Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5533

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (4):** 2014-2019 (2017)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Effect of Opencast Coal Mining on Soil Available Micronutrients in Cultivated Soils of Telangana State

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Received: 5.08.2017 | Revised: 16.08.2017 | Accepted: 18.08.2017

ABSTRACT

The present investigation was undertaken to understand and estimate the impact of opencast coalmining on soil available micronutrients in cultivated soils of Telangana state. Soil samples were collected from Srirampur (Adilabad), Medipalli (Karimnagar), Bhupalapally (Warangal) and Yellandu (Khammam) opencast areas of Telangana. At each opencast mining place surface samples (0-15 cm) depth were collected. 10 surface samples at a distance of 1.5 km (approximately) from opencast coal mining area and another 10 surface soil samples from 3.5 km from coal mines in all directions. These samples are designated as samples within 2 km from coal mining and beyond 2 km respectively. With an assumption that accumulation of coal dust will be within 2 km from mining site. Thus a total of 80 samples were collected i.e 40 within 2 km another 40 beyond 2 km from mining area from four places of opencast i.e Srirampur, Medipalli, Bhupalpally and Yellandu. The data was analysed statistically by two sample t test to compare Zn, Cu, Fe and Mn contents in samples within 2 km and beyond 2 km from opencast coal mining. There was significant change in manganese content of soils within 2 km and beyond 2 km of the mining activity. There was no significant change in zinc, copper and iron content of soils within 2 km and beyond 2 km of the mining activity

Key words: *Micro Nutrients, Opencast, Coal Mine.*

INTRODUCTION

In India the mining operations have degraded significant area of land and have replaced ecosystem of the mined out areas with the undesirable waste materials in form of overburden dumps. The process of coal extraction drastically alters the physical and biological nature of the mined out areas, so the land protection becomes an inevitable aspect and should be given the prime importance right from the initial stage of mining operation. However in most of the mining areas in India, large scale exploitation of mineral resources has been carried out since early days of mining without taking due care of the land protection and also without any proper plan for the future use of degraded land.

Cite this article: Madhavi, B. and Jayasree, G., Effect of Opencast Coal Mining on Soil Available Micronutrients in Cultivated Soils of Telangana State, *Int. J. Pure App. Biosci.* **5(4):** 2014-2019 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5533

Due to these unscientific mining techniques used earlier large scale degradation of land, subsidence of strata, disturbance of water table, pressure on the nearby forest areas, threat to flora and fauna and many other hazards have taken place.

The present investigation was undertaken to understand and estimate the impact of opencast coalmining on soil available micro nutrients *viz.*, Zn, Cu, Fe and Mn in Telangana state.

MATERIAL AND METHODS

Soil samples were collected from Srirampur (Adilabad), Medipalli (Karimnagar), Bhupalapally (Warangal) and Yellandu (Khammam) opencast areas of Telangana. At each opencast mining place surface samples (0-15 cm) depth were collected 10 surface samples at a distance of 1.5 km (approximately) from opencast coal mining area and another 10 surface soil samples from 3.5 km from coalmines in all directions. These samples are designated as samples within 2 km from coal mining and beyond 2 km respectively. With an assumption that accumulation of coal dust will be within 2 km from mining site. Thus a total of 80 samples were collected *i.e* 40 within 2 km another 40 beyond 2 km from mining area from four places of opencast *i.e* Srirampur, Medipalli, Bhupalpally and Yellandu. Twenty grams of soil was shaken with 40 ml of DTPA extractant of pH 7.3 for 2 hours. The contents were filtered and in the filtrate different micro nutrients (Zn, Cu, Fe & Mn) were determined by using Atomic Absorption Spectrophotometer (AAS) as per the specifications suggested by Lindsay and Norvell (1978).

RESULTS AND DISCUSSION

The available zinc content of soils ranged between 0.33 to 2.4 mg kg^{-1} within 2 km from the mining activity and 0.12 to 3.30 mg kg^{-1} beyond 2 km from the mining activity (Table 1). There was no significant change Zn content of soils within 2 km and beyond 2 km of the mining activity (Fig.1).

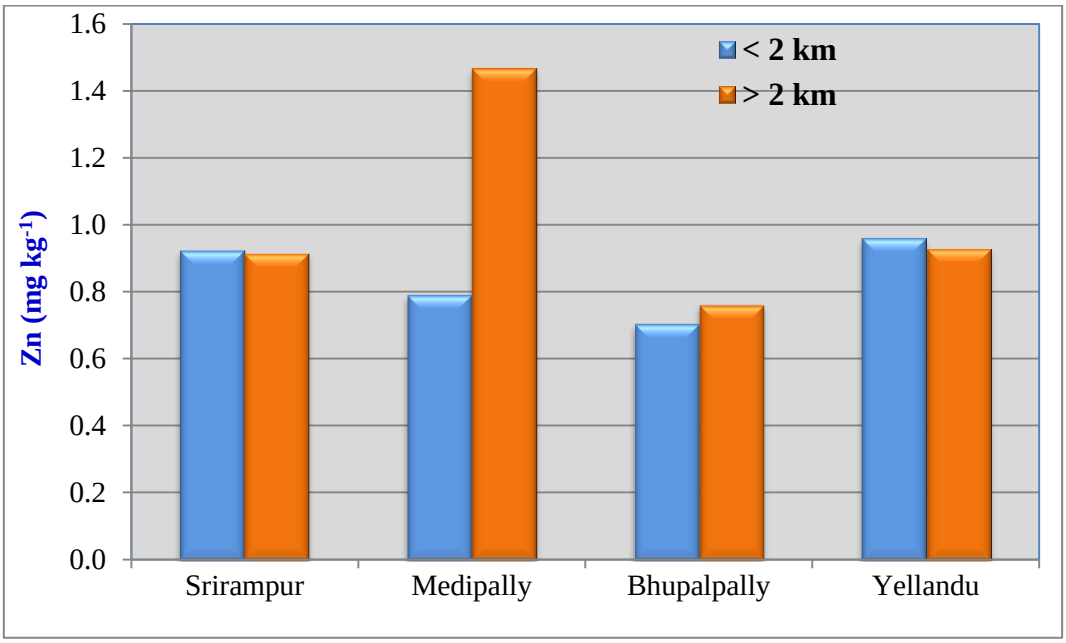
Available copper content of soils ranged between 1.08 to 13.33 mg kg^{-1} within 2 km from the mining activity and 0.33 to 13.33 mg kg^{-1} beyond 2 km from the mining activity (Table 2). There was no significant change in Cu content of soils within 2 km and beyond 2 km of the mining activity (Fig.2).

Available iron content of soils ranged between 5.6 to 62.6 mg kg^{-1} within 2 km from the mining activity kg^{-1} and 6.69 to 48.90 mg kg^{-1} beyond 2 km from the mining activity (Table 3). There was no significant change in iron content of soils within 2 km and beyond 2 km of the mining activity (Fig.3).

Available manganese content of soils ranged between 2.2 to 36.8 mg kg^{-1} within 2 km from the mining activity kg^{-1} and 3.90 to 32.40 mg kg^{-1} beyond 2 km from the mining activity (Table 4) . There was significant change in manganese content of soils within 2 km and beyond 2 km of the mining activity (Fig.4).

Table 1: Variation in Zinc (Zn) content in within 2 km and beyond 2 km area in opencast mining areas of Telangana

Srirampur		Medipalli		Bhupalapally		Yellandu	
< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km
1.98	0.88	0.4	1.66	0.7	3.30	0.7	0.42
1.08	0.33	0.8	0.56	0.6	0.76	0.9	1.32
0.33	1.38	0.4	0.49	1.1	0.63	1.1	0.34
0.62	0.79	0.5	1.92	0.7	0.65	1.0	0.72
0.96	1.12	0.9	0.65	0.8	0.42	0.8	0.62
0.34	0.78	0.7	1.76	0.6	0.80	0.6	1.56
2.47	1.3	0.8	2.41	0.4	0.12	0.78	0.71
0.57	0.62	0.6	1.98	0.57	0.25	1.98	1.98
0.48	0.98	1.3	1.57	1.02	0.46	0.33	0.98
0.39	0.98	1.5	1.67	0.55	0.23	1.40	0.65

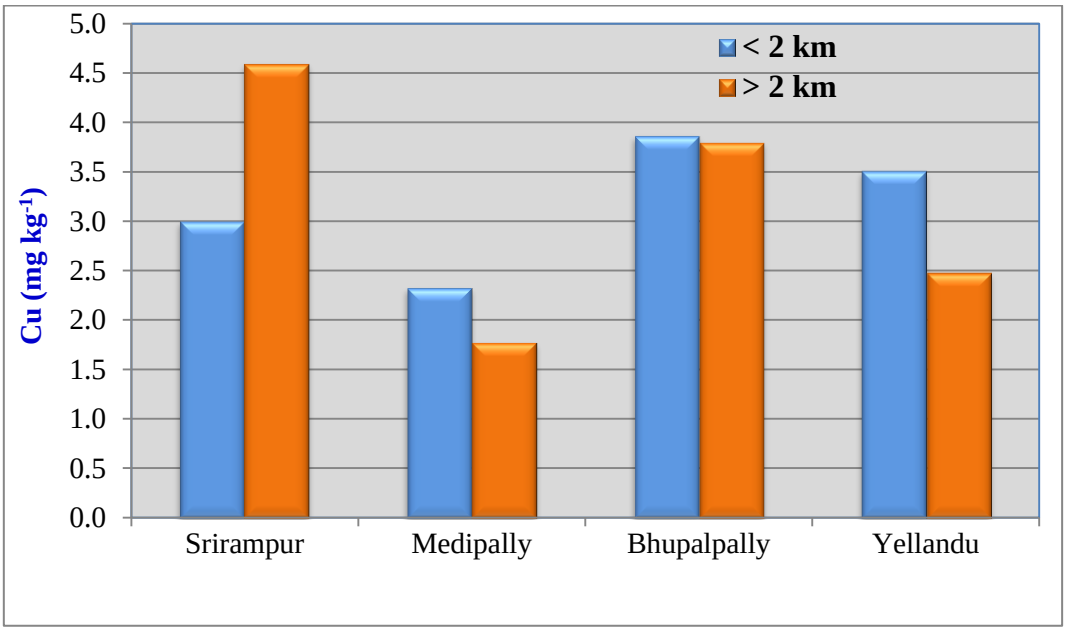


* Each value is an average of 10 surface samples

Fig. 1: Variation in Zinc content within 2 km and beyond 2 km area from opencast mining areas of Telangana region

Table 2: Variation in Copper (Cu) content in within 2 km and beyond 2 km area in opencast mining areas of Telangana

Srirampur		Medipalli		Bhupalapally		Yellandu	
< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km
1.25	3.9	4.7	1.95	1.5	0.80	2.9	0.45
0.79	13.33	1.8	0.88	4.9	8.04	3.1	2.60
4.58	11.88	1.4	0.91	1.3	2.80	1.7	8.25
0.33	0.52	5	2.3	3.8	0.33	2.4	0.52
0.98	1.01	2	1.77	2.3	0.45	2.6	1.44
8.88	4.67	1.3	0.98	3.3	1.06	2.1	2.39
1.54	4.12	1.4	1.54	2.8	8.60	4.67	0.99
2.89	1.44	1.3	1.48	2.89	2.50	1.25	1.48
1.81	4.1	1.5	1.86	6.10	2.30	13.33	4.10
6.98	0.94	2.9	4.1	9.77	11.10	1.05	2.60

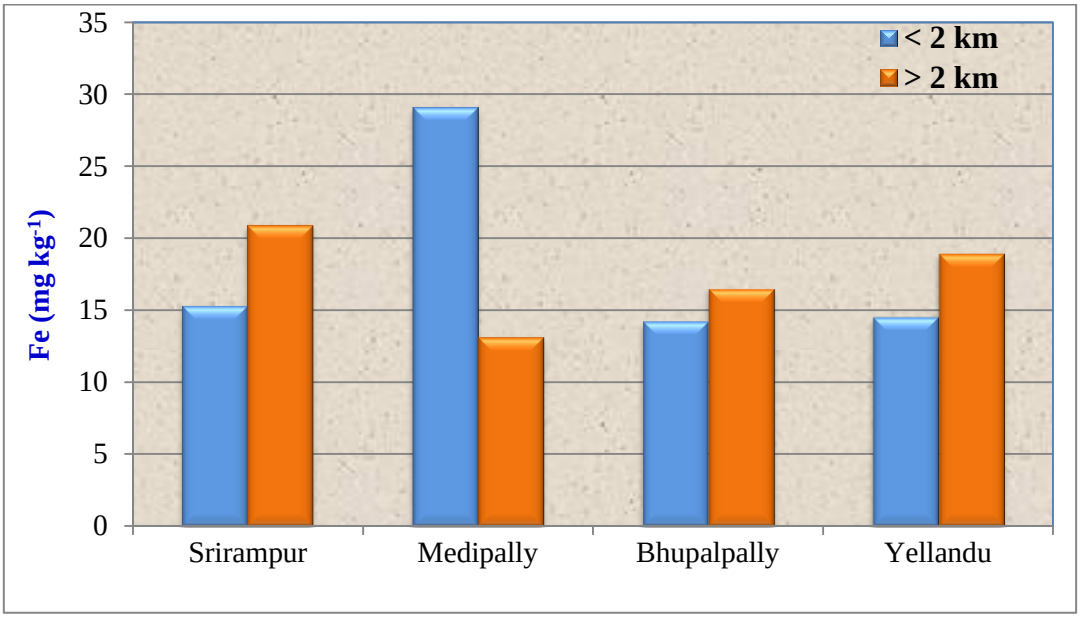


* Each value is an average of 10 surface samples

Figure 2: Variation in Copper content within 2 km and beyond 2 km area from opencast mining areas of Telangana region

Table 3: Variation in Iron (Fe) content in within 2 km and beyond 2 km area in opencast mining areas of Telangana

Srirampur		Medipalli		Bhupalapally		Yellandu	
< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km	< 2 km	> 2 km
29.66	11.1	20.8	23.22	15.5	1.72	11.3	7.60
12.4	50.16	22.5	8.8	15.5	22.18	5.6	12.60
17.98	41.58	21	11.6	19.1	2.80	23.1	42.30
8.58	6.96	19.6	6.94	20.9	6.78	24.8	11.18
16.88	11.89	15.4	14.8	6.2	7.60	4.6	43.61
12.25	11.89	20.5	16.88	8.6	10.30	24.7	14.59
18.66	11.2	51.1	18.66	9.0	22.10	9.98	15.99
11.88	43.69	21	12.99	12.4	28.10	13.21	12.99
13.21	12.11	62.7	6.69	22.45	14.6	19.11	12.11
11.58	8.85	36.1	10.92	12.75	48.90	8.89	16.65

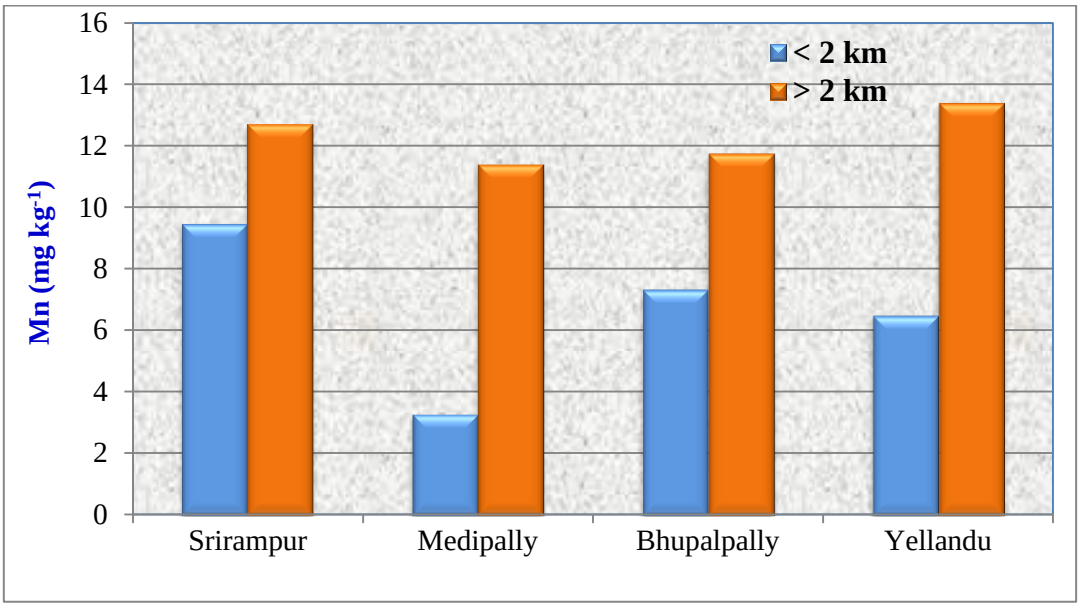


* Each value is an average of 10 surface samples

Fig. 3: Variation in Iron content within 2 km and beyond 2 km area from opencast mining areas of Telangana region

Table 4: Variation in Manganese (Mn) content in within 2 km and beyond 2 km area in opencast mining areas of Telangana

Srirampur		**Medipalli**		**Bhupalapally**		**Yellandu**	
< 2 km	**> 2 km**	**< 2 km**	**> 2 km**	**< 2 km**	**> 2 km**	**< 2 km**	**> 2 km**
6.88	15.52	3.4	12.09	2.5	3.90	2.1	18.60
22.6	20.01	3	10.6	2.6	8.63	2.2	32.40
9.65	7.1	2.8	25.6	3.2	12.30	5.8	15.99
3.15	6.1	2.2	12.04	8.6	5.35	5.6	5.12
7.79	18.4	2.8	6.88	1.6	18.60	2.9	15.27
9.12	12.45	2.9	7.79	6.6	22.80	3.4	1.99
15.99	10.7	4.1	15.99	5.2	9.60	12.45	15.66
4.8	15.27	2.8	7.48	10.75	8.60	14.80	7.48
7.35	11.62	2.9	5.31	13.74	8.92	4.36	11.62
7.1	10.01	5.9	10.33	18.38	18.91	11.05	9.84



* Each value is an average of 10 surface samples

Fig. 4: Variation in Manganese content within 2 km and beyond 2 km area from opencast mining areas of Telangana region

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