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Impact of Automobile Exhaust on Certain Biochemical Changes of Some Road Side Cereal Plants of Meerut

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Abstract – Automobile – "The need of modern world for speed and comfort", is of a great concern to us due to air/soil pollution. Thus, most Vehicles disturb our environment. Meerut lies in the western part of Uttar-Pradesh and is important source of cereal crops. Pollution is a major culprit in environmental degradation. With rapid progress of urbanization and industrialization of the country accompanied with indiscriminate fall out of waste substances resulted in the suffering of the life sustaining systems. The load of pollutants in the aerial atmosphere has increased many fold due to automotive exhaust and industrial emission, organic vapours, carbon monoxide, sulphur dioxide, unburnt hydrocarbons, oxides of nitrogen, lead oxides and heavy metals like nickel, arsenic, cadmium and titanium etc. released into the air are hazardous to human health, vegetation, flora and fauna. Likewise, the discharge of industrial waste to land and water resources cause a serious soil and water pollution in certain parts of the country.

Key Words : Vapours, Sulphur, Unburnt, Hydrocarbons

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INTRODUCTION

Common air pollutant affecting vegetation includes ozone and PAN (byproducts of automobile exhaust). Thus, all this result auto-exhaust pollution. According to an estimate (Ahmad et al. 1989) automobile fleet of the country emits over 1.8 million tons of air pollutants of which more than 80% are released in the cities. This all now have further reached to higher level. Sharma (1977) reported that air constitutes above 80% of man's daily intake by weight wide array of solid, liquid and gases are known to be present in the atmosphere in concentration sufficient to cause injuries to plant as well as to human life.

Pollution is generally defined as undesirable change in the environment. A number of human activities contribute to the emission of particulates in the atmosphere. Emission of motor vehicle is prime. Auto exhaust is the major source of air pollution in most town and cities.

Carbon monoxide (CO) is the most abundant atmospheric pollutant in the troposphere; levels of atmospheric CO are highest during winter season. Road traffic is by and large is source of manmade CO emission. Daily CO concentration in urban area rises and falls with traffic density and changes in weather conditions eg. Levels are maximum during morning and evening rush hours. Suspended particulate matter (SPM) is a conglomerate of chemically heterogeneous substances. The SPM values attain the maximum limit during summer. It has been long recognized that smoke in the air of towns adds an adverse effect on plant biochemistry, by reducing light intensity and hours of bright sun shine per day. Dust and grit also affects plant food synthesis due to reduced light intensity. Thus, automobile exhaust affects plant performances (Sharma et al. 1983).

The mad rat race among the nations over the globe for development jeopardized the health of man himself. Progress in agriculture, transportation and industry is taken a general criterion of development of any country. This craze resulted into unlimited exploitation of every bit of natural resource. The environment is a life sustaining system consisting of both living and non-living entities (e.g. air, water, soil, biota) many of which interact with each other, the environmental pollution caused by man's activities degrades these entities and make them extinct. Unlimited exploitation of nature by man disturbed the delicate ecological balance n\between living and non-living component of the biosphere. The unfavorable condition created by man himself threatened the survival not only of man himself but also of flora and fauna. The number of species likely to become rare, threatened, endangered or near extinction in the Red Data Book of the IUCN, is increasing with time.

Automobiles are one of the major sources of environmental pollution and cause health hazards to dangerous level. The ever increasing vehicular traffic density posed continued threat to ambient air quality and taking most of cities in the grip of auto-exhaust pollution. According to an estimate (Ahmad et al.,

1989) automobile fleet of the country emits over 1.8 million tons of air pollutants of which more than 80% are released in the cities. Automobile include two-wheelers, cars, trucks and buses etc. The auto exhaust consist of unburnt hydrocarbons, carbon monoxide, nitrogen oxides, lead oxides, heavy metals like nickel, arsenic, cadmium and titanium etc. air pollution has profound influence on flora. The response of plants to pollution is variable and depends on the individuals' genotype, age, stage of growth, proximity and concentration of pollution. It may affect the stomata behavior morphology, anatomy; germination also brings about changes in the chemistry of nearby soil.

Pollution is a necessary evil of all development. But man should not forget that "the splendid plentiful ness of nature is a heritage that should be conserved for future generations and not to be spoiled". The present study is a step in the direction to attract the attention of people for the same.

Several workers have shown their keen interest in studying effect of automobile exhaust on various roadside plants. Khan et al. (1995) observed symptoms o senescence, thinning of canopy, change in phenology, change in leaf size, leaf damage, dust deposition and deterioration and shoot conditions in some trees under the impact of automobile exhaust. Chattopadhyay (1996) noted that polluted leaves showed quantitative changes of varying degree in a number of leaves surface micro morphological characters i.e. stomatal frequency, epidermal thickness, leaf specific weight trichome density and size etc.

REVIEW OF LITERATURE

Agarwal and Tiwari (1998) calculated tderance in ten plant species and reported *Ficus glomerta* as tolerant and *Acacia nilotica* as sensitive species. Anbazhagan and Bhagwat (1991) reported increase in leaf area, panicle length and plant height when treated with kinetin and ascorbic acid spray. Ascorbic acid has been suggested as a reliable physiological detoxificant of pollutants by many workers (Freebarian, 1960; Keller and Schwager, 1977; Nandi et al., 1980). The plants acts as pollution sink and they replenish the atmosphere with much needed oxygen. Smith (1974) suggested the possibility of using trees as pollution sink.

Many workers (Motto et al. 1970; Mandany et al. 1990) analyzed the road side soil for different heavy metals and El-Dosuky et al. (1998) reported higher lead and cadmium contents in soil as well as in plants present along the road side.

Salgare and Iyer (1991) also studied effect of automobile exhaust pollution on some roadside plants. Kalamaker (1992) worked on the effect of automobile exhaust pollution on certain plants. Mandre and Tulmets (1997) found some pigments changes in Norway spruce induced by dust pollution along roadside.

Lone (2004) studied seasonal trends in the N contents of some economically important tree species under air pollution stress. The use of plants as monitors of air pollution and vehicular pollution along roadside has long been established since plants are the initial accepter of air pollution. This concept has been backed by the proponents of "green belt" as an aid in protecting urban environment from industrial pollution (Lone and Khan, 2007).

EXPERIMENTAL PLANTS

In the present study 4 plants selected which are as follows-

- Wheat *(Triticum aestivum)*
- Rice *(Oryza sativa)*
- Maize *(Zea mays)*
- Jae or Oat *(Avena sativa)*

Indian civilization, with the antiquity and continuity, ever recognized the importance of maintaining ecological balance by avoiding under exploitation of natural resources. Time tested techniques were discovered by sages and sears, and practiced by craftsman and householders for preservation of healthy environment for ever past 5000 years. Indian culture has little to learn from 20th century western mind regarding environment and sustainable development or living harmony with plants and its environment.

BIOCHEMICAL TECHNIQUES

50 mg dry powder of plant sample or 500 mg air dried soil was digested with 5 ml of concentrated. Sulphuric acid (Conc. H_2SO_4) and 2 ml of 30% Hydrogen per oxide (H_2O_2) for 5 minutes on sand bath. After cooling the digest, 3 ml more of H_2O_2 was added to it and the digestion continued for about 30 minutes more, till the contents became clear. The cooled digest was diluted to a known volume (50ml). The estimation of the digest was done with Nessler's reagent of Koch and Mc.

RESULTS & DISCUSSION:

TABLE – 1

TOTAL NITROGEN OF SOIL AND PLANT PARTS OF *TRITICUM AESTIVUM* GROWING UNDER FIELD CONTIONS NEAR ROADSIDE (20 M=EXPERIMENTAL AND ALSO AWAY FROM ROADSIDE 200 M=CONTROL) TOWARDS MEERUT GHAZIABAD ROAD.

STUDY SITE	FARM SOIL	ROOT	SHOOT	SPIKELET	GRAIN
	mg/gm DRY WEIGHT				
	AT VEGETATIVE STAGE				
Control	40.00±2.80	10.00±1.26	12.50±1.26	--	--
Experimental	41.40±2.88	12.20±1.38	14.40±1.48	--	--
	FLOWERING STAGE				
Control	36.50±3.80	12.0±0.80	16.00±2.80	--	--
Experimental	33.10±2.50	13.80±0.90	18.00±2.86	--	--
	AT YIELD STAGE				
Control	32.15±2.30	13.50±1.12	17.60±1.40	8.60±0.60	8.60±0.64
Experimental	31.00±2.40	16.00±1.40	20.00±1.80	9.40±0.40	10.00±0.80

TRITICUM AESTIVUM

Table 1 show certain comparative biochemical characteristics of soil and plant parts of *Triticum aestivum,* Linn. at three stages of growth viz. vegetative, flowering and yield stage under actual field conditions on a distant farm 200 mt distance away from road side (unpolluted soil = control) and at 20 mt distance away from road side (polluted soil = experimental) point towards Meerut Ghaziabad Road. Analysis of total N, were carried out in dry samples of soil, root, shoot, spikelet and grain of *Triticum aestivum* (wheat) grown on both control and experimental fields. Thus, total N values in root are 122.0%, 115.0% and 118.5% of control samples respectively at vegetative, flowering & yield stage. Likewise, these parameters in shoot are 115.2%, 112.5% and 113.6% of control samples at there stages of growth respectively. Since in wheat grain part is important and edible therefore, these investigations were also done in spikelet and seeds. Thus, total N in spikelet and grain are 109.3% and 116.2% of control samples respectively.

TABLE – 2

TOTAL NITROGEN OF SOIL AND PLANT PARTS OF *TRITICUM AESTIVUM* GROUWING UNDER FIELD CONDITIONS NEAR ROADSIDE (20 M=EXPERIMENTAL AND ALSO AWAY FROM ROADSIDE 200 M=CONTROL) TOWARDS MEERUT – MUZAFFAR NAGAR ROAD

STUDY SITE	FARM SOIL	ROOT	SHOOT	SPIKELET	GRAIN
	mg/gm DRY WEIGHT				
	AT VEGETATIVE STAGE				
Control	41.20±4.00	10.80±1.60	12.60±1.30	--	--
Experimental	42.00±2.40	12.10±1.30	14.80±1.42	--	--
	FLOWERING STAGE				
Control	40.00±3.60	12.60±1.26	13.80±1.40	--	--
Experimental	42.10±4.20	14.40±1.80	18.60±1.60	--	--
	AT YIELD STAGE				
Control	33.00±2.40	14.00±1.00	16.80±1.40	8.70±0.86	8.80±0.88
Experimental	34.80±4.00	16.20±1.80	20.10±1.60	10.40±0.68	10.45±0.70

Table 2 show the comparative biochemical characteristics of soil and plant of wheat grown on field condition towards Meerut Muzaffar Nagar road at 200 mt. distance away from road side (unpolluted = control) and at 20 mt. distances (Polluted = experimental) point away from road side. Analysis of total N, were carried out in the collected samples of soil, root, shoot, spikelet and grain of *Triticum aestivum* plant grown on both control and experimental field. Thus, total N, values in soil of experimental field are ca. 102%, 105% and 105% of control field respectively measured at 3 stages. However, these values in root are ca. 112.0%, 114.2% and 115.7% of control respectively, at vegetative, flowering & yield stages of growth. Further, these parameters in shoot are 117.4%, 134.7% and 119.6% of control samples respectively. These investigations were also done with the spikelet and grain parts of this plant. Thus, total N, level in spikelet and grain are 119.5% and 118.7% of control samples respectively at yield stage of growth in wheat plant grown at Meerut Muzaffar Nagar road.

CONCLUSIONS :

There is a general increase in total N content at 20 mt. distance away from road side plant parts and decrease in total N content in 200 mt. distance away from road side plant parts: however, there is some differential response to plant tissue in these parts with respect to polluted road side condition. The decrease in the N content of the foliage of some economically important plant has been earlier recorded by Lone and Khan (2007). The increase in the N contents of foliage in road side (20 mt. distances) grown plants may be due to losses in proteins of membrane permeabily caused by automobile exhausts emissions containing certain non degradable heavy metals etc. This increases permeability of membrane and so more uptake of Nitrogen (Ceicel and Wake, 1962; Darley et al., 1963; Kalamakar, 1992 and Kumar and Bhargava, 2008; Singh & Bhargava, 2009; Singhal & Bhargava, 2011)

REFERENCES

Agarwal, S. and S.Tiwari 1998 Air Piollution tolerance index of a few plants growing near Rai Garh, M.P. Environment and Ecology. 16(4): 813-816.

Babu, C.R. 1977 Herbaceous flora of Baghpat, C.S.I.R. Publication, New Muzaffar Nagar.

Badola, S.P. and H.R. Singh 1981 Hydrobiology of river Alaknanda of the Garhwal Himalayas. Ind. J. Ecol. 8: 269-76.

Cock, L.V. and C.V. Redi 1966 Laboratory hand book for oil and fat analysis. Academic Press, London.

`Ghos, M.N. 1984 Fundamentsl of experiments Biology. Scientific Book Agent : 107. Rajaram N. (2004): Medicinal plants used by tribals of Moolagongai district of tamil Nadu, India. Adv. Plant Sci. 17(II): 421-426.

Mishra, R.R. 1972 Flora of Hardoi district (U.P.) Hydrophytes, Proc. 59th Sess. Ind. Sci. Cong. 322.

Phillipson, J.D. 2001 Phytochemistry and Medicinal plants. Phytochemistry, 56: 237-243.

Reshu 2005 Some biochemical aspects of Lageneria vulgaris, Linn.: An Assessment of its medicinal value regarding hypertension. Adv. Plant. Sci. 17(II): 431-525.

Schaffer, M. 1987 Minimum viable population copying with uncertainty in ME Soule (Ed.). Viable Pop. of Conservation Cambridge Univ. Press. Cambridge, N.Y./London.

Sumanpreet 1999 Sweet Poison : Tobacco. Biospecturm 1(I): 31.

Uphof, A. 1947 Biochemical analysis of Ocium sanctum. J. Indian Chem. Soc., 24: 358-369.

Wiekens, G.E. 2001 Economic Botany - Principles and Practices, Kulwer Academic Publishers, London, p. 459.