

Chapter 6

Subjective and Objective Assessment for Variation of Plant Nitrogen Content to Air Pollutants Using Machine Intelligence: Subjective and Objective Assessment

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ABSTRACT

In olden days, the plants used to tolerate and minimize the effect of air pollution caused by the then established industries and some automobiles. But in today's scenario, the rate at which plants and industries are rising doesn't match the count of trees. The plant survival and metabolism are based upon the nitrogen and chlorophyll available. There are several expensive methods to determine the chlorophyll and nitrogen content of the leaf like SPAD meter; the researchers have proposed a simple, inexpensive method that precisely determines the chlorophyll and nitrogen values with a simple input RGB image. This chapter investigates the variation of content of plants in polluted environments and pollution-free environments.

DOI: 10.4018/978-1-5225-9175-7.ch006

INTRODUCTION

Rise in Industrialization, automobiles and so forth have raised a concern in increase of air pollution. Adding to the wound, cutting down of trees for various reasons has given rise to profound deterioration of air quality index. Recently, it is even proven that air pollution can lead to depletion of mathematics skills. Major air pollutants are oxides of Nitrogen, Sulphur and VOCs (Volatile Organic Compounds) that effects health and can even take to death. Plants and trees are the major source of keeping the environment balance but cutting them down is leading to major environmental defects making home earth defenseless. The exposure of these particulate matter or air pollutants in plants have caused a gradual decrease in their Nitrogen pigment levels. Nitrogen is the backbone of a plant. With Nitrogen deficiency, a plant can't survive many days and it is called as plant starvation. Plants are very heavily paying for the pollution caused by road side traffic. Plants can purify the air up to some extent but cannot tolerate excess pollution. There are tolerance levels for every plant where it can balance the environment in its limits. Anything excess can lead to unbalancing the environment which costs humans a lot. The major plant Nitrogen pigments are Chlorophyll and Carotenoids, which are primarily responsible for plant reproductivity, growth, metabolism, germination of seeds. Chlorophyll is the principle photoreceptor in photosynthesis process. Here, carbon dioxide is fixed to produce carbohydrates and oxygen. Carotenoids is a natural fat-soluble pigment that plays a critical role is photosynthesis process. When the plants are exposed to excess pollution, above threshold levels or acceptable range, photosynthesis process will incapacitate leading to plant starvation. The particulate matters have a negative bio effect on plants. They cover the leaf blade reducing the light penetration and blocking the opening of stomata. These impediments influence strongly the process of photosynthesis which rate declines sharply. In India there is an evidence of adverse impacts of air pollution on vegetation around industrial areas and metropolitan cities. It is identified that SO₂, the most important air pollutant is contributing to reduction up to 50% of agricultural species growing in the vicinity of industrial and metropolitan cities. The SO₂ concentrations of 75 to 135 μm^{-3} were recorded in those areas. It is estimated that an average loss of 20% in paddy is recorded due to cement dust pollution.

Hence, several samples of different plant leaves were carried out for diagnosis in several places including NIT Warangal campus. The research is carried out to analyses and implement statistics by comparing the variation of plant Nitrogen and Chlorophyll pigments according to available density of pollution and pollution free environments.

Finally, the air pollutants lead to acid rains which may lead to a complete dissolution of plant nutrients and completely damage the plant. The acid rains even result in a disastrous damage of the soil.

RELATED WORK

In recent past, air pollutants, responsible for vegetation grievance and crop yield losses, are causing increased concern. Urban air pollution is a serious problem in both developing and developed countries. The increasing number of industries and automobile vehicles are continuously adding toxic gases and other substances to the environment. Environmental stress, such as air pollution, is among the factors most limiting plan productivity and survivorship. Air pollution can straight away affect plants via leaves or indirectly through soil acidification. When exposed to aerial pollutants, most plants experienced physiological changes before exhibiting visible damage to leaves. The atmospheric SO₂ adversely affects various

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