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RESEARCH ARTICLE

BIOCHEMICAL ANALYSIS OF DUST POLLUTED LEAVES

***Darade, M.S.**

Department of Botany, Govt. Vidarbha Institute of Science and Humanities, Amravati (M.S), India

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ABSTRACT

The analysis of dust polluted leaves were carried out .The effect of dust on phenolic and protein contents of plant leaves were determined in different plants .The estimation of Phenolic compounds and Protein compound was carried out in leaves. Total fifteen plants were assayed for the presence of amount of biochemical components in dust deposited leaves. The survey of dust polluted leaves were made in the campus of the Govt. Vidarbha Institute of Science and Humanities in Amravati. It is found that *Bauhinia variegata L.* has shown minimum amount of phenolic contents in dust polluted leaves (2.212µg/µL) while in *Polyalthia longifolia L .(son.).*Th. it was found 112.93 µg/µL. The Protein content in dust polluted leaves were found minimum in *Bougainvillea spectabilis L* (6.55 µg/µL)and maximum in *Ficus benghalensis L*(178.96 µg/µL) .It is observed that size and surface texture of leaves affect the capturing of dust particles and maximum dust deposition on the leaves which affect directly and indirectly on the physiological activities taking place in the leaves .

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INTRODUCTION

The Phenols are also called as Phenolics, are a class of chemical compounds consisting of a hydroxyl group (- OH) bonded directly to an aromatic hydrocarbon group. The simplest of the class is phenol, which is also called carbolic acid C6H5OH. Phenolic compounds are classified as simple phenols or polyphenols based on the number of phenol units in the molecule. Phenolic compounds are synthesized industrially and also are produced by plants and microorganisms with variation between and within the species. Increasing phenol concentration and its role in providing resistance to pathogen and oxidative stress are well documented (Maletsika *et al*. 2015). Proteins are large biomolecules or macromolecules consisting of one or more long chains of amino acid residues. Proteins perform a vast array of functions within organisms including catalysing metabolic reactions, DNA replication, responding to stimuli and transporting molecules from one location to another. Proteins can also work together to achieve a particular function and they often associate to form stable protein complexes. Proteins are essential parts of organisms and participate in virtually every process within cells. Many proteins are enzymes that catalyse biochemical reactions and are vital to metabolism. Reduction in protein content in plants because of air pollution has been reported by many investigators (Guoetal., 2007; Rajput and Agrawal, 2005).

Corresponding author: **Darade M.S.**
Department of Botany, Govt. Vidarbha Institute of Science and Humanities, Amravati (M.S), India.

Protein degradation and increased proteolytic activities have been suggested as an index of oxidative stress in plants (Romero-Puertas et al., 2002). Considering the importance and effect of dust deposition on leaves and its interference in biochemical activities in plants present investigation attempted.

MATERIALS AND METHODS

Collection of Sample

The samples of dust deposited leaves at mature condition and at diferent heights were collected in replicates from the campus of Govt. Vidarbha Institute of Science and Humanities, Amravati. The samples were collected in the month of January, February and March 2017. Each sample were placed in airtight polyethylene bags separately and brought to the laboratory for biochemical analysis. The material was washed thoroughly and moisture was drained before analysis for estimation of Phenolic and Protein contents. The analysis of dust polluted leaves was done as per the standard methods.

Determination of total Phenol

Dust polluted leaf tissues was extracted with 10ml of 80% ethanol. 1ml of extract was added to 1ml of 20% Sodium carbonate and 0.5ml of Folin - phenol reagent and it was kept in a boiling water bath at 100°C for 10 minutes. Total volume was made up to 10ml by adding distilled water and absorbance was read on spectrophotometer at 650nm.

The amount of phenols present in the sample was calculated from a standard curve prepared from Catechol (Sadasivam and Manikam, 1992).

Estimation of phenol

1 gm sample of dust polluted leaves was taken and ground it with 10 ml 80% acetone. It was then centrifuged at10000 rpm for 20 minutes. The supernatant was represented five time with volume 80% ethanol. The supernatant was evaporated to dryness .The residues was dissolved to 5 ml volume of distilled water. 0.2 to 2ml sample was pipette out in the test tube and made the volume upto 3ml with of distilled water. Folin-Ciocalteu reagent reagent was then added upto 0.5ml. After 3 minute 20 % 2 ml of Sodium bicarbonate was added in each test tube, then the extract was boiled for 1 minute in boiling water bath.

working standard solution was pipette out in series of test tube, after that pipette out 0.1 and 0.2 sample extract into 2 other test tubes. The volume was makeup to 1ml with water in all the test tube upto 1 ml. Tube with 1ml of water served as blank. 5ml solution of FCR (Folin-Ciocalteu Reagent) was mixed well and immediately incubated at room temperature at 30 minute. The absorbance was measured at 660nm against the blank.

RESULT AND DISCUSSION

In dust polluted plant species variation in phenol content was observed. The highest concentration of phenol is found in *Polyalthia longifolia* (*112.93*µg/µL) and *Annona squamosa* (88.69 µg/µL) and lowest found in *Bauhinia variegata L* (*2.21* µg/µL) and *Cassia fistula* (3.84 µg/µL) (Table 1).

Table 1. Determination of Phenol content in dust polluted leaves

S. N.	Plant species	Weight of sample	Total volume of extract	Extract taken for analysis	Absorbance 650 nm	Phenol µg/µL
1	*Annona squamosa L.*	0.5g	10ml	0.1ml	0.6	88.69
2	*Bauhinia variegata L.*	0.5g	10ml	0.1ml	0.3	2.212
3	*Bougainvillea spectabilis L .*	0.5g	10ml	0.1ml	0.44	40.21
4	*Butea monosperma (L).taub*	0.5g	10ml	0.1ml	0.18	38.57
5	*Cassia fistula L.*	0.5g	10ml	0.1ml	0.32	3.848
6	*Ficus benghalensis L .*	0.5g	10ml	0.1ml	0.1	62.81
7	*Ficus religiosa L..*	0.5g	10ml	0.1ml	0.4	28.09
8	*Morinda citrifolia L.*	0.5g	10ml	0.1ml	0.06	74.93
9	*Nyctanthus arbortristis L.*	0.5g	10ml	0.1ml	0.06	74.93
10	*Plumeria alba L .*	0.5g	10ml	0.1ml	0.5	58.39
11	*Polyalthia longifolia L .(son.).Th.*	0.5g	10ml	0.1ml	0.68	112.93
12	*Pongamia pinnata (L).Pierre*	0.5g	10ml	0.1ml	0.16	44.63
13	*Sapindus mukorossi L.*	0.5g	10ml	0.1ml	0.2	32.51
14	*Spathodia campanulata L .*	0.5g	10ml	0.1ml	0.46	46.27
15	*Tabebuia argentea L .*	0.5g	10ml	0.1ml	0.4	28.09
	S. E.				0.05	7.83
	S. D.				0.19	30.32

Table 2. Determination of Protein content in dust polluted leaves

Sr. No.	Plant species	Weight of sample (mg)	Total volume of extract(ml)	Extract taken for analysis(ml)	Absorbance 660 nm	Protein µg/µL
1	*Annona squamosa L.*	0.5	10	0.1	0.42	99.65
2	*Bauhinia variegata L.*	0.5	10	0.1	0.27	47.93
3	*Bougainvillea spectabilis L .*	0.5	10	0.1	0.15	6.55
4	*Butea monosperma (L).taub*	0.5	10	0.1	0.06	24.48
5	*Cassia fistula L.*	0.5	10	0.1	0.48	120.34
6	*Ficus benghalensis L .*	0.5	10	0.1	0.65	178.96
7	*Ficus religiosa L..*	0.5	10	0.1	0.42	99.65
8	*Morinda citrifolia L.*	0.5	10	0.1	0.4	92.75
9	*Nyctanthus arbortristis L.*	0.5	10	0.1	0.22	30.68
10	*Plumeria alba L .*	0.5	10	0.1	0.64	175.51
11	*Polyalthia longifolia L .(son.).Th.*	0.5	10	0.1	0.2	23.79
12	*Pongamia pinnata (L).Pierre*	0.5	10	0.1	0.6	161.72
13	*Sapindus mukorossi L.*	0.5	10	0.1	0.4	92.75
14	*Spathodia campanulata L .*	0.5	10	0.1	0.28	51.37
15	*Tabebuia argentea L .*	0.5	10	0.1	0.64	173
	S.E.				0.05	15.61
	S. D.				0.19	60.45

It was then cooled and absorbence at 650 nm was measured on Spectrophotometer.

Estimation of protein

Estimation of protein was carried out in dust polluted leaves .In this method 0.5gm of dust polluted tissues of leaves were taken and grinded in mortor pestle with the help of solvent buffer having pH -7, after that it was centrifuged. The supernatant was used for the protein estimation .0.2 ml

The increasing phenol content may be due to increase in the oxidative enzyme like Polyphenol oxidase in plant that turn more active when plant is subjected to any stress. Similar study was carried out by A. Arul and R. Nelson (2015). They found that Phenol concentration was more prominent in *Arachis hypogea* and *Dolichos lablab* and lesser content in *Vigna mungo*. The Cement dust had a significant effect on the growth of some plant species compared with noncement dusted plants. Toxic compounds such as fluoride, magnesium, lead, zinc, copper, beryllium, sulfuric acid and hydrochloric acid were found to be emitted by cement manufacturing plants (Andrej,

1987). Reduction in plant height, cover and number of leaves of *Carissa carandas* showed that the losses are generally attributed to the cement dust which contained toxic metals. The impact of dust emission on plant vegetation in the vicinity of cement plant. According to their work the cement industry is the major source of particular matter like SO2,NO2 and CO2 emission and cement dust contains heavy metals like nickel, cobalt, lead, chromium, etc. which are hazardous to the biotic environment with impact for vegetation, human and animal health and ecosystem.

It is observed that the maximum content of protein was found in *Plumeria alba* (175.51 µg/µL) and *Tabebuia argentea* (173 µg/µL) and minimum lower content found in *Bougainvellias pectabillis* (6.65 µg/µL) as shown in Table 2. The decrease in protein concentration could be attributed to inactivatation of enzyme due to air pollutant (Prasad and Inamdar 1990). Inactivation enzyme reduce growth of plant (Skinder, 2015) .The Decrease in plant height of *Delonix regia* might be due to the decrease in phytomass, net primary production and chlorophyll content in response to the cement dusts, confirming the findings of Prasad and Inamdar (1990) in *Vignamungo*. The cement dust kiln showed a reduction in chlorophyll content, protein, starch, yield and phytomass in *Arachishypogaea* L. (Prasad and Inamdar, 1990). A significant reduction in leaf number for *Carissa carandas*, *Delonix regia* agrees with the findings of Anda (1986).

Conclusion

Plant response varies between species of a given genus and between varieties within a given species. Plants do not necessarily show similar susceptibility to different pollutants. The secondary metabolites response to stress condition and produce phenolic compounds. The phenolic compounds prevents the plant from oxidative stress and pathogenic activity due to increasing oxidative enzymes like polyphenol oxidase. The plant produces secondary metabolites, the protein. The proteins is involved in direct growth and development. Dust particles inhibit the formation of biochemical contents in plants and reduces the rate of chemical reactions in the plant tissues hence dust reduce the growth and development of plant.

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