fistula	7.50	6.3	10.21	77	22
Phyllanthus emblica	11.02	6.21	4.25	72	16
Moringa olifera	6.69	5.36	4.69	82	12
Zizyphus jujuuba	8.35	4.08	2.63	85	25
Tectona grandis	6.25	7.30	2.36	78	6

T = total chlorophyll (mg g-1 of dry weight); A= ascorbic acid (mg g-1 of fresh weight); P= leaf extract pH; R= relative water content (%).Source: Agarwal (2006).

Discussion:

Some plants have been classified according to their degree of sensitivity and tolerance towards various air pollutants. Sensitive plant species are suggested to act as bio-indicators. Levels of air pollution tolerance vary from species to species, depending on the capacity of plants to withstand the effect of pollutants without showing any external damage. This study is useful for the better understanding and management of air quality as well as in selection of suitable plant species (with high APTI) for plantation in industrial area as well as roadside. Singh and Rao (1983) have suggested a method of determining Air Pollution Tolerance Index (APTI) by synthesizing the values of four different biochemical parameters i.e. leaf extract, pH, ascorbic acid, total chlorophyll and relative water contents The APTI was calculated by using the following formula (Singh and Rao, 1983).

APTI= [A (T+P) + R] /10

Where, **A**= Ascorbic acid (mg/g dry wt.)

T= Total Chlorophyll (mg/g dry wt.), **P**= pH of leaf extract,

R= Relative water content of leaf tissue (%).

Based on the APTI value the plants were conveniently grouped as follows (Kalyani and Singaracharya, 1995):

APTI value Response

30 to100 Tolerant

29 to17 Intermediate

16 to 1 Sensitive

<1 Very sensitive

     Azadirachta indica A juss -30.5 high tolerance, *Ficus religiosa Linn* – 25.77 moderate Tolerane (in descending order). Therefore highly tolerant, moderately tolerant and intermediately tolerant species will be suitable for the establishment of an effective "green belt" around the polluted area The importance of trees in urban environment is now widely recognized that they too cleanse the particulate air pollution and help to make cities and towns more agreeable places to dwell upon. India's rich biodiversity of both indigenous and exotic trees offers a wide range of choice to restore our sick and sultry towns. The present paper recommends various tree species for urban plantings, so that a wider usage of local as well as exotic tree species can be explored for controlling airborne particulate pollution in urban climate. However, a basic knowledge of their biological relationship with human environment is absolutely necessary in which arboculturists, environmental scientists, and town planners can work together. Much more research on urban trees is needed for effective control of atmospheric particulate pollution.

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