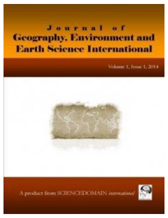

Journal of Geography, Environment and Earth Science International

20(2): 1-12, 2019; Article no.JGEESI.47449
ISSN: 2454-7352

Impact of Cement Dust on Physico-chemical Properties of Soils around a Cement Factory in Bagalkot, Karnataka, India

Sukumar A. Kokatnur[1*] and V. B. Saviramath[2]

[1]*Department of Studies in Geography, Karnatak University Dharwad, India.*
[2]*Department of Geography, Karnatak Science College, Dharwad, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JGEESI/2019/v20i230103
Editor(s):
(1) Prof. Mohamed Nageeb Rashed, Department of Chemistry, Faculty of Science, Aswan University, Egypt.
Reviewers:
(1) Moses Oghenenyoreme Eyankware, Ebonyi State University, Nigeria.
(2) Nazura Usmani, Aligarh Muslim University, India.
(3) Tebogo Mashifana, University of Johannesburg, South Africa.
(4) Farhaoui Mohamed, National Office of Electricity and Drinking Water, Morocco.
Complete Peer review History: http://www.sdiarticle3.com/review-history/47449

Original Research Article

Received 29 December 2018
Accepted 14 March 2019
Published 03 April 2019

ABSTRACT

Aims: To study the physicochemical properties of soil around the cement factory, to examine the effect of the industrial dust on the soil properties and to analyse the relation between the proportion of pollutants and the distance from the cement factory.
Study Design: Were used to analyse the relationship between soil samples at four different locations within the study area. Statistical methods such as; percentage, graph and Pearson correlation method.
Place and Duration of Study: For this study soil samples were collected around J k cement factory near Muddhapura of Mudhol Taluk of Bagalkot district in the pre monsoon period at four directions. Samples were analysed using titrant method, flame photometer method, oslen method to determine physicochemical properties. Pearson correlation method was used to analyse the relation between concentration of different elements in the soil samples and distances in four directions.

**Corresponding author: E-mail: sukky1008@gmail.com;*

Results: From detailed analysis it was observed that there was increase in concentration of major elements, such as P, Ca, and Mg. However, there are some exceptions such as OC, N, S, Na, Zn, and Fe whose concentration in the soil samples increase with increase in distances in all directions. Since their correlation with distance is positive and significant since the P-value is less than 0.05.
Conclusion: In the present study, it has been established that the physicochemical properties of the soils around the factory have been changed due to the dust deposition as it is adversely affecting the composition soils. This in turn affected the concentration of nutrients required for plants growth. Furthermore, it may become hazardous to soil, flora and fauna.

Keywords: Physicochemical; proportion; pollutants; correlation.

1. INTRODUCTION

As cement manufacturing industries generate various type of pollution. The dust emitted from cement plants are of two categories. They are cement and clinker dust which contain cement mineral compounds [1]. The second category is the raw mill and percipitate dust that have not been calcined and they contain calcium carbonates, oxides of iron, sillicon, aluminium, magnesium and other minor elements [2].

Previous literature has shown that the pollutants were emitted at every stage involve manufacturing of cement. The pollutants are emitted at every stage of the manufacturing process, including extraction of the raw materials,crushing, Production etc. [3]. The dust emitted from the cement factories are usually deposited around the factories [4]. Concentration of the dust goes on decreasing with increasing the distance from the factory [5]. The concentration of dust is higher corresponding to the dominant direction of wind i.e south-west to north-east in the study area. Cement dust chnages elemental concentration of soil and also changes its physicochemical properties [6]. Change in properties of soils due to deposition of the dust adversely affects not only soils but also plants and animals [7].

The study area constitutes a part of the Deccan plateau of Karnataka State in India and covered by black soils which are rich in iron, lime and magnesium carbonate but poor in phosphorus, nitrogen and organic matter. But the soils around the factory have lost their original properties due the dust deposition. Therefore, there is a need for monitoring and evaluation of the cement manufacturing industries in order to mitigate the cement dust. Thus, the present study makes an attempt to analyse the impact of cement dust deposition on some elemental physicochemical properties of soil cover in the vicinity of JK cement factory of Bagalkot district.

2. MATERIALS AND METHODS

For the purpose of determining physicochemical properties of the soils, 16 top soil samples in the depth of 0-15 cm. from various distances of 0.25 km, 0.5 km, 0.75 km and 1km in four directions viz. South-west, south-east, north-west and north-east were collected from the study area in the pre monsoon period in which south-west monsoon winds are dominant. The samples were tested by titration Method, technique where a solution of known concentration was used to determine the concentration of an unknown solution. The concentration of the unknown is determined by the volume of titrant to determine the concentration of certain metal ions viz. sodium, potassium, lithium, and calcium; flame photometer was used. This is a controlled flame test with the intensity of the flame colour quantified by photoelectric circuitry.

Oslen method was used to determine the relative bioavailability of ortho-phosphate in soils. Along with these, Pearson correlation method was used to analyse the relation between concentration of different elements in the soil samples and distances in four directions.

The aim of the study was achieved from the following objectives

1. To study the physicochemical properties of soil around the cement factory
2. To examine the effect of the industrial dust on the soil properties.
3. To analyse the relation between the proportion of pollutants and the distance from the cement factory

2.1 Study Area

The district of Bagalkot is situated entirely on the North Karnataka Plateau, which is part of the Deccan Plateau and Located in north-central Karnataka, Bagalkot is surrounded by Belgaum District to the west, Bijapur District and Kalburgi District to the north and north-east, Raichur District to the east and Koppal, Gadag and Dharwad Districts to the south-east, south and south-west respectively.

It is positioned at16°12′N 75°45′E and covers an area of 6593 km².Bagalkot district has six taluks- Bagalkot, Badami, Hunagunda, Mudhol, Jamkhandi, Bilgi. According to the 2011 census Bagalkot district has a population of 18, 90,826, the district has a population density of 288 inhabitants per square kilometre. There are six cement industries in Bagalkot district which are located at various places such as Mudhol, Lokapur, Bilagi and Bagalkot. The JK Company established a cement industry at Muddhapura of Mudhol Taluk In the year 2005. The cement plant is located at the distance of 20 km from taluk head quarters Mudhol. Physicochemical properties of soil are presented in Table 1.

3. RESULTS AND DISCUSSION

Analysis of the samples showed that there is considerable increase in concentration of several elements around the cement factory. Table 2 shows that mean concentration of different elements at various distances from the cement factory, while Table 3 reveals the correlation of concentration of elements in the soil samples over different distances in all directions. It can be observed that majority of correlations are negative implying that their concentration decreases with increasing distances. Major elements, among these are P, Ca, Mg.

However, there are some exceptions such as OC, N, S, Na, Zn, and Fe whose concentration in the soil samples increase with increase in distances in all directions. Their correlation with distance is positive and significant since the P-value is less than 0.05.

3.1 Potential Hydrogen (pH)

Statistics of the pH analysis of different soil samples are given in Table 2. pH is significant when detecting with soil. If the pH is less than 6 then it is said to be an acidic soil, the pH range from 6-7 represents normal soil and with pH greater than 7 the soil is said to be alkaline soil. According to the results obtained, it varied from 7.31 to 8.68 in the study area. Hence, soil was found to be alkaline type, pH valve is declining with the increase of distance. These results indicating that the soils around the cement plant were alkaline in reaction with cement dust. The soil pH was 8.68 at 0.25 km. it decreased gradually to 7.67 at 0.5 km. and the pH was 7.81at 750 meter and 7.31 at 1 km. distance (Fig.1).

The Pearson Correlation between pH and distance is -0.882 with a p-value of 0.118. Even though, the correlation value is strong and it is negative since the p-value is greater than 0.05 we may conclude that the relation is non-significant.

3.2 Electric Conductivity (EC)

Electric Conductivity measures the ions present in solution. The electrical conductivity of soil solution increases with the increased concentration of ions. EC is also used to check the quality of soil. Here Electric Conductivity increased from 0.445, to 0.511 at 1 km to 0.75 km distance from cement factory and 0.646 at 0.5 km and 0.872 at 0.25 km (250 meter) distance from the cement manufacturing unit indicating the effect on soluble salt content of the soil (Fig. 4).

The Pearson Correlation between EC and distances is -0.606 with a p-value of 0.394. Even though the correlation value is strong and it is negative. Since the p-value is greater than 0.05 we may conclude that the relation is non-significant.

3.3 Organic Carbon (OC)

Soil Organic Carbon is a significant property of the soils. If the soil is deficient organic matter it enhances the process of soil erosion. The soil, that is rich in organic matter is highly useful for the agricultural practices. The data clearly showed continuous decrease in organic carbon content from 4.94 (g.kg-) at 1 km distance, 4.3 (g.kg-) 750 meter, and 3.68 (g.kg-) at 500 meter and finally 2.90 (g.kg-) at 250 meter distance from the cement factory. It confirms the trend of organic carbon content in polluted area. On the basis of above results it can be concluded that the contents of cement dust highly affected the properties of soil as shown in Fig. 5.

The Pearson Correlation between OC and distances is 0.999 with a p-value of 0.001. Since the correlation is positive and it is significant since the p-value is 0.001 which is less than 0.05 we may conclude that there is positive and statistically significant correlation between OC and distances.

3.4 Nitrogen (N)

Nitrogen is a most significant manure element in the soils. Plants react quickly to use of nitrogen salts. This component encourages exceeding ground vegetation growth and gives a deep green color to the leaves. It is the most essential nutrient required by plant for proper growth and development.

The result showed that, the availability of Nitrogen in collected soil is 223.25 kg /hectare at the distance of 1 km from the cement industry and its continuously decreasing 208 kg /hectare at 750 meter, 189.27 kg /hectare at 500 meter and finally 177 .2 kg /hectare 250 meter at the distance from the cement factory. It showed a clear trend of reduction in total Nitrogen content in soil with decreasing distance as shown in Fig. 6.

The Pearson Correlation between N and distances is 0.997 with a p-value of 0.003. Since the correlation is positive and it is significant since the p-value is 0.003 which is less than 0.05. We may conclude that there is positive and statistically significant correlation between N and distances. This implies that as the distance from cement factory increases the concentration of N in soil samples also increases.

3.5 Potassium (K)

The total potassium is also one of the major elements in plants components and it is useful for growth of every plants. The normal content of potassium in soils is 110 kg/ha to 280 kg/ha. But more concentration of potassium content was detected near the cement factory because of cement dust.

The total potassium content of the soil is 520.75 kg/hectare at 1 km distance from the cement factory and increasing trend were continued, P was found to be 528 kg/hectare at 750 meter and 533 kg/hectare at 0.5 km and 587.5 kg/hectare, nearest to the factory because of cement dust (Fig. 7).

The Correlation between K and distances from the factory is -0.868 with a p-value of 0.132. Even though the correlation value is strong and it is negative. Since the p-value is greater than 0.05. Thus, the relation is non-significant.

Table 1. Physicochemical properties of soil and Methods

Sl. no	Elements	Abbreviation of elements	Methods	Measurements
01	pH	Potential Hydrogen	pH meter	
02	EC	Electrical Conductivity	Conductivity meter	
03	OC	Organic Carbon	Titration Method	g.kg-
04	N	Nitrogen	Kjeldas Method	kg/ha(kilo gram per hectare)
05	P	Phosphorous	Olsen Method	kg/ha(kilo gram per hectare)
06	K	Potassium	Flame photometer	kg/ha(kilo gram per hectare)
07	S	Sulphur	Turbidimetric Method	kg/ha(kilo gram per hectare)
08	Na	Sodium	Flame photometer	me/100gm (milli equivalents per 100 gram)
09	Ca	Calcium	Titration Method	me/100gm (milli equivalents per 100 gram)
10	Mg	Magnesium	Titration Method	me/100gm (milli equivalents per 100 gram)
11	Zn	Zink	DTPA Extract (AAS)	ppm(parts per million)
12	Fe	Iron	DTPA Extract (AAS)	ppm (parts per million)
13	Mn	Manganese	DTPA Extract (AAS)	ppm(parts per million)
14	Cu	Copper	DTPA Extract (AAS)	ppm (parts per million)
15	CaCO3	Calcium Carbonate	Titration Method	me/100gm(milli equivalents per 100 gram)

Source: APHA

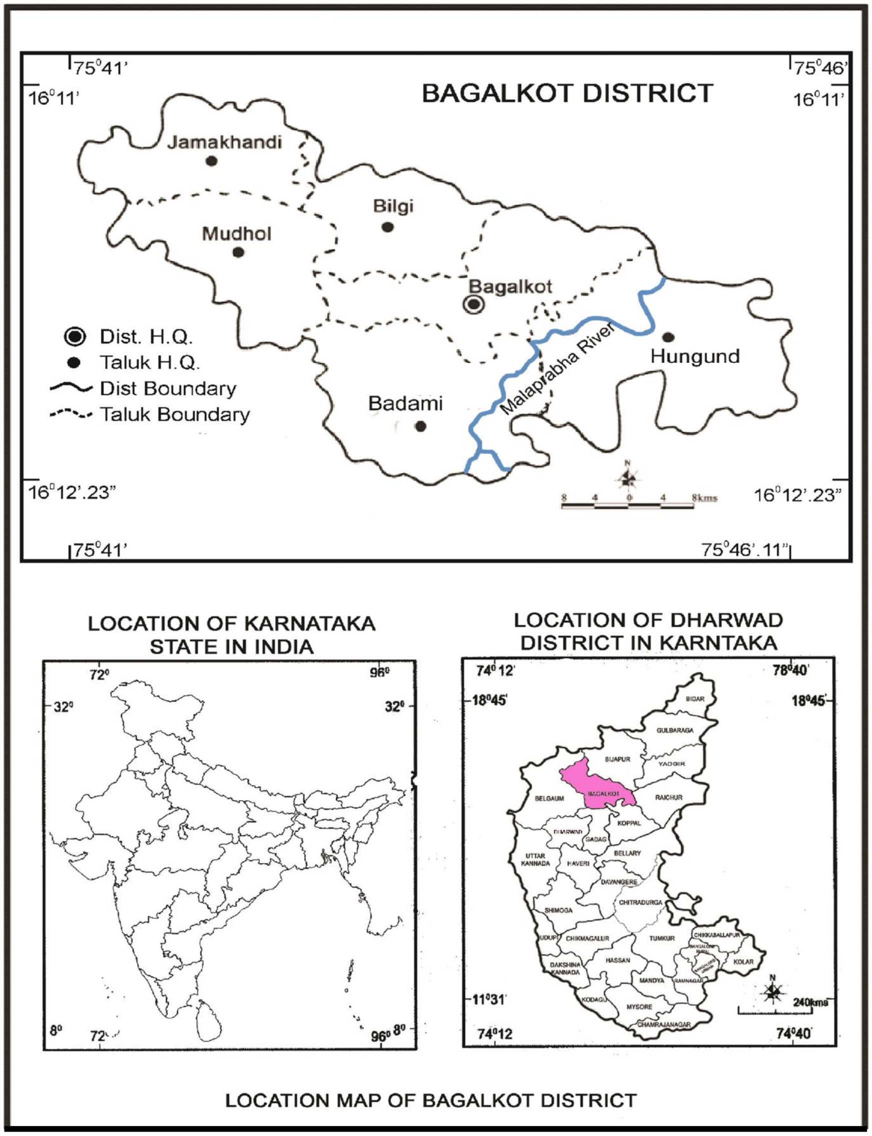

Fig. 1. Location of the study area

3.6 Sulphur (S)

The normal range of sulphur content in soil is 20 kg/hectare to 40 kg/hectare. For the samples of soil in the study area high sulphur content and high concentration of sulphur in soils were measured which showed an increasing trend with increasing distance from the factory.

At the distance of 0.25 km sulphur content of soils was 78.81 kg/hectare and its increases to 93.35 kg/hectare at 0.5 km distance, and 118.69 kg/hectare and 127.53 kg / hectare at the distance of 0.75 km and 1 km distance respectively from the cement factory as shown in Fig. 8.

The Correlation between Sulphur and distances from the factory is 0.985 with a p-value of 0.015. Since the correlation is positive and it is significant since the p-value is 0.001 which is less than 0.05 we may conclude that there is positive and statistically significant correlation between concentration of sulphur in the soil samples and distances.

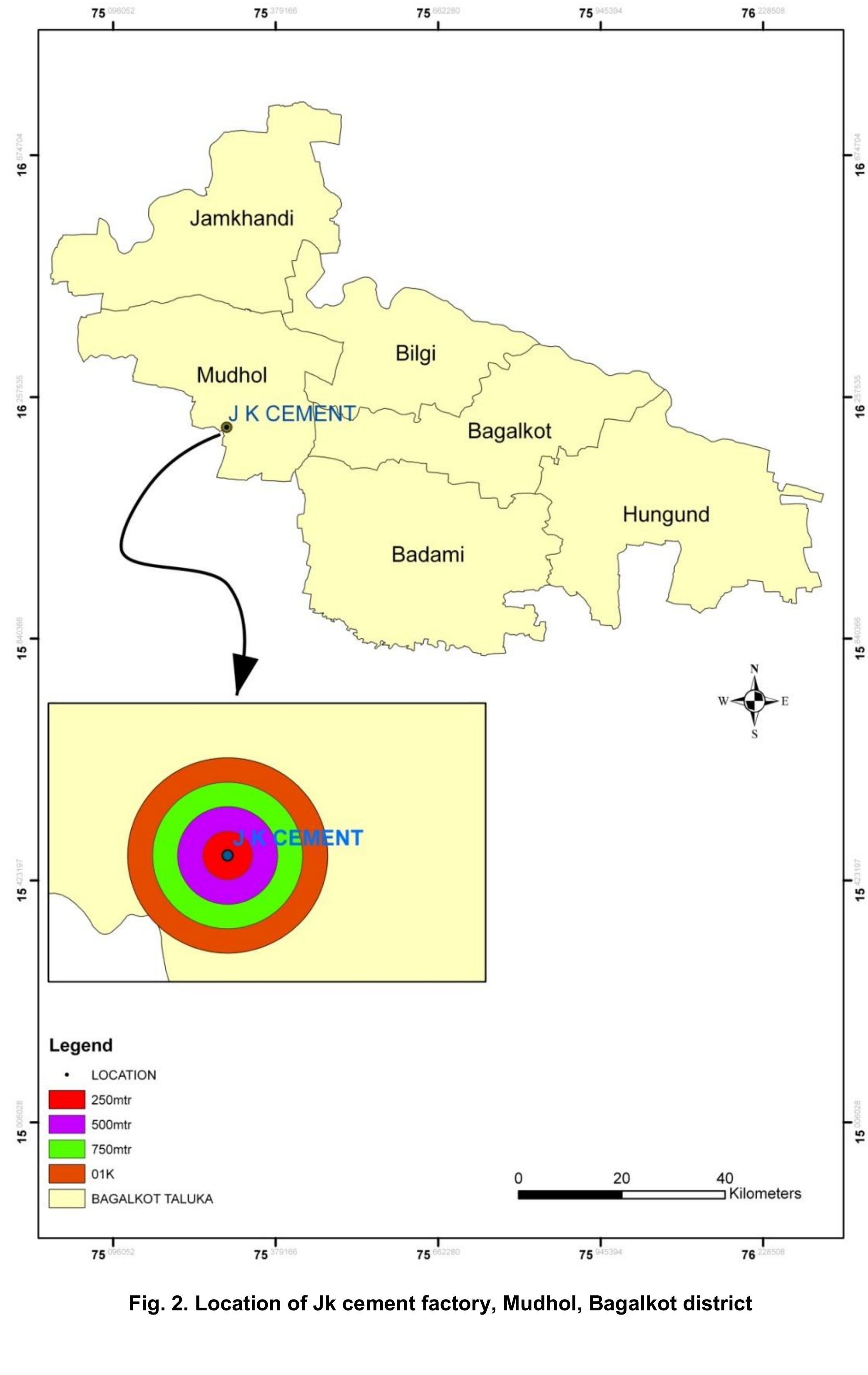

Fig. 2. Location of Jk cement factory, Mudhol, Bagalkot district

Table 2. Physico-chemical properties of the soils with average distance from the factory

Elements of Soil (Units) Sl. no	Directions	pH	EC	OC g.kg-	N Kg/ha	P Kg/ha	K Kg/ha	S Kg/ha	Na Me/100 gm	Ca Me/100 gm	Mg Me/100 gm	Zn ppm	Fe ppm	Mn ppm	Cu ppm	$CaCO_3$ Me/100 gm
01	SE 0.25 km	8.76	0.826	2.95	175.2	26.17	580	78.25	2.23	60.2	11.2	6.253	1.110	5.365	0.478	7.25
02	NE 0.25 km	9.01	0.868	3.01	178.6	27.08	590	80	2.02	70.1	12.1	5.894	1.235	5.231	0.480	8.82
03	SW 0.25 km	8.90	0.900	2.98	187	34.15	595	79	2.26	69.3	10.5	6.145	1.125	6.125	0.476	9.23
04	NW 0.25 km	8.08	0.896	2.69	168	38.06	585	78	2.01	89.1	12.1	5.985	1.121	6.789	0.470	8.96
Average	0.25 km	8.68	0.872	2.90	177.2	31.36	587.5	78.81	2.13	72.17	11.47	6.06	1.396	5.87	0.476	8.565
05	SE 0.5 km	8.53	0.557	3.25	180.1	15.15	484	98.21	1.21	59.3	9.8	7.213	1.125	6.013	0.414	5.15
06	NE 0.5 km	8.08	0.875	4.23	189.3	28.15	580	95.21	2.01	68.3	10.3	6.868	1.258	6.321	0.344	7.51
07	SW 0.5 km	7.03	0.557	3.12	192	25.15	584	86	2.12	64.2	9.3	7.148	1.236	7.154	0.414	8.12
08	NW 0.5 km	7.5	0.597	4.12	196	37.15	484	94	1.92	70.1	11.5	6.546	1.563	7.125	0.412	8.14
Average	0.5 km	7.78	0.646	3.68	189.27	26.48	533	93.35	1.81	65.47	10.22	7.94	1.35	6.653	0.396	7.23
09	SE 0.75 km	8.58	0.249	4.12	195.1	13.75	528	123.27	1.11	57.8	7.6	8.124	1.564	7.546	0.356	4.12
10	NE 0.75 km	8.03	0.489	4.89	198.1	26.12	576	124.41	1.82	59.1	9.8	7.213	1.564	7.122	0.339	6.23
11	SW 0.75 km	7.65	0.498	3.96	231	16.2	545	102.1	1.78	59.1	8.8	9.123	1.568	8.369	0.400	7.52
12	NW 0.75 km	7.0	0.586	4.23	210	25.12	463	125	1.68	71.2	9.2	7.898	1.894	8.965	0.408	7.36
Average	0.75 km	7.81	0.911	4.3	208	20.29	528	118.69	1.59	61.8	8.85	8.08	1.647	8.005	0.375	6.24
13	SE 1.km	8.01	0.311	4.45	220.3	15.57	480	145.32	0.48	54.1	6.7	9.546	1.989	8.365	0.476	3.05
14	NE 1.km	7.5	0.462	5.32	225.1	22.11	578	156.12	1.52	56.2	7.1	9.258	1.898	9.325	0.441	5.62
15	SW 1.km	7.25	0.451	4.85	245	15.00	456	126	1.63	57.8	7.1	9.895	2.102	9.621	0.368	5.65
16	NW 1.km	6.5	0.559	5.14	245	26.00	459	148	1.52	64.2	7.2	8.986	2.125	9.125	0.396	5.56
Average	1 km	7.31	0.445	4.94	223.25	22.54	520.75	127.53	1.67	62.05	7.02	8.50	2.02	8.32	0.141	6.41

Source: Lab report (This Table shows the value of physicochemical properties in soil samples below 15 cm.)

Table 3. Pearson correlation between concentration of elements and distance

Elements	Distance	
	Pearson correlations	P-value
pH	-0.882	0.118
EC	-0.606	0.394
OC	0.999	0.001
N	0.997	0.003
P	-0.868	0.132
K	-0.868	0.132
S	0.985	0.015
Na	0.153	0.847
Ca	-0.909	0.091
Mg	-0.983	0.017
Zn	0.889	0.111
Fe	0.803	0.197
Mn	0.977	0.023
Cu	-0.919	0.081
$CaCO_3$	-0.907	0.093

Source: Personal computation

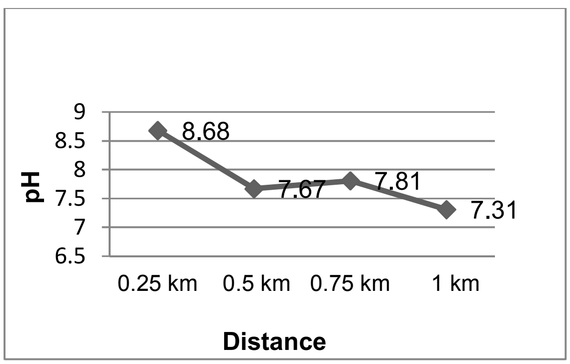

Fig. 3. pH value of the soil

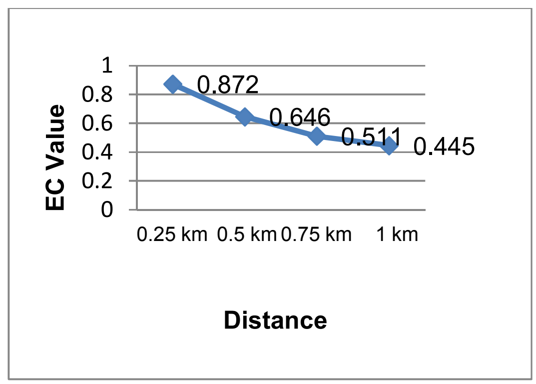

Fig. 4. Electric conductivity of the soil

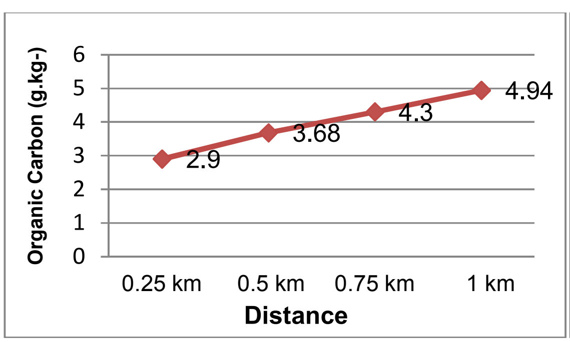

Fig. 5. Organic carbon of the soil

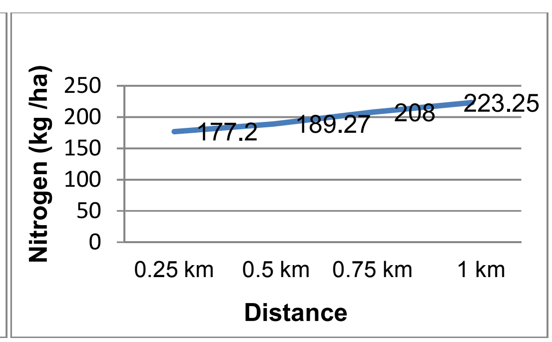

Fig. 6. Nitrogen content in soil

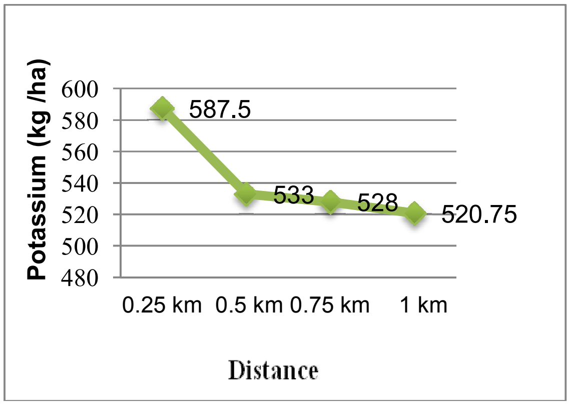

Fig. 7. Potassium content in soil

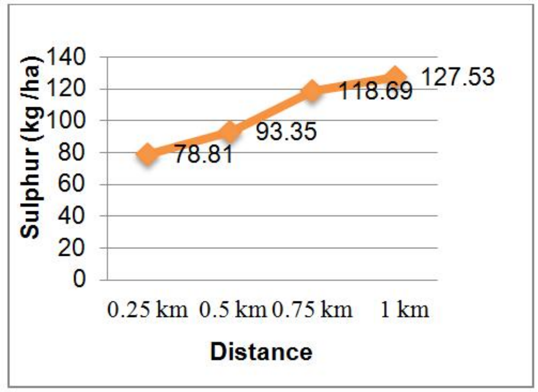

Fig. 8. Sulphur content in soil

3.7 Sodium (Na)

The normal range of sodium content in the soil is 1.00 me/100gm to 1.5 me/100gm (milli equivalents per 100 gram). The results obtained showed that, the soil of the study area is laden with more sodium content compared to the normal range of sodium content in soils.

Sodium content of soils in the study area was 2.13 me/100gm at the distance of 0.25 km, showing higher concentration of sodium nearby the cement factory. At the distance of 0.5 km and 0.75 km the concentration of sodium was 1.81 me/100gm and 1.59 me/100gm respectively. (Fig. 9) Correlation between concentration of Na in the soil samples and distances from the factory is 0.153 with a p-value of 0.847. Even though the correlation value is strong and it is positive as the relationship is non-significant.

3.8 Calcium (Ca)

Normally concentration of calcium in the soil ranges from is 10 to 30 me/100gm (milli equivalents per 100 gram).Calcium content in soils near the factory is showing high concentration because of cement dust and its continuously decreasing away from cement factory. At the distance of 0.25 km calcium content is 72.17 me/100gm. 65.47 me/100gm calcium content is found at the distance of 0.5 km. At the distance of 0.75 km and 1 km from cement factory calcium content of soils is 61.8 me/100gm and 62.05 me/100gm respectively (Fig. 10).

Correlation between concentration of Ca in soil samples and distances from the factory is -0.909 with a p-value of 0.091. This indicates that the relationship is non-significant.

3.9 Magnesium (Mg)

The magnesium content of soils in the study area is having more concentration of magnesium compare to normal range of magnesium content in soils. The normal range of magnesium content in soils is 3 to 10 me/100gm. In study area at the distance of 0.25 km from the cement factory the concentration of magnesium is 11.47 me/100gm and 10.22 me/100gm at the distance of 0.5 km. 8.85 me/100gm and 8.37 me/100gm at the distance of 0.75 and 1 km distance from cement factory respectively (Fig. 11).

Correlation between concentration of Mg in soil samples and distances from the factory is -0.983 with a p-value of 0.017. Since the correlation is positive and it is significant since the p-value is 0.001 which makes it clear that there is negative and statistically significant correlation between concentration of magnesium in the soil samples and distances. This implies that as the distance from cement factory increase the concentration of Mg in soil samples decreases.

3.10 Zinc (Zn)

Zinc is one of the major micronutrient elements in soils, it is play vital role in plants growth. In the study area soils are having sufficient Zinc content. But the soils have lost concentration of Zink near the cement industry. The normal range of Zinc content in soils is 0.6 ppm to 6.5 ppm. Ppm (Parts per million).

The Zinc content of soils in study area is 6.06 ppm at the distance of 0.25 km from the cement industry. Here it is showing increasing trend with increasing distance from cement factory. At the distance 0.5 km the concentration of Zinc is 7.94

ppm and 8.08 ppm at the distance of 0.75 km. finally the concentration of Zinc content in soils is 8.50 ppm at the distance of 1 km from factory (Fig. 12).

Correlation between concentration of Zn in the soil samples and distances from the factory is 0.889 with a p-value of 0.111. Though the correlation value is strong and it is positive as the p-value is greater than 0.05 the relationship is non-significant.

3.11 Iron (Fe)

Ferrous content is one of most essential micronutrient element for plant development. The moderate concentration of iron is good for plants but the study area soils have lesser concentration of iron. If the concentration of iron in soils less than 2.5 ppm, they are called as Non Calcareous soils and if its concentration is more than 4.5 ppm, they are called Calcareous soils.

The study area has Non Calcareous soils as its concentration of iron is 1.396 ppm at the near the factory 0.25 km distance. At the distance of 0.5 km and 0.75 km the concentration of iron is 1.35 ppm and 1.647 ppm respectively, and finally the concentration of iron in soils is increasing suddenly as 5.76 ppm at the distance of 1 km from cement industry. Correlation between concentration of Fe in the soil samples and distances from the factory is 0.803 with a p-value of 0.197. This is also showing non-significant relationship (Fig. 13).

3.12 Manganese (Mn)

Manganese is also one of the major micronutrients in the soil. The soils which have 28.46 ppm are better for growth and development of plants. But the concentration of manganese is lower in the soils of the study area.

Here the manganese concentration of soils is 5.87 ppm at the distance of 0.25 km from the factory and its concentration increases away from the cement industry. At the distance of 0.5 km and 0.75 km the concentration of manganese in soils is 6.653 ppm and 8.005 ppm respectively and 8.32 ppm concentration of manganese in soils is found at the distance of 1 km from the factory. This implies that as the distance from cement factory increases the concentration of Mn in soil samples also increases (Fig. 14).

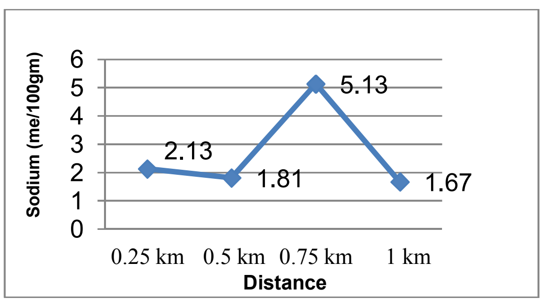

Fig. 9. Sodium content in soil

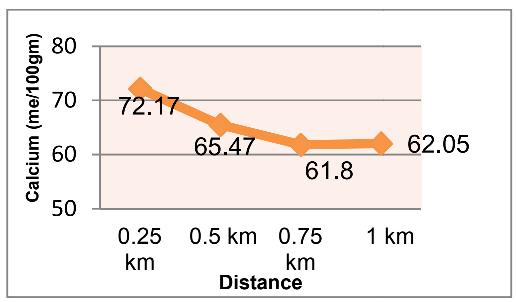

Fig. 10. Calcium content in soil

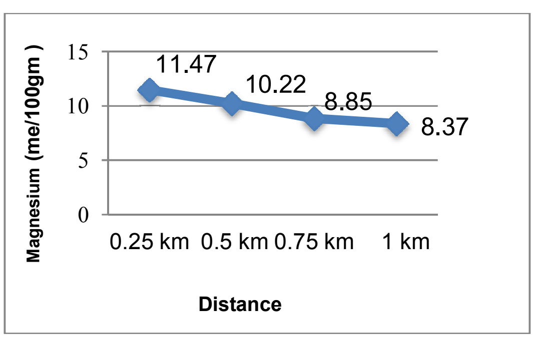

Fig. 11. Magnesium content in soil

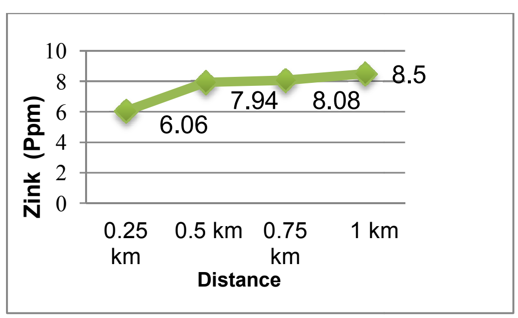

Fig. 12. Zinc content in soil

Correlation between concentration of manganese in soil samples and distances from the factory is 0.977 with a p-value of 0.023. Since the correlation is positive and it is significant since the p-value is 0.023 which is less than 0.05 which shows positive and statistically significant correlation.

3.13 Copper (Cu)

Like Zn, Fe and Mn, copper is also is one of the essential micronutrients of soils. The concentration of copper in study area soils is 0.476 ppm at the distance of 0.25 km from cement factory. At the distance of 0.5 km and 0.75 km from the cement industry the concentration of copper in soils is 0.396 ppm and 0.375 ppm respectively and finally 0.141 ppm found at the distance of 1 km from cement factory. Thus, it goes on decreasing away from the factory. (Fig. 15). Thus showing a decreasing trend.

Correlation between concentration of Cu in soil samples and distances from the factory is -0.919 with a p-value of 0.081. This shows non-significant relationship.

3.14 Calcium Carbonate ($CaCO_3$)

Calcium Carbonate is one of the most important elements in soils, it is essential for every plant. But high concentration of Calcium Carbonate in soils results into alkaline soils. Its maximum concentration is found near the factory due to fall of dust on soils. At the distance of 0.25 km the concentration of CaCO3 is 8.56me/100gm (milli equivalents per 100 gram). 7.23 me/100gm and 6.24 me/100gm is found at the distance of 0.5km and 0.75 km and 6.41 me/100gm at the distance of 1 km from cement factory. This shows that the concentration of calcium carbonates decreases with increasing distance. (Fig. 16).

Correlation between concentration of CaCo3 in soil samples and distances from the factory is -0.907 with a p-value of 0.093. This is also showing non-significant relationship.

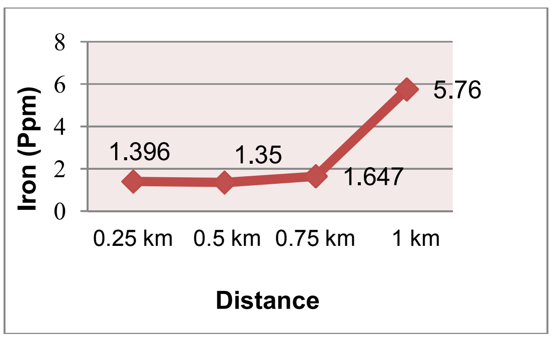

Fig. 13. Iron content in soil

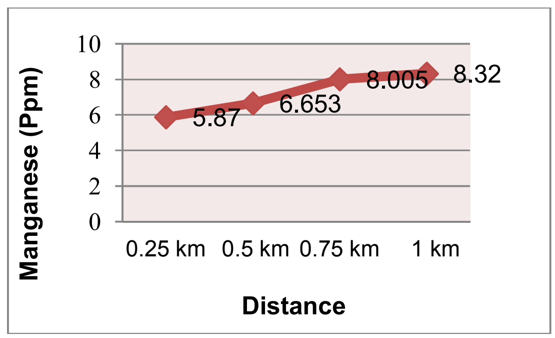

Fig. 14. Manganese content in soil

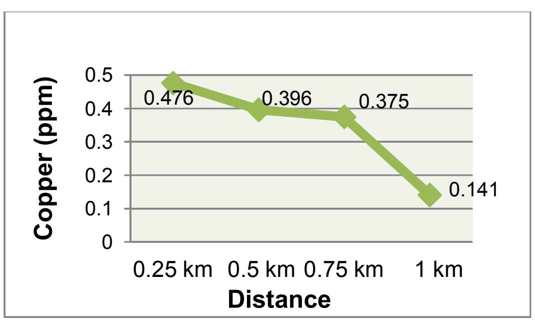

Fig. 15. Copper content in soil

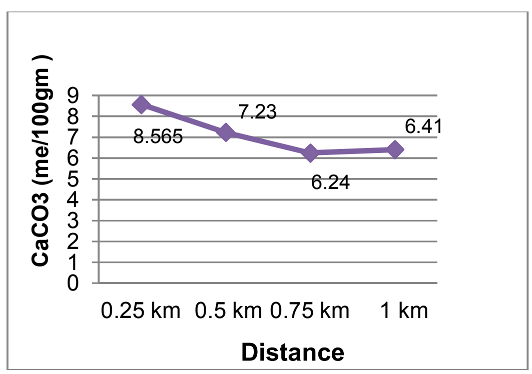

Fig. 16. Calcium carbonate

4. CONCLUSION

In the present study, it has been established that the physico-chemical properties of the soils around the factory have been affected due to the dust deposition as it is adversely affecting the composition soils. This in turn affected the concentration of nutrients required for plants growth. Further, it may become hazardous to soil, flora and fauna. As such, the factory management has not initiated any measures to reduce the dust emission, therefore the, government has to take proper action against the factory which may force the management to make efforts to minimise the dust emission. Further, people living around the factory have to be educated about effects of dust deposition on their fields and houses so that they could be cautious about it.

ACKOWLEDGEMENT

The authors acknowledges Karnatak University, Dharwad and Karnatak Science College, Dharwadd for providing necessary facilities. First author acknowledges to Directorate of Minority, Government of Karnataka to provide funds to research work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Abdul-wahab, Sabah. Impact of fugitive dust emissions from cement plants on nearby communities. Ecol. Model. 2006; 195:338-348.
2. Maina JN. Impact of cement dust deposition on the elemental composition of soils in the vicinity of Ashaka cement factory, Nigeria. International Research Journal of Agricultural Science and Soil Science. 2013;3(2):66-74.
3. Okoro HK, Orimolade BO, Adebayo GB, Akande BA. An Assessment of Heavy Metals Contents in the Soil around a Cement Factory in Ewekoro,Nigeria Using Pollution Indices. Pol. J. Environ. Stud. 2017;26(1):221-228.
4. Shukla S, Nagpure A, Vivek K, Sunisha B, Preeti S, Deepali S, Ravindra Nath S. Impact of dust emission on plant vegetation in the vicinity of cement plant. Environmental Engineering and Management Journal. 2008;7:31-35.
5. Addo MA, Darko EO, Gordon C, Davor P, Gbadago JK, Faanu A, Kpeglo D, Ameyaw F. Assessment of airborne 238 U and 232 Th exposure and dust load impact on people living in the vicinity of a cement factory in Ghana. Radiat Prot Environ. 2014;37:120-31.
6. Khamparia A, Chattergee SK, Shrma GD. Assessment on Effect of Cement Dust Pollution on Soil Health. JERD. 2012; 7(1A):368-374.
7. Singh J, Kalamdhad A. Effects of heavy metals on soil, plants, human health and aquatic life. International Journal of Research in Chemistry and Environment. 2011;1:15-21.
8. Jain R, Jain P. Pollution of soil due to cement factory near Narsingarh, Madhya Pradesh (India). Journal of Environmental Research And Development. 2006;1(2): 151-154.
9. Mlitan AB, Alajtal AI, Alsadawy AM. Toxicity of heavy metals and microbial analysis of soil samples collected from the area around Zliten Cement Factory. Open Journal of Air Pollution. 2013;2: 25-28.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/47449