

Study of Impact of Pollutants on Road-Side Plants and Agricultural Crops Released from different Kinds of Vehicles at Gopalganj, Bihar, India

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ABSTRACT

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Accepted: 15 Jan 2023 Published: 05 Feb 2023 In the present work attempts have been made to study the impact of vehicular pollutants on road side plants at Gopalganj district Head Quarter. In the name of advancement there has been extra ordinary increasing in different kinds of vehicles run with diesel, petrol and CNG. Here the pollutants emitted by these vehicles have remarkable impact on road side plants in general and plats near cross road and Rail gate. At most of the occasion near the cross road the traffic jam may be noted. This is also true for railway crossing during the peak hours of the day. Road sides plants may be an indicator of air pollution have been also speculated. Here attempts have been made to observe the impacts of different of particulate matters on the road side plants as well as on the road side agricultural crops, with respect to their growth, flowering and fruiting etc. Here the need for the permanent solutions to these problems has been also highlighted.

Keywords : Vehicular pollutants, Road side plants, Agricultural crops, Indicator of pollution, Railway crossing, Peak hours.

I. INTRODUCTION

Along with the explosion in population, changes in the economic status, changes in the life style, there has been extra ordinary increase in the different kinds of automobiles such as cars, trucks, three wheeler auto rickshaw, tow wheelers motorbike, scooters, and local made three wheeler good's carrier in every towns and cities of India. In Bihar, Gopalganj district is one of them. In addition to the local automobiles, a the National Highway passes through the district head quarters to interstate transport such as trucks, buses and cars from other states also pass through the main town of the district Gopalganj. These vehicular emissions are damaging the air as well as their impacts can be observed on the road side plants and agricultural crops. In Gopalganj the public transport system is in adequate. So there are increases in private cars and shared auto rickshaw, tow wheelers etc.

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An automobile emits different kinds of pollutants such as carbon monoxide, oxides of nitrogen, hydrocarbons, particulate matter, lead, sulpher dioxide, etc. All these amount to 60-70% factors for air pollution. There are also release of volatile organic compounds and carbon nano particles. Above emissions are generally from the old aged and inadequately maintained trucks, buses, four and three wheelers automobiles. Further, even today in the town there are narrow roads, road side shops, and venders, due to which every time during day hours there are traffic jams on the road in general and near the cross road in particular. Old model tow wheelers and local made three wheelers emissions one about twice the amount emitted by all other sources.

All the aerial substances that have adverse effects on plants, animals or materials are called air pollutants. The particulate and gaseous pollutants are more harmful which may be solid or liquid particles, either small or large. Larger particles easily deposited on the leaf surface of plants. Based on their chemical nature particulate pollutants may be either inorganic particulate matter or organic particulate matter as defined by Swami (2018). Impacts of vehicular emission have been studied by Black and Black (1979); Chaphekar et al; (1980); Shettye and Chaphekar (1980); Bhat and Iqbal (988); Gupta and Ghosh (1988); Jahan and Zafar (1992); Krishnamurthy et al; (1994); Raina and Sharma (2003); Raina et al; (2004); Lin and Xing (2007); Mandal *et al*; (2011); Prasad *et al*; (2012); Ram et al; (2014); Kameshwaran et al; (2019). Keeping these ideas in mind the present work was done to study the impact of vehicular pollutants on road side plants and agricultural crops in Gopalganj.

II. MATERIALS & METHODS

For this the study was done during winter season that is from December to February, during summer- April to June and during rainy season- July to September. During the study the kinds vehicles that passes through were also observed. The plants situated near road sides or adjacent to it were watched with respect to the deposition on their leaves, flowers etc. Similarly, impact on seed setting fruits formation, leaf fall etc. were also observed. This was also done with agricultural crops during winter such as mustard, wheat and pulse crops. The data collected from such observations were analysed and conclusion was drawn on this basis.

III.RESULTS AND DISCUSSION

It was noted that during winter road side trees like litchi, mango, jamun, and other ornamental plants were badly affected due to thick deposition of the pollutants on their leaves. In litchi it was observed that entire plants were looking black due to deposition of the aerosols, which included components released from the vehicular emission as well as due to friction of the tyres of these vehicles. The thick deposition of such pollutants might have affected the photosynthetic mechanisms and due to this different physiology of plants might have been affected. This may be correlated with the small inflorescence, no fruit setting in litchi plants. Agarwal and Agarwal (1999) have elaborately evaluated pollution due to vehicular emission and discussed its impact on health. They have confirmed that high density of motor vehicles to be the reason for high pollution levels. This automobile linked pollution is expected to worsen with further increase in economic growth and industrialization. Rawat (2001) studied the negative effects of automobile on road side plants on Mussori Road. Bakshi (2001) investigated road side air quality of Jammu city. They reported high levels of suspended particulate matter (SPM) due to heavy automobile traffic. Raina and Sharma (2003) studied the impact of automobile pollutants on leaf anatomy, chlorophyll contents of Jamun tree. They also found that there was less flowering and fruit development. Raina et al; (2004) also studied the impact of vehicular pollutants on the ornamental plants along the road side.



Incomplete combustion of Petrol emanates nitrous oxide, sulfur dioxide, lead, carbon monoxides and particulate matter that may damage the plants along the road side as well as the agricultural crops etc. Growth and other characteristics can be affected by exposure to heavy metals released from automobile exhaust. In the present study damage of liens of plants as well as the crops were noted along the road side. Such findings corroborate with findings of Pyatt (1970) and Feder (1970) respectively.

Damage of road side plants depends on the absorption of So₂ and its quantity. Similarly, dust particles released form the automobiles is another important factors. The particles of tyres released fur to friction may also increase the dust density. So automobile emission is one of the pre dominant sources of such particles pollution. PM 2.5 refers to the atmospheric particulate matter that has a diameter of less than 2.5 micrometers, while PM-10 are the particulate matters having diameter of 10 micrometers. These particles have been studied elaborately with respect to their interactions with the human body, but there is no information for the plants itself.

It is known to us that when petrol as well as diesel are burned at high temperature, particularly the different automobiles such as Buses, Trucks, four wheelers, three wheelers, local made three wheelers and bikes etc. emits, carbon dioxide, nitrogen oxides, sulphur dioxide, carbon monoxide, particulate matters and vapours. Among them nitrogen oxide is toxic to plants even at the concentration of 120µg/m³ when sulphurdioxide and ozone are present, the effects are even worse. The National environmental standard for nitrogen oxide is 200 μ g/m³ as a 1-hour average. The two major oxides of Nitrogen (NOX), Nitric oxide (NO) and Nitrogen dioxide NO2 are at high concentrations near the high traffic of different automobiles. These oxides harm the plants or the agricultural crops near the road side where traffic jams are frequent. The damage is not visible normally but is reflected in poorer growth, early leaf falls of the trees, and loss of productivity in terms of value and amenity. Sheng and Zhu (2019) reported that Nitrogen dioxide even at 6µL/L concentration can affect chlorophyll contents, peroxide activity, leaf minerals ion contents such as N⁺, P⁺, K⁺, Ca⁺⁺, Mg⁺⁺, Mn^{+ +}, Zn^{+ +}. NO₂ also increased oxidative damage. They concluded that NO₂ affects leaf chlorophyll damage, increases levels of lipid peroxidation and protein dissolution. Changes in both physiological responses and mineral ion concentrations induced by NO₂ exposure significantly affect plants growth. Therefore, it may be concluded that NO2 released from the vehicular emission constitutes a pollution risk to plants and agricultural crops which are near the road side where there are more traffic rush and iams.

Higher concentrations of sulphur dioxide can produce acute injury in the form of foliar necrosis even after short duration of exposure. Much longer exposure even at low concentrations of sulphur dioxide may cause chronic injury. It has been reported that SO₂ is converted into sulfuric acid from SO₃. This damage vegetation and bleached spots, bleached areas between veins, bleached margins, chlorosis, suppressed growth, early leaf fall and reduction in yield may be noted. Even SO₂ at 1 ppm can reduce chlorophyll contents by 39 to 65%.

Wang and Liao (2016) reported that carbon monoxide shows cross talk with other signaling molecules including NO, phytohormones (IAA, IBA, and GA) and other gas signaling molecules (H₂S, H₂, CH₄) etc.

IV.CONCLUSION

The automobile emissions due to combustions of Petrol and diesel in general and during traffic jams on congested road or near signals or cross road are damaging our environments. The plants, tree or agricultural crops near such places are being severely affected. Similarly, the particulate matters, the dusts produced by the traffic and due to friction of their tyres are deposited on the surface of leaves of road side trees and nearby agricultural crops. All these are



damaging the plants and vegetables so we get early leaf fall, reduction in fruit yields, growth and even trees are dying due to continuous exposure to such emission which is causing cumulative effects.

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