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Research Paper

Assessment of soil available macronutrient trends in the vicinity of cement factories of Kashmir

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ABSTRACT

The present study was conducted to assess the impact of cement dust pollution on soil available macronutrients around Khrew Industrial area of Kashmir. Three cement industries (Max, Arco and JK) were selected for the purpose and a total of one hundred composite soil samples (0-15 cm depth) were collected from different distances around Max, Arco and JK cement industries of Khrew Kashmir. The chemical analysis indicated that available N content at Max, Arco and JK cement plants varied from 80.44-128.80, 82.00-130.00 and 78.14-122.32 mg kg^{-1}, respectively whereas, available P content of soils ranged from 6.68-12.38, 6.72-12.51 and 6.65-12.22 mg kg^{-1} respectively. The data revealed that available K content of soils varied from 80.16-128.72, 78.87-126.87 and 80.92-130.14 mg kg^{-1}, in the soils of Max, Arco and JK cement factories, respectively, whereas, available Ca content varied from 1172.00-2150.00, 1161.00-2147.00 and 1182.00-2153.00 mg kg^{-1}, around Max, Arco and JK cement industries, respectively. In general, available N, P and S showed an increasing trend, whereas, Ca, Mg and K indicated a decreasing trend with increasing distance from the cement plants. It was seen that the cement dust adversely affect the available nutrient status of soil.

Key words: Agriculture, cement dust, pollution, macronutrients

The cement industry has been recognized as playing a vital role in the imbalances of the environment and producing air pollution hazards. Cement dust is a potential phytotoxic pollutant in the vicinity of cement producing plants and creates serious pollution problems causing enormous damage to the ecosystem. These pollutants emanating from the kiln, spread over a large area and affect the vegetation, soil and other natural resources. These dust particulates get deposited on various parts of plants especially on leaf surfaces as well as on ground soil and affect growth and yield of crop plants through biological changes (Stern, 1976). The dust escaping from cement factories is often transported by wind and deposited in areas close and far away from the factory. Changes in land use and management practices often modify most soil morphological, physical, chemical and biological properties to the extent reflected in agricultural productivity. Adoption of appropriate land use management practices and land use planning would help to minimize the degradation in soil physical quality and would ensure sustainable crop production and productivity (Ramesh *et al.,* 2008). Soils under a particular land-use system may have different physicochemical properties, which may modify fertility status and nutrient availability. Owing to the fact that comparatively, not many studies have been performed to investigate the influence of cement dust

pollution on soil available nutrients in the Kashmir valley, the present investigation was attempted to summarize the detrimental effects of cement dust on soil available macronutrients around cement factories of Kashmir.

MATERIALS AND METHODS

Collection of soil samples: The cement polluted area of Khrew is situated 23 kms away Southeast of Srinagar at an altitude of 1607 meters above sea level, the geographical co-ordinates of 34°1N′ latitude and 75°1′E longitude. Three cement industries (Max, Arco and JK) were selected for the purpose and a total of 100 composite soil samples were collected from different distances around the cement plants. Ninety seven (97) composite soil samples were collected from surface soils (0-15 cm) at an interval of 100 m distance from three cement plants in all directions, besides these three reference/control composite soil samples, one from each cement plant were collected at a distance of 6 km.

Processing and analysis of soil samples: The soil samples after thoroughly mixing were collected in air tight polythene bags and brought to the laboratory. Coarse concretions, stones and pieces of roots, leaves and other undecomposed organic residues were removed. The soil samples were then air-dried and ground using wooden mortar and pestle and sieved through 2 mm sieve for laboratory investigations. Available nitrogen was determined by alkaline potassium permanganate distillation method as described by Subbiah and Asija (1956). Available phosphorus was estimated by ammonium molybdate method as outlined by Olsen *et al.* (1973). Available potassium was estimated by neutral normal ammonium acetate method (Jackson, 1973). Available sulphur was determined by method of Chesnin and Yien (1950). Calcium and magnesium content in the soil samples were determined by versenate titration method (Jackson, 1973).

RESULTS AND DISCUSSION

Available primary and secondary macronutrients content of soils around cement plants: The results pertaining to status of available primary and secondary macronutrients around different cement plants are presented in “Table 1(a)”, 1(b)”and 1(c)” and “Figure 1(a)”, 1(b)”, and 1(c)”, are discussed as below:

The perusal of data revealed that available N content around Max, Arco and JK cement plants varied from 80.44-128.80, 82.00-130.00 and 78.14-122.32 mg kg^{-1}, respectively. The mean available N content of soils was 96.96, 96.37 and 95.72 mg kg^{-1} at Max, Arco and JK cement plants, respectively. The available N content showed a decreasing trend towards the industries and increased gradually away from the cement plants towards the control. The available N content was low in all the sites except control samples where its status was medium. Microorganism activity was affected negatively by cement pollution and the other environmental conditions resulting from cement pollution. It most likely would have negative effects on the other ecosystem functions (Nowak *et al.*, 2003; Ocak *et al.*, 2004). Hence the results might be attributed to retarded microbial activity in soils at polluted sites and thereby leading to less release of nitrogen through decomposition of organic residues as nitrogen has highly significant and positive correlation with soil organic carbon content. Similar results were reported by Mukunda Rao (1993) in paddy fields artificially dusted with cement dust @ 0.5 t ha^{-1}. Shanti *et al.* (2004) also reported a decrease in total N content because of decreased mineralization of peptone nitrogen in cement dust polluted soils. Similarly Oludoye and Ogunyebi (2017) and Solanki and Parihar (2017) observed an increasing trend in soil available N with increasing distance away from the cement plants. The available P content around Max cement plant ranged from 6.68-12.38 mg kg^{-1} with an average value of 8.02 mg kg^{-1}, around Arco cement plant it varied from 6.72-12.51 mg kg^{-1} with an average value of 8.02 mg kg^{-1}, and similarly available P content ranged from 6.65-12.22 mg kg^{-1} with mean value of 7.92 around JK cement plant, the highest and lowest available P content was observed at 0.1 and 6 km distance, respectively from the cement plants.

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Table-1a: Status of available primary and secondary macronutrients (mg kg^{-1}) around Max Cement Industry, Khrew

Sample No.	N	P	K	Ca	Mg	S
1	80.44	6.68	128.72	2150.00	426.00	10.10
2	80.44	6.70	127.00	2135.00	420.00	10.00
3	82.00	6.74	124.00	2100.00	400.00	10.15
4	82.00	6.88	122.26	1980.00	384.00	10.20
5	84.62	6.88	120.00	1956.00	380.00	10.25
6	84.62	6.94	121.86	1966.00	384.00	10.25
7	87.20	7.00	122.20	1970.00	388.00	10.26
8	88.42	7.00	122.00	1970.00	388.00	10.42
9	88.42	7.26	123.00	1975.00	396.00	10.42
10	90.50	7.30	123.80	1990.00	404.00	10.90
11	90.50	7.35	115.44	1952.00	378.00	10.50
12	91.70	7.35	104.00	1900.00	366.00	10.62
13	92.80	7.42	102.10	1862.00	355.00	10.66
14	94.72	7.68	100.00	1810.00	343.00	10.57
15	94.72	7.77	100.00	1786.00	332.00	10.74
16	95.60	7.80	98.80	1743.00	320.00	10.78
17	97.54	7.80	98.00	1696.00	312.00	10.80
18	97.54	7.86	96.27	1650.00	312.00	10.73
19	98.00	7.86	96.76	1622.00	300.00	10.92
20	99.18	8.00	95.50	1575.00	292.00	10.82
21	100.80	8.22	90.00	1533.00	277.00	11.00
22	100.80	8.30	88.68	1500.00	274.00	11.18
23	101.90	8.52	87.90	1500.00	270.00	11.57
24	102.21	8.55	86.55	1477.00	241.00	11.28
25	103.51	8.64	84.43	1453.00	229.00	11.32
26	104.21	8.71	84.20	1414.00	221.00	11.50
27	105.00	8.76	84.20	1402.00	221.00	11.32
28	106.78	8.78	84.00	1387.00	220.00	11.24
29	106.78	8.80	83.50	1355.00	216.00	11.38
30	107.00	9.00	83.00	1310.00	216.00	11.44
31	107.00	9.12	82.46	1300.00	212.00	11.00
32	110.52	9.20	82.00	1280.00	202.00	11.52
33	110.52	9.30	82.00	1260.00	200.00	11.66
34	128.80	12.38	80.16	1172.00	178.00	12.70
Range	**80.44-128.80**	**6.68-12.38**	**80.16-128.72**	**1172.00-2150.00**	**178.00-426.00**	**10.00-12.70**
Mean	**96.96**	**8.02**	**100.73**	**1680.32**	**307.56**	**10.89**
S.D	**10.59**	**1.12**	**16.81**	**291.35**	**77.32**	**0.58**
C.V %)	**10.92**	**13.96**	**16.68**	**17.33**	**25.13**	**5.32**

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Table-1b: Status of available primary and secondary macronutrients (mg kg^{-1}) around Arco Cement Industry, Khrew

Sample No.	N	P	K	Ca	Mg	S
1	82.00	6.72	125.73	2147.00	424.00	10.10
2	82.00	6.72	126.87	2142.00	417.00	10.10
3	83.50	6.76	124.00	1990.00	400.00	10.00
4	83.50	6.88	121.33	1980.00	381.00	10.18
5	84.62	6.92	120.00	1956.00	378.00	10.18
6	84.62	6.94	121.86	1960.00	382.00	10.25
7	86.20	7.00	122.00	1966.00	385.00	10.26
8	87.46	7.13	122.75	1970.00	388.00	10.42
9	88.42	7.26	123.00	1972.00	391.00	10.42
10	90.50	7.43	124.80	1983.00	400.00	11.00
11	91.50	7.45	114.71	1952.00	375.00	10.50
12	91.50	7.48	102.00	1900.00	366.00	10.62
13	92.80	7.62	101.10	1855.00	352.00	10.66
14	94.72	7.68	100.00	1800.00	340.00	10.77
15	95.60	7.77	99.10	1780.00	332.00	10.74
16	95.60	7.85	98.80	1741.00	320.00	10.78
17	97.54	7.88	98.00	1688.00	310.00	10.80
18	98.00	7.92	96.27	1650.00	312.00	10.70
19	98.00	7.96	96.00	1612.00	300.00	10.92
20	99.18	8.10	94.15	1570.00	287.00	10.82
21	102.0	8.22	90.00	1529.00	271.00	11.15
22	102.80	8.30	88.68	1500.00	270.00	11.20
23	103.90	8.52	86.10	1493.00	266.00	11.57
24	104.21	8.58	86.55	1477.00	240.00	11.28
25	104.21	8.66	83.13	1451.00	229.00	11.32
26	106.56	8.75	83.12	1410.00	221.00	11.60
27	106.50	8.79	82.22	1400.00	217.00	11.40
28	107.98	8.82	82.00	1381.00	219.00	11.40
29	107.98	8.82	81.77	1350.00	214.00	11.48
30	109.00	9.00	81.00	1300.00	214.00	11.50
31	109.00	9.12	81.00	1300.00	212.00	11.10
32	112.52	9.25	80.19	1271.00	200.00	11.52
33	130.00	12.51	78.87	1161.00	171.00	12.70
Range	**82.00-130.00**	**6.72-12.51**	**78.87-126.87**	**1161.00-2147.00**	**171.00-424.00**	**10.00-12.70**
Mean	**96.37**	**8.02**	**100.52**	**1685.97**	**308.61**	**10.90**
S.D	**10.88**	**1.11**	**17.16**	**283.49**	**76.19**	**0.59**
C.V(%)	**11.28**	**13.84**	**17.07**	**16.81**	**24.68**	**5.41**

Thus available P content also decreased towards more polluted sites. This may be attributed as excess amount of calcium could capture phosphate as calcium phosphate and reduce its availability; further the phosphate content is affected by soil pH which could reduce the phosphorus availability

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in the soil (Martinez *et al.*, 2011). Zhang and Ke (2004), Ogedengbe and Oke (2011), Al-Omran *et al.* (2011), and Solanki and Parihar (2017).The data revealed that available K content ranged from 80.16-128.72, 78.87-126.87 and 80.92-130.14 mg kg^{-1}, with mean values of 100.73, 100.52 and 102.9 mg kg^{-1} around Max, Arco and JK cement factories, respectively.

Table-1c: Status of available primary and secondary macronutrients (mg kg^{-1}) around JK cement industry, Khrew

Sample No.	N	P	K	Ca	Mg	S
1	78.14	6.65	130.14	2153.00	429.00	10.12
2	80.44	6.70	128.00	2138.00	423.00	10.12
3	81.50	6.71	125.00	2110.00	404.00	10.10
4	81.00	6.82	123.26	1984.00	387.00	10.16
5	83.36	6.88	118.00	1966.00	381.00	10.16
6	84.62	6.91	121.61	1974.00	384.00	10.21
7	86.12	6.98	123.32	1978.00	390.00	10.21
8	87.55	7.00	123.00	1980.00	388.00	10.40
9	88.42	7.22	124.00	1984.00	398.00	10.42
10	89.38	7.27	126.82	1998.00	408.00	10.80
11	90.50	7.32	117.51	1958.00	380.00	10.50
12	91.70	7.35	107.00	1910.00	369.00	10.60
13	92.80	7.42	104.10	1882.00	358.00	10.61
14	93.12	7.63	102.00	1830.00	343.00	10.55
15	94.72	7.72	100.00	1786.00	335.00	10.74
16	95.60	7.75	99.18	1747.00	324.00	10.78
17	96.28	7.80	98.00	1699.00	317.00	10.80
18	97.54	7.83	97.31	1650.00	312.00	10.70
19	98.00	7.86	96.76	1622.00	304.00	10.92
20	98.00	7.98	95.50	1578.00	292.00	10.78
21	99.80	8.22	91.50	1535.00	280.00	11.00
22	100.00	8.26	88.68	1508.00	274.00	11.00
23	101.00	8.46	87.90	1500.00	270.00	11.50
24	101.81	8.51	86.55	1479.00	245.00	11.21
25	103.51	8.64	85.41	1458.00	229.00	11.32
26	104.21	8.71	85.77	1418.00	224.00	11.45
27	104.00	8.72	84.20	1407.00	221.00	11.30
28	105.18	8.75	84.00	1387.00	220.00	11.26
29	106.78	8.80	84.00	1355.00	218.00	11.33
30	106.10	7.93	83.50	1318.00	216.00	11.41
31	107.00	9.10	83.00	1315.00	212.00	11.00
32	108.16	9.14	83.00	1288.00	206.00	11.50
33	122.32	12.22	80.92	1182.00	183.00	12.51
Range	**78.14-122.32**	**6.65-12.22**	**80.92-130.14**	**1182.00-2153.00**	**183.00-429.00**	**10.00-12.51**
Mean	**95.72**	**7.92**	**102.09**	**1699.30**	**312.85**	**10.83**
S.D	**9.96**	**1.08**	**16.97**	**287.04**	**76.37**	**0.54**
C.V(%)	**10.40**	**13.63**	**16.62**	**16.89**	**24.41**	**4.98**

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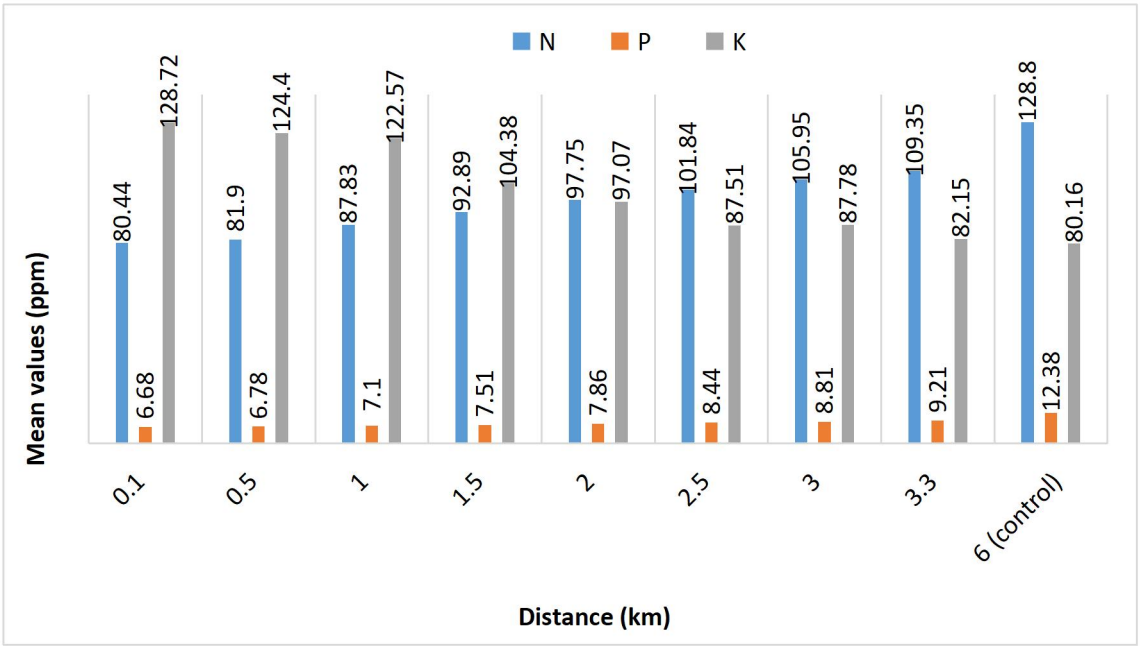


Fig. 1a: Status of available primary macronutrients (mg kg^{-1}) around Max Cement Industry, Khrew

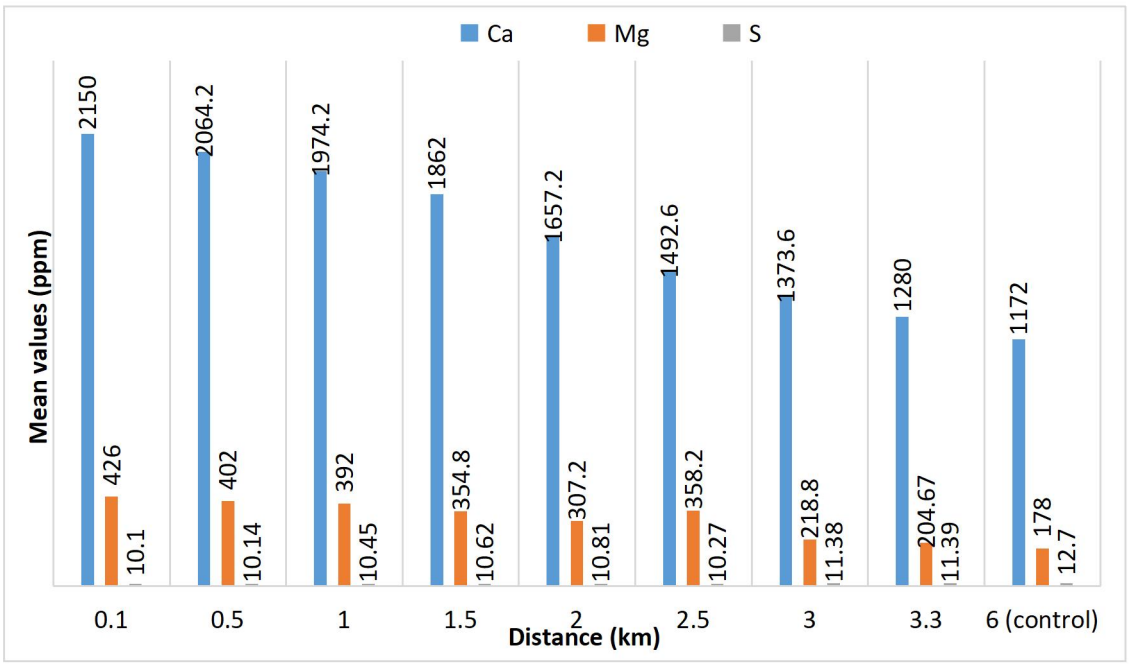


Fig.1b:Status of available secondary macronutrients (mg kg^{-1}) around Max Cement Industry,Khrew

The available K content showed an increasing trend towards the polluted sites (i.e. nearer to cement plants) being highest at 0.1 km distance, and lowest at 6 km distance from cement plants. The soils around the cement industries were high in available K content. The increase in available potassium content of soil in cement polluted sites could be attributed to its abundance in the cement dust. These results are in agreement with Seeker and Ozaytekin (2002) they suggested that cement dust increased the potassium content and it remained higher than phosphorus and magnesium content. An increase in potassium content of the cement dust polluted soils was also witnessed (Singh 2003; Al-Omran *et al.* 2011; Khamparia *et al.* 2012). The available Ca content of soils around Max, Arco

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and JK cement industries varied from 1172.00-2150.00, 1161.00-2147.00 and 1182.00-2153.00 mg kg^{-1}, with average values of 1680.32, 1685.00 and 17.20 mg kg^{-1}, respectively. The cement dust showed a positive effect on Ca content of soils. The highest and lowest available Ca content was found at 0.1 km distance from cement plants and at control sites, respectively around all cement industries. The available soil Ca content was found in higher range in all the sites. The increase in exchangeable Ca content of soils could be due to cumulative effect of the dust fall due to mining activity over a period of time. There is clear incidence of Ca addition from the dust generated from the plant, which is reflected as high pH of the soils around different cement plants. These results were in tune with the reports of Mandal and Voutchkov (2010), Mutlu *et al.* (2013), Amos *et al.* (2015), and Solanki and Parihar (2017). The data revealed that available Mg content of soils ranged from 178.00-426.00, 171.00-424.00 and 183.00-429.00 mg kg^{-1}, with mean values of 307.56, 308.61 and 15.84 mg kg^{-1} around Max, Arco and JK cement plants, respectively. The data revealed an increasing trend towards the polluted sites, and decreased as one moved away from the industries away from the polluted sites. The status of available soil Mg content like Ca was again in higher range at all the sites. Thus contaminated sites contained higher levels of exchangeable magnesium being constantly received from the emissions of cement factory. The increase in these cations (Ca^{2+}, K^{+} and Mg^{2+}) may also be contributed to the increased cation exchange capacity of soil. Earlier studies by Panda *et al.* (1973) and Kholsa and Puri (1984) have also revealed that cement dust causes an increase in exchangeable magnesium content of soil. Khamparia *et al.* (2012), Oludoye and Ogunyebi (2017), Al-Omran *et al.* (2011), and Amos *et al.* (2015) also observed similar results. The perusal of data revealed that available S content around Max, Arco and JK cement plants varied from 10.00-12.70, 10.00-12.70 and 10.00-12.51 mg kg^{-1}, respectively. The mean available S content of soils was 10.89, 10.90 and 10.83 mg kg^{-1} around Max, Arco and JK cement plants, respectively. The available S content was above the critical range at all the sites and in general indicated and increasing trend with increase in distance away from the cement plants. The results might be attributed to less organic matter and higher pH of soils at the cement plants. Zerrouqi *et al.* (2008) also observed an increasing trend of soil available S with increase in distance from the cement plants.

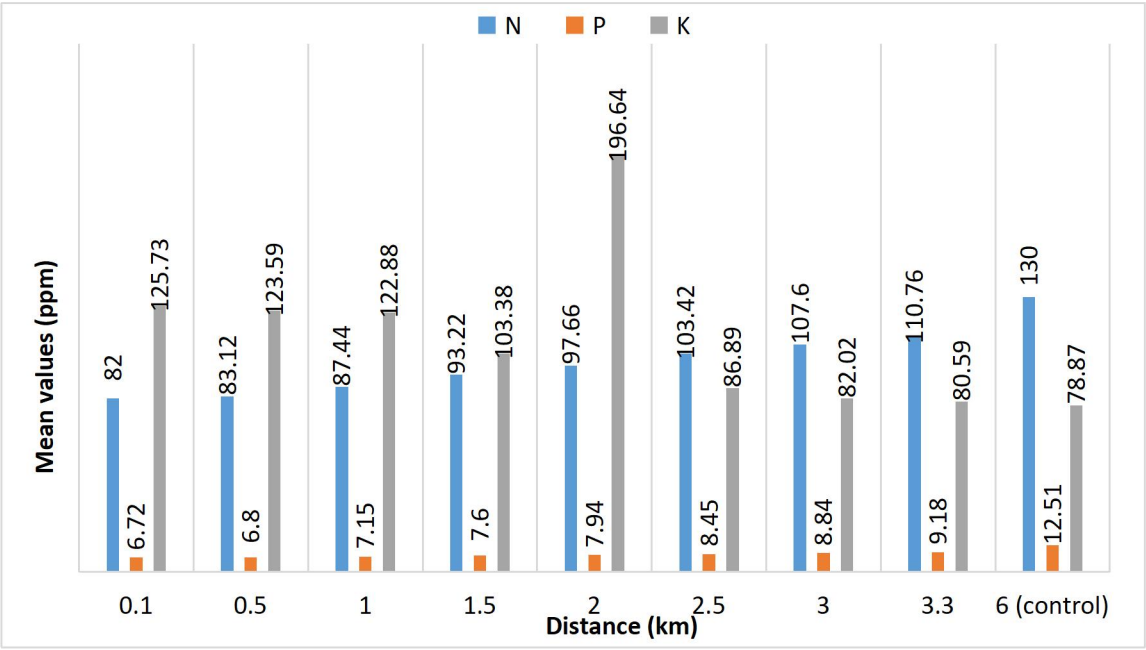


Fig. 1c: Status of available primary macronutrients (mg kg^{-1}) around Arco Cement Industry, Khrew

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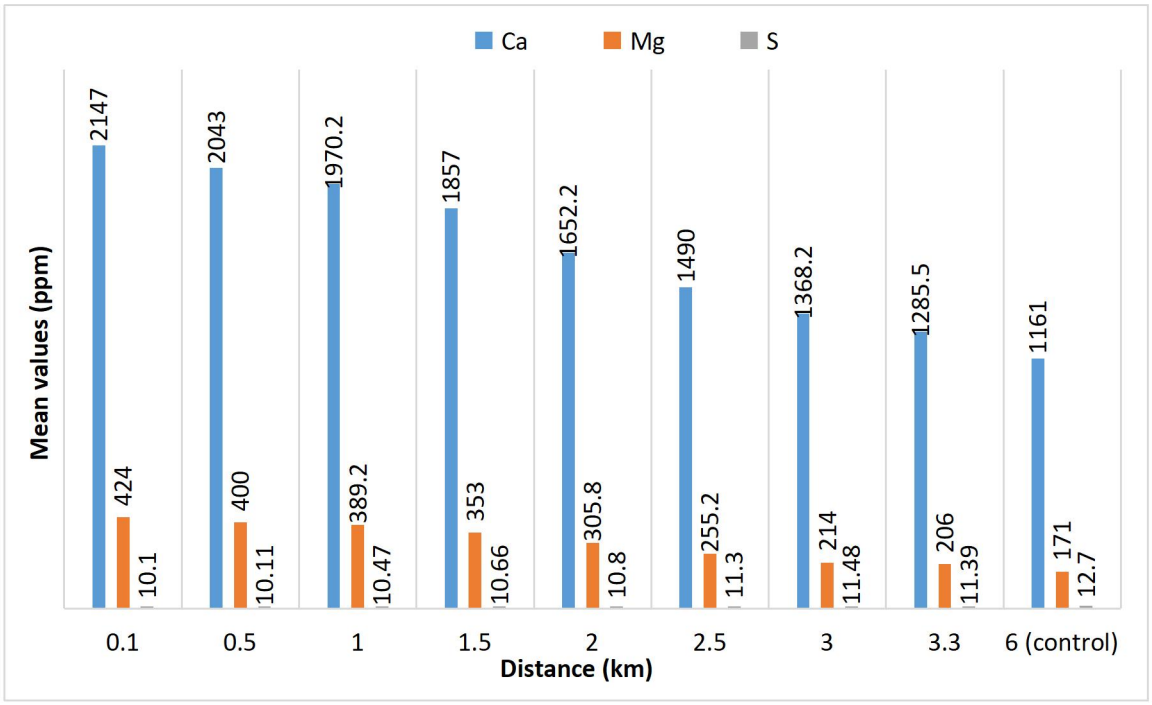


Fig.1d: Status of available secondary macronutrients (mg kg^{-1}) around Arco Cement Industry, khrew

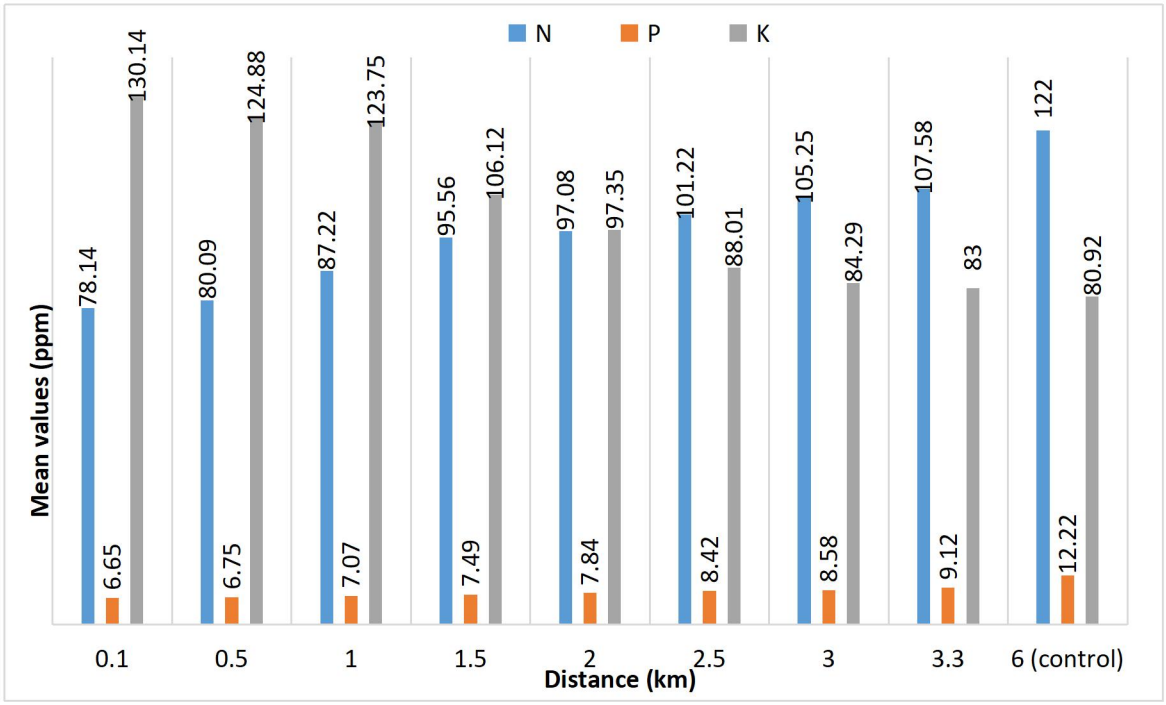


Fig. 1e: Status of available primary macronutrients (mg kg^{-1}) around JK Cement Industry, Khrew

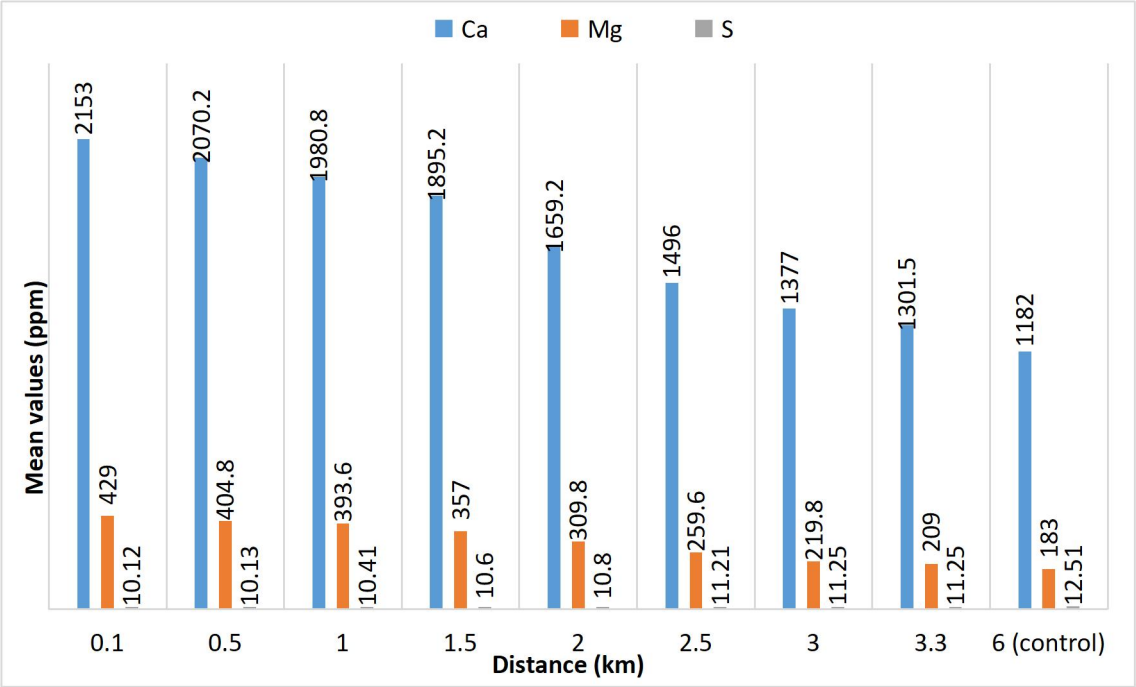


Fig. 1f: Status of available secondary macronutrients (mg kg^{-1}) around JK Cement Industry, Khrew

CONCLUSION

The available N content was in low range in all the sites except control samples where its content was medium and showed a decreasing trend towards the industries and increased gradually away from the cement industries towards the control, like available N, available P content also decreased towards more polluted sites i.e. nearer to the cement plants. The soils around the cement industries were high in available K content and showed an increasing trend towards the polluted sites. The available soil Ca and Mg content was found in higher range in all the sites and increased as one moved nearer to cement plants. The available S content was above the critical range at all the sites and in general indicated and increasing trend with increase in distance from the cement plants. From the study we can conclude the cement dust pollutes the soil health and quality which in turn affects the health of biodiversity. Hence it is recommended resistant plant species should be planted in and around the cement factories.

CONFLICT OF INTEREST

All the authors affirm that there is no conflict of interest among them. All research activities comply with relevant legal, institutional and ethical standards.

AUTHOR CONTRIBUTION

All the authors contributed equally in this research article.

REFERENCES

Al-Omran, A. M., El-Maghraby, S. E., Mahmoud, E. A. N., El-Eter, A. M., Salem, M. I. and Al-Qahtani. 2011. Impact of cement dust on some soil properties around the cement factory in

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Al-Hasa Oasis, Saudi Arabia. *American-Eurasian Journal of Agriculture and Environmental Sciences,* **11**: 840-846.

Amos, B. B., Musa, I., Abashiya, M. and Abaje, I. B. 2015. Impacts of cement dust emissions on soils within 10 km radius in Ashaka area, Gombe state, Nigeria. *Environment and Pollution,* **4**: 29-36.

Asadu, C. L. and Agada, C. 2008. The impact of cement kiln dust on soil physic-chemical properties at Gboko, East Central Nigeria. *Nigerian Journal of soil and Environment Research,* **8**: 1595-6121.

Chesnin, L. and Yien, C. H. 1950. Turbidimetric determination of available sulphur. *Proceedings, of Soil Science Society of America,* **15**: 149-151.

Jackson, M. L. 1973. *Soil chemical Analysis*. Prentice Hall of India, Pvt. Ltd., New Delhi pp. 498.

Khamparia, A., Chattergee, S. K. and Sharma, G. D. 2012. Assessment on effect of cement dust pollution on soil health. *Journal of Environmental Research and Development,* **7**: 368-374.

Khosla, P. K. and Puri, S. 1984. Effect of cement kiln dust on soil nutrients of sal (*Shorea robusta*) forest ecosystem. *Journal of Tree Sciences,* **3**: 73-79.

Mandal, A. and Voutchkov, M. 2011. Heavy metals in soils around the cement factory in Rockfort, Kingston, Jamaica. *International Journal of Geosciences,* **2**: 48-54.

Martınez, M., Acosta, V. A. and Faz, S. 2011. Enrichment of metals in soils subjected to different land uses in a typical Mediterranean environment (Murcia City, Spain). *Applied Geochemistry,* **26**: 405-414.

Mutlu, S., Atici, O. and Gulen, Y. 2013. Cement dust pollution induces toxicity or deficiency of some essential elements in wild plants growing around a cement factory. *Toxicology and Industrial Health,* **29**: 474-80.

Nowak, D. J. 2003. Air pollution removal by Chicago's urban forest. **In**: *Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project* (Eds. E. G. McPherson, D. J. Nowak and R. A. Rowntree). 63-68, USDA Forest Service General Technical Report NE-186, USA.

Ocak, I., Sulun, Y. and Hasenekoglu, I. 2004. The effect of cement dust emitted from Gaziantep cement plant on microfungus flora of surroundings soils. *Turkey Trakya University Journal of Science,* **5**: 107-115.

Ogedengbe, K. and Oke, A. O. 2011. Pollution impact of cement production on air, soil and water in a production location in Nigeria, *Journal of Science and Technology,* **31**: 46-56.

Olsen, S.R., Koul, C.V., Watanabe, F.S. and Dean, L.A. 1954. Estimation of available phosphorus by extracting with sodium bicarbonate. *United States Department of Agriculture Circular* **939:** 315-326.

Oludoye, O. O. and Ogunyebi, L. A. 2017. Nutrients assessment of tropical soils around a mega cement factory in southwest Nigeria. *Journal of Ecological Engineering* **18**: 21–28.

Panda, S. C., Nayak, R. C. and Mahapatra, I. C. 1973. A note on effect of cement dust on soil fertility and crop growth around the factory area of Rajgangpur (Orissa). *Indian Journal of Agronomy* **18**(3): 389-391.

Ramesh, V., Balloli, S. S., Sharma, K. -L., Ramachandran, K., Korwar, G. R. and Ramakrishna, Y. S. 2008. Characterization of Soil for Physical Properties under Different Land Use Systems. *Indian Journal* of *Dryland Agricultural Research and Development,* **1**:102-109.

Seker, C. and Ozayhekin, H. H. 2002. Effect of Portland cement on soil mechanical properties and seedling emergence of wheat in silty loam soil. *Proceedings International conference on sustainable land and management, Konya* pp. 274-281.

Shanthi, M., Basker, R. and Saralakimari, D. 2004. Influence of cement dust pollution on soil nitrogen status. *Pollution Research* **23**(1): 151-156.

Singh, S. N. 2003. Alteration in mineral accumulation pattern of *Triticum aestivum* L. exposed to particulate pollution. *Environmental Pollution,* **32**: 171-177.

Solanki, P. and Parihar, S. K. 2017. Effect of cement kiln dust on some properties of soil. *International Journal of Advance Research in Science and Engineering,* **6**: 2141-47.

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Stern, A. C. 1976. *Air Pollution Measurement, Monitoring and Surveillance of Air Pollution*, 3rd Ed., Academic Press, New York.

Subbiah, B. V. and Asija, G. L. 1956. A rapid procedure for the determination of available nitrogen in soils. *Current Science,* **25**: 259-260.

Uysal, I., Muftuoglu, N. M., Demirer, T., Karabacak, E. and Tutenocakl, T. 2006. The effect of cement dust on some plants and soil in Canakkale. *Ege Universitesi Ziraat Fakultesi Dergisi,* **43**: 133-144.

Zerrouqi, Z., Sbaa, M., Qujidi, M., Elkharmouz, M., Bengamra, S. and Zerrouqi, A. 2008. Assessment of cement's dust impact on the soil using principal component analysis and GIS. *International Journal of Environmental Science and Technology,* **5**: 125-134.

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