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STUDY OF PHYSICOCHEMICAL AND ENZYME ACTIVITY IN SOIL NEAR 4 CEMENT FACTORY OF SATNA DISTRICT OF MADHYA PRADESH (INDIA)

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ABSTRACT
Nature is consists of soil, air and water. Soil is the most important medium for growing of plants and plays an important role in our life. Due to human activities several kinds of pollutant like cement dust, pesticides, insecticides, fertilizers and chemicals release to the nature. Cement dust is the main factor of soil pollution. The present paper deals with physico-chemical study of 12 soil samples collected from four cement factory sides of Satna district of Madhya Pradesh. Physico-chemical study of soil in the industrial area of cement has been studied and observed that effect of soil pollution decreases as the distance from factory increases.

KEYWORDS: Physicochemical, enzyme activity, cement factory, pollution, Satna district.

INTRODUCTION
Soil is easily polluted by various factors such as papers, oils, plastics, factory wastes etc. directly and indirectly. Soil fertility is affected and decreases the microorganisms and nutrients. Pollution problems are spread very rapidly. It's badly effects in human health. Due to modernization and industrialization has changed the life style. The direct effects of cement dust pollution changing of the chemical composition of the soil and alkalization of the ecosystem.[1] The pollutant particles enter into the soil and changes it physicochemical properties. Major impacts of the cement activity on the environment are the deposition of the dusts and gases in the soil and water.[2] Cement dust pollution has a negative effect in the soil microbial activity and soil enzyme activity.[3] Soil enzyme activities depend on optimum condition of moisture, pH and temperature and substrate concentration. Soil pH can affect enzyme activity in the soil. When soil is polluted by heavy metals enzyme may vary under stress.[4-5]

For present study undertaken physicochemical analysis and enzyme activity of soil samples in and around four cement factory of Satna district Madhya Pradesh. Maihar is a Tehsil of Satna district of Madhya Pradesh, India. It is well known for the temple of the revered mother goddess Sharda Devi and situated in Trikut hill. The town is well connected by road and rail. It is located on latitude 24.27^{o}N and longitude 80.75^{o}E. It has an average elevation of 376 meter (1204ft). There are three cement factories, *viz.* Maihar cement factory, KJS cement factory and Reliance cement factory. Maihar cement factory is situated at Sarlanagar about 8 Km. away from Maihar town on Maihar-Dhanwahi Road. The factory complex and the township are situated at Sarlanagar about 8 km away from Maihar town on the Dhanwahi road. Where KJS cement factory and Reliance cement factory are also located in Maihar Tehsil. Satna cement factory is located away from Maihar town 20 km in north –east region. Soil physicochemical properties can change due to cement dust pollution. Therefore, this study was carried out to assess the impact of cement dust pollution on the abundance and properties of soil around the cement plants.

MATERIALS AND METHODS
Collection of soil samples and analysis
For present study soil samples were collected in the area of four cement industries (Maihar cement factory, KJS cement factory, Reliance cement factory and Satna cement factory). Based on the area distribution, the soil samples collected from three different sites A (inside the factory sample A, D, G,& J), B (2 km away in the area from the each factory, sample B, E, H and K) and site C (5 km away in the area from the each factory, sample C, F, I and L). Total 12 samples were collected from 12 different sites in clean sterile polythene bags. The dried samples after grinding in wooden pestle and mortar were mixed throughly and passed through 2 cm. diameter sized seive and then are ready to use for analysis of *pH*, organic compounds, Calcium carbonate, Nitrogen, phosphate and Potassium.[7-9]

RESULTS AND DISCUSSION

Physicochemical characteristics of soil samples

Soil pH: Different soil samples *pH* analyzed and results are given in table- 1. The highest pH 9.10 KJS cement factory soil sample distance 0 KM from the factory and the lowest pH 7.20 Satna Cement factory soil sample distance 5 km from the cement plant. Hence soil was found to be alkaline type and having decreasing pH with the increase of distance.

(B) Calcium Carbonate: 12 soil samples Calcium carbonate analysis results are given in table -1. It was observed that result of calcium carbonate varied from 36.09 to 20.17 in study area and it was decrease the distance from factory to 5 km. It means calcium carbonate content decrease with increasing distance. The higher content of CaCO3 and its basic nature near cement factory due to higher dust fall. According to Katyal & Satake, 1989; Dzombak 1987; Seker, and Ozaytekin 2002[10-12] increase in concentration of Ca++ maica the soil alkaline.

(C) Organic compound analysis results are given in table -1. The data showed gradual decrease in organic carbon content from 5.42% to 3.90% in the soil in accordance to distance from the cement factory. According to **El-Monayeri *et al*.; 1996**; **Bandick, and Dick 1999; Harrison, 1987**[13-15] the amount of organic carbon accumulation is faster than the decomposition which makes soil unfertile.

(D) Nitrogen: Analysis results of Nitrogen are given in table-1. The highest content of Nitrogen 840.60 kg/hactare was found at o km maihar cement factory and lowest 680kg/hectare Satna cement factory 5 km away from Satna cement factory. It showed reduction of Nitrogen content in soil with increasing distance.

(E) Phosphorous analysis results are given in table -1 Phosphorous showed a positive trend towards the increment of distance from the cement-factory. It was 6.50kg/hactare at factory and 20.34kg/hactare at 5 km. from factory. These results shows that availability of phosphorous is dependent upon the soil acidity (pH) and form of phosphorous in the soil Friedel, *et al.;* 1996[16] suggested that significant decrease in soluble reactive phosphorous concentration due to formation of CKD calcium phosphate.

(F) Potassium: Total potassium content of the soil has been analysed and results are tabulated in table-1 The highest Potassium content 695kg/hactare Maihar cement factory soil sample at 0 km. from cement plant and Pang, and Kolenko, 1986[17] that cement dust cause increase in potassium content and it remains higher than Na, P and Mg in the affected soil.

On the basis of above results it can be concluded that the contents of cement dust highly effected the properties of soil. Cement dust is mainly contains CaCO3. It raise the pH of soil and make the soil alkaline. Nitrogen mineralisation process also decreases as Nitrogen content increases. Ca forms chelate with P thus availability of P is decreases. Potassium content was shown higher. Physiological and Biological process of the plant are also affected by dust pollution. These conditions are not favourable for growth of plants and microbs thus make soil unfertile and tend towards the low crop yield.

Table 1. Physical characteristics of 12 soils samples collected from 4 cement factory side Satna District

S.N0	Name of sampling stations	Distance from factory	Samples code	pH	CaCO3	Organic Compound	Nitrogen (Kg/hectare)	Phosphenate (Kg/hectare)	Potassium (Kg/hectare)
1	Maihar cement factory	0km	A	8.90	34.16	5.12	840.60	6. 50	695.0
2	Maihar cement factory	2km	B	8.50	32.39	4.56	780.10	7.0	600.2
3	Maihar cement factory	5km	C	8.40	30.23	4.24	710.20	7.30	590.00
4	KJS cement factory	0km	D	9.10	36.09	5.42	820. 23	9.10	521.30
5	KJS cement factory	2km	E	8.75	33.12	4.90	790.10	10.34	508.6
6	KJS cement factory	5km	F	8.60	31.40	4.20	770.20	10.98	485.4
7	Reliance cement factory	0km	G	8. 40	28.35	5.00	790.45	7.12	606.0
8	Reliance cement factory	2km	H	8. 20	27.00	4.32	740.21	8.08	570.60
9	Reliance cement factory	5km	I	8.00	26.22	4.10	715.20	8.73	560.50
10	Satna cement factory	0km	J	7.90	24.23	4.20	800.30	15.10	509.0
11	Satna cement factory	2km	K	7.50	22.16	4.00	750.32	18.65	468.00
12	Satna cement factory	5km	L	7.20	20.17	3.90	680.43	20.34	450.00

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