ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 02, pp.26748-26750, February, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

CHEMO TOXICITY INVESTIGATIONS AND PHYSICO - CHEMICAL ANALYSIS OF COMPOSITE SAMPLES OF CHEMICAL WASTE EFFLUENT WITH SOIL + NPK IN THE NEARBY AREA OF KALIASOTE DAM BHOPAL (M.P.)

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ARTICLE INFO

Article History:
Received 22nd November, 2015
Received in revised form
25th December, 2015
Accepted 12th January, 2016
Published online 27th February, 2016

Key words:

NPK, recycled wastewater,
Irrigation, Soil Properties.

ABSTRACT

The aim of this study was to analyze the chemo toxicity and physico – chemical parameters of soil nutrients with time on the nearby area of Kaliasote Dam during season 2006-2007. A total of 10 samples were taken from different sites of Bhopal (M.P.) The various soil parameters were analyzed included the soil pH, electrical conductivity, water holding capacity, total nitrogen, organic carbon and phosphorous. Results showed that soil parameters varied a little during the whole year.

Citation: **Rajesh Mehta, Parul Kumar, 2016.** "Chemo toxicity investigations and physico - chemical analysis of composite samples of chemical waste effluent with soil + npk in the nearby area of kaliasote dam bhopal (M.P.)", *International Journal of Current Research,* 8, (02), 26748-26750.

INTRODUCTION

The term "soil testing" refers to the full range of chemical, physical and biological tests that may be carried out on a submitted sample of soil, though in the present context only nutritional aspects will be considered. Soil testing has a long history in Australian agriculture, and has contributed significantly to the development of modern scientifically-based production systems. More recently, it has become an important, but all too often a misused, tool for turf producers and turf managers. The present paper explains the principles on which good soil testing is based, how the results should be interpreted, and what can realistically be expected of a soil test in turf situations. Water is a vital resource but a severely limited in most countries. Rapid industrial developmental activities and increasing population growth had declined the resources day to day throughout the world. The population increase has not only increased the fresh water demand but also increased the volume of wastewater generated. Therefore, there is an urgent need to conserve and protect fresh water and to use the water of lower quality for irrigation (Al-Rashed and Sherif, 2000).

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Treated or recycled wastewater (RWW) appears to be the only water resource that is increasing as other sources are dwindling (Environmental Protection Agency, 1991). Consequently the reuse of wastewater for agriculture is highly encouraged (Mohammad and Mazahreh, 2003; Al-Salem *et al*., 1996). The reuse of wastewater for agricultural irrigation purposes reduces the amount of water that needs to be extracted from water resource (Environmental Protection Agency, 1992 and Gregory, 2000). It is the potential solution to reduce the freshwater demand for zero water discharge avoiding the pollution load in the receiving sources.

It is the necessity of the present era to think about the existing urban wastewater disposal infrastructure, wastewater agriculture practices, quality of water used, the health implications and the level of institutional awareness of wastewater related issued (Rutkowski *et al.,* 2006). Due to ever increasing population huge volume of domestic wastewater is being produced in cities. Indiscriminate disposal of such water is a cause for pollution of air, soil and groundwater supplies. Cost of treatment of Domestic wastewater for recycling is too high to be generally feasible in developing countries like India. However, such wastewater exerting most of the nutrient load and could be used as irrigation water to certain crops, tree and plants that may lead to increase in agricultural produce and plantation. It has a potential to supply (organic) carbon nutrients Nitrogen, Phosphorus, Potassium (NPK) and (inorganic) micro nutrients to support crop/plant growth (Weber *et al*., 1996). In the agriculture practices, the irrigation water quality is believed to have an effect on the soil characteristics, crops production and management of water (Shainberg *et al*., 1978). Particularly, the application of saline/sodic water results in the reduction of crop yield and deterioration of the physico-chemical characteristics of soil. Present study deals with application of domestic wastewater for irrigation and its effect on soil characteristics.

Why Test Soil?

Soil testing may be carried out for various purposes. Its main uses include:

- Assessment of land capability for various forms of agriculture,
- Identifying and quantifying soil constraints (e.g. salinity),
- Monitoring of soil fertility levels.

Providing guidelines as to the type and amount of fertiliser to be applied for optimum plant growth on the particular site and As a diagnostic tool to help identify reasons for poor plant performance. In the present context, the ultimate aim is to reduce the guesswork involved in managing a specific area of turf. However, the results and recommendations may be worthless, or even misleading, if sampling and/or analysis of submitted samples are not carried out properly or if subsequent interpretation of the data is flawed.

Basic Requirements

There are three basic steps that must be followed if meaningful results are to be obtained from soil testing. These are:

- To take a representative sample of soil for analysis,
- To analyse the soil using the accepted procedures that have been calibrated against fertiliser experiments in that particular region and
- To interpret the results using criteria derived from those calibration experiments.

Each of these steps may be under the control of a different person or entity. For example, the sample may be taken by the farmer/turf manager or by a consultant agronomist; it is then sent to an analytical laboratory; and finally the soil test results are interpreted by an agronomist to develop recommendations for the farmer or turf manager.

MATERIALS AND METHODS

The soil samples were collected from 10 Different Stations in the Morning Hours between 9 to 11am. The samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Temperature and pH were recorded at the time of Sample Collection, by using Thermometer and Pocket Digital pH Meter while other Parameters were Estimated in the Laboratory By using Standard Methods as Prescribed By APHA, AWWA.

RESULTS AND DISCUSSION

During Pre Monsoon

S.No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	pH	-	5.9	5.7	6.2	6.3	6.0	5.6	6.3	6.4	6.3	5.6
2	Ele.cond.	%	0.11	0.11	0.10	0.09	0.10	0.08	0.09	0.10	0.10	0.09
3	Water holding capacity	%	39	35	42	43	40	31	27	24	42	37
4	Fe_2O_3	%	6.08	5.51	5.32	4.21	5.82	6.81	5.63	6.92	6.40	6.36
5	P_2O_5	%	0.17	0.18	0.19	0.21	0.17	0.22	0.21	0.15	0.16	0.21
6	CaO	%	1.27	1.33	1.50	1.31	1.54	1.39	1.41	1.54	1.63	1.43
7	Organic carbon	%	0.86	0.79	0.81	0.72	0.80	0.78	0.76	0.75	0.70	0.77
8	Total Nitrogen	%	0.042	0.040	0.039	0.032	0.040	0.033	0.028	0.031	0.028	0.022
9	Manganese	Mg/l	1.18	1.11	1.00	1.06	1.50	1.64	1.05	1.41	1.27	1.13
10	Zinc	Mg/l	5.9	6.4	7.0	7.5	5.7	5.5	5.3	6.4	6.3	4.5
11	Molybdenum	Mg/l	4.9	5.3	5.6	4.6	4.2	5.3	5.7	7.0	5.2	4.2
12	Boron	Mg/l	0.28	0.27	0.23	0.21	0.27	0.31	0.23	0.18	0.19	0.21
13	Cadmium	Mg/l	0.52	0.43	0.33	0.64	0.66	0.42	0.37	0.46	0.53	0.52
14	Lead	Mg/l	0.31	0.28	0.21	0.25	0.38	0.35	0.42	0.39	0.33	0.29

During Monsoon

S.No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	pH	-	6.3	6.6	7.0	7.1	6.9	6.3	7.1	7.2	7.1	6.3
2	Ele.cond.	%	0.11	0.12	0.11	0.10	0.11	0.09	0.10	0.11	0.11	0.10
3	Water holding capacity	%	31	39	48	50	33	23	31	27	48	41
4	Fe_2O_3	%	6.88	6.22	6.02	4.76	6.58	7.71	6.37	7.83	7.24	7.19
5	P_2O_5	%	0.23	0.21	0.22	0.23	0.20	0.28	0.23	0.17	0.19	0.23
6	CaO	%	1.44	1.50	1.70	1.48	1.74	1.57	1.60	1.74	1.84	1.61
7	Organic carbon	%	0.37	0.35	0.31	0.33	0.29	0.28	0.24	0.33	0.43	0.48
8	Total Nitrogen	%	0.048	0.045	0.044	0.037	0.045	0.038	0.032	0.035	0.032	0.024
9	Manganese	Mg/l	1.33	1.25	1.13	1.20	1.70	1.85	1.19	1.60	1.44	1.29
10	Zinc	Mg/l	6.8	7.2	8.0	8.4	6.4	6.2	6.0	7.2	7.1	5.1
11	Molybdenum	Mg/l	5.5	6.0	6.3	5.2	4.8	6.0	6.4	8.0	5.9	4.8
12	Boron	Mg/l	0.32	0.31	0.26	0.23	0.31	0.35	0.26	0.21	0.22	0.23
13	Cadmium	Mg/l	0.59	0.49	0.38	0.72	0.74	0.48	0.41	0.52	0.60	0.59
14	Lead	Mg/l	0.35	0.32	0.23	0.28	0.43	0.39	0.48	0.44	0.38	0.33

Post Monsoon

S.No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	pH	-	7.0	7.6	6.8	6.9	6.7	6.3	6.9	7.0	6.9	6.3
2	Ele.cond.	%	0.11	0.12	0.11	0.10	0.11	0.09	0.10	0.11	0.11	0.10
3	Water holding capacity	%	30	39	47	50	32	23	30	26	47	41
4	Fe_2O_3	%	6.75	6.12	5.91	4.68	6.47	7.57	6.25	7.69	7.11	7.06
5	P_2O_5	%	0.23	0.21	0.22	0.23	0.19	0.28	0.23	0.17	0.18	0.23
6	CaO	%	1.42	1.47	1.67	1.45	1.72	1.55	1.57	1.72	1.82	1.58
7	Organic carbon	%	0.36	0.35	0.30	0.32	0.29	0.28	0.24	0.32	0.42	0.47
8	Total Nitrogen	%	0.047	0.044	0.043	0.036	0.044	0.037	0.031	0.035	0.031	0.024
9	Manganese	Mg/l	1.31	1.23	1.11	1.18	1.67	1.83	1.17	1.57	1.42	1.25
10	Zinc	Mg/l	6.6	7.0	7.8	8.3	6.4	6.2	5.8	7.0	6.9	5.1
11	Molybdenum	Mg/l	5.4	5.8	6.3	5.2	4.7	5.8	6.4	7.8	5.7	4.7
12	Boron	Mg/l	0.31	0.30	0.25	0.23	0.30	0.35	0.25	0.21	0.22	0.23
13	Cadmium	Mg/l	0.57	0.48	0.37	0.70	0.73	0.47	0.41	0.52	0.58	0.57
14	Lead	Mg/l	0.35	0.31	0.23	0.28	0.42	0.39	0.47	0.43	0.37	0.32

Sampling Stations

1. Near Guest House
2. At down site of Kamla Nagar
3. At downhill towards MANIT
4. At sluice gate
5. Near temple site
6. Near spill of Kaliasote dam
7. Near middle centre of reservoir
8. Near Barkheri Khurd
9. Near Bhoj University site
10. Near spill of reservoir

Conclusion

The variation in the properties are shown in the above tables. The results show that the parameters varied a little during the whole year.

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