IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

Impact Factor: 6.252

Volume 2, Issue 4, April 2022

Seasonal Changes in Some Micronutrients and Heavy Metals from Soil Near Lote Industrial Sector, District Ratnagiri, Maharashtra

Srikant Kekane[1] and Ganesh Bhagure[2]

I. C. S. College of Arts, Commerce and Science, Khed, Ratnagiri, Maharashtra, India[1]

Satish Pradhan Dnyanasadhana College of Arts Science and Commerce, Thane West, Maharashtra, India[2]

Corresponding Author: Srikant Kekane

Abstract: *A thorough understanding of the soil temporal variability of micronutrients and how this variation impacts the environment is critical for optimum crop productivity and eco system preservation in a variety of disciplines within agricultural science. An attempt was made to investigate the soil temporal variability of micronutrients such as cadmium, cobalt, chromium, copper, mercury, nickel, lead, zinc, and SAR from March to September 2017 in the Lote industrial area. During the post-monsoon season, the concentration of several micronutrients is often high. Nutrient imbalance is caused by the rate of fertiliser input and the continual discharge of industrial waste water on the soil surface.*

Keywords: Soil micronutrients, Lote industrial area, Seasonal variation, SAR.

I. Introduction

In agricultural research and production, a thorough understanding of the temporal variability of soil fertility characteristics and their consequences on the environment is becoming increasingly important. The goal of specific nutrient recommendations and large-scale environmental monitoring is to increase crop yield while limiting negative environmental effects. Excess nitrogen (N), phosphorus (P), and potassium (K) shortage in soil is caused by incorrect fertiliser and manure application recommendations. However, a thorough understanding of how fertiliser and management processes affect long-term soil fertility in traditional agricultural systems across wide regions remains a mystery [1]. Residual water in coarse-textured soil occurs in intragranular pores and accounts for around 10% of total soil porosity, while it is practically hieratically immobile in fine-textured soil [2]. Sixteen elements are required for plant growth. These elements are classified as macronutrients and micronutrients. Micronutrient deficiencies or excesses, such as iron, zinc, and copper, can have both synergistic and antagonistic effects in plants [3]. Dynamic soil quality indicators are soil qualities that can be modified quickly due to land use [4]. Soil contamination has been linked to the presence of heavy metals and residues from municipal and industrial trash. Soil is a natural dynamic entity formed by natural forces operating on natural stuff. At varying depths, it is frequently divided into horizons from mineral and organic elements. These differ from the parent materials in morphological, physical, and component chemical attributes, composition, and biological features. Because industries are voracious users of natural resources, they pollute the air, water, and soil. Soil contamination is typically caused by factories, fertilizers, swage, sludge, city compost, other industrial waste, industrial effluents, and water drainage. Once pollutants penetrate and are incorporated into the soil, their concentration in the soil continues to rise, becoming harmful to all kinds of life such as plants, microorganisms, and humans [5,6]. The current study aims to assess the association between various soil micronutrients in the Lote industrial region during the pre- and post-monsoon seasons.

II. Experimental Section

The study area is located in the Ratnagiri district Lote MIDC. Soil samples were taken from eight different sites. A soil pit was drilled at each sample location to assess the depth of the soil horizons and to conduct discrete depth sampling by natural horizons. Soil samples were air dried, broken if bulk, and sieved using a 2 mm screen. All samples were kept in polythene receptacles [7]. The analytical properties of the soil samples were determined as follows. Cadmium, cobalt, chromium, mercury, lead, and zinc were measured spectrophotometrically, whereas copper and nickel were determined using an atomic absorption spectrophotometer. All of the chemicals utilized were of the AR grade. Standard procedures were used for the analysis [8,9]. The sodium adsorption ratio (SAR) was estimated using the equation below.

$$SAR = Na^{+} / [(Ca^{++} + Mg^{++}) / 2]0.5$$

Where, Na^{+}, Ca^{++} and Mg^{++} in (mg/kg)

III. Results and Discussion

Table 1 summarises the findings of the analysis. From March 2017 to September 2017 (mg/kg); for pre monsoon and post monsoon; During the research period "T," the temperature in the entire region ranged from 37.7^{0}C (post-monsoon) to 32.7^{0}C. (pre-monsoon). The content of cadmium in soil ranged from 6.4 mg/kg to 74.0 mg/kg. Cadmium concentrations were lowest in the pre-monsoon season and highest in the post-monsoon season. Excessive concentrations over the limit were detected as a result of industrial waste water discharge on the soil surface. The cobalt content ranged from 0.1 mg/kg to 169 mg/kg and was highest in the post-monsoon season, while it was lowest in the pre-monsoon season. The readings exceeded the essential limitations set by higher plants. Nitrogen fixing microorganisms require just trace quantities. As a result, the cobalt content in soil appears to be totally enough for nitrogen fixation [10].

During the research period, chromium concentrations ranged from 11.6mg/kg to 27.2mg/kg. The concentration was found to be lowest in the post-monsoon season and highest in the pre-monsoon season. Copper and mercury levels varied greatly throughout the pre- and post-monsoon seasons. The content of nickel ranged from 77.7 mg/kg to 169.0 mg/kg. The concentration of nickel was lowest during the pre-monsoon season and highest during the post-monsoon season. The concentration of lead ranged from 29.0 mg/kg to 89.0 mg/kg during the pre-monsoon season, with the highest concentration occurring during the post-monsoon season. It is caused by industrial effluent percolation. The seasonal fluctuation of copper, mercury, nickel, lead, and zinc was seen in the pre-monsoon and post-monsoon seasons due to farmers' usage of a large amount of inorganic fertilizer and continuous discharge of industrial waste, effluents on soil surface and which was percolated in soil generates an imbalance in micronutrient content [11]. SAR (sodium adsorption ratio) varies from 1.17 mg/kg to 84.09 mg/kg. SAR was found to be lowest in the pre-monsoon season and highest in the post-monsoon season. A greater SAR value suggests loamy sand, clay loam, or clay soil.

Table 1: Various Elements Concentration in Soil Samples from the Lote Industrial Area

Location	Season	SAR	Pb	Zn	Cd	Co	Cr	Cu	Hg	Ni
S-1	**Pre. M.**	3.99	29	102.4	9.7	55.2	24.5	141.1	BDL	119.7
	Post.M.	17.44	82	86.1	24.6	105	24.4	120.2	BDL	159
S-2	**Pre. M.**	3.21	41	92.7	7.7	53.3	22.2	135.9	1099	92.5
	Post.M.	10.28	89	759	23.9	106.5	21.6	144.9	189	145.3
S-3	**Pre. M.**	1.29	43	128.3	8	78.6	25.5	173	2199	115.2
	Post.M.	17.44	88	104	20	112.8	20	158.7	209	143.8
S-4	**Pre. M.**	14.1	34	109.6	8.4	50.6	1.1	96.4	BDL	77.7
	Post.M.	14.84	79	329	9.3	94.1	20.8	26.4	269	151.7
S-5	**Pre. M.**	3.49	38	89.7	10.4	63.2	23.8	119.8	2099	91.6
	Post.M.	6.12	83	579	21.3	8.5	23.9	141.3	BDL	156.9
S-6	**Pre. M.**	19.42	43	106.9	10.7	0.1	26.2	123.5	199	81.2
	Post.M.	52.56	82	89	6.4	116.5	17.8	13.5	69	159
S-7	**Pre. M.**	13.25	34	91.6	8.4	51.6	11.9	144.7	499	68.8
	Post.M.	84.09	81	68.5	29.1	99	10.6	82.6	19	117.8
S-8	**Pre. M.**	1.17	44	9	14	52	26	144	BDL	91.5
	Post.M.	7.94	89	74	74	169	10.9	72.5	BDL	169
Max		**84.09**	**89**	**759**	**74**	**169**	**26.2**	**173**	**2199**	**169**

Min		**1.17**	**29**	**9**	**6.4**	**0.1**	**1.1**	**13.5**	**19**	**68.8**
Average		**16.91**	**61.19**	**176.18**	**17.87**	**75.99**	**19.45**	**114.91**	**685.00**	**121.29**

IV. Conclusion

Industrial pollution has a negative impact on soil quality. The primary impact on biomass was the excessive use of fertiliser and irrigation water. To achieve long-term agricultural success, good management is required.

Acknowledgement

The authors are grateful to the management and principal of ICS College of Arts, Commerce and Science, and the management and principal of S. C. S. College in Satishpradhan Dnyanasadhana College Thane (west) for providing required departmental facilities.

References

[1]. L Darilek ; B Huang ;Y Qi ; Y Zhao; W Sun; Z Gu; X Shri; Agricultural Ecosystem and Environment, 2007,129, 286 -292.
[2]. I Ebtisum; El Dardiry; Aust. J. Basic and Applied Science, 2007, 1 (3): 220-225.
[3]. JN Nigal; Asian J. of Chem., 2000, 12(4), 1364-1366.
[4]. K Chan; YA Bowrnan; A. Oates, Soil Sci., 2001, 166:61-67.
[5]. EY Oyinlola; IA. Aliyu, Chem. Class J., 2005, 2, 32-35.
[6]. DK Das, Introductory Soil science, Kalyani Publisher 2nd, Ed. 2006.
[7]. M Sanchez-Maranon; M Soriano; G Delgado; R Delgado, Soil Science Society, Am. J. 2002,66,928-958.
[8]. APHA (American Public Health Association), 1989,17 th Ed.
[9]. ISI (Indian Standards Institution) New Delhi, 1968.
[10]. E Carpenter; J Tarr; EL. Rice, Proc. Okla. Acad. Sci., 1980,60:43-47.
[11]. EA Kirkby; V Romheld, International Fertilizer Society York U.K., 2004, 1-51.