IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 3 Ver. I (May. - Jun. 2015), PP 121-125
www.iosrjournals.org

"Effect of Fertilizer Industry Effluent on Agricultural Soil and Groundwater Quality -A Case Study"

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Abstract: *A study of water samples and soil Agricultural soil collected from Pulgaon Area, Fertilizer Industry,Pulgaon dist Wardha (M. S.) as been carried out to examine its potability for domestic purposes. he physicochemical parameters like temperature, temperature, Alkalinity, Chloride, Hardness, Total dissolved solids(TDS), pH, sulphate were studied by using various analytical techniques.Mositure content, Bulk density, specific gravity of soil were determine in laboratory method and N,P,K were determined Flame photometrically. The parameters were analyzed & compared with standard values prescribed by American Public Health Association (APHA) & World Health Organization. And Department of Agricultural Ministry standards, New Delhi*

Keywords: *Flame photometry, potability, Specific Gravity*

I. Introduction

Different devastating ecological and human Activities of the last four decades implicate industries as a main contribution environmental pollution. Environmental pollution due to increase of industrial activities are one of the most significant problems of the century. Pollution in water and Agricultural soil is strictly related to human activities such as industry, agriculture, burning of fossil fuels, mining and metallurgical processes and their waste disposal. A industry which uses the large amount of waste water in their processes includes textile manufactures, Fertilizer plants,soyabin oil processors etc. Many different types of effluents and most of by-products from any kind of industry create a most serious pollution to the water bodies and soil. The pollution of soil is often a direct or indirect consequence of industrial activities. With the ever increasing demand on irrigation water supply, farmlands are frequently faced with utilization of poor quality irrigation water. Due to irrigation water formers use industrial effluents which being discharged in canal, nalha, draine. Since, the use of effluents as irrigation water may introduce some highly pollutant, which may affect in the plants. Soil physiochemical properties are adversely affected by high concentration of pollutant, rendering contaminated soils unsuitable for crop production. Heavy Metals can also be flowing from soil into groundwater resulting in to soil contamination and decrease or problem of growth of plants. Soils polluted with high concentration of chemical from discharging point sources are potential exposure Way for surrounding population. The high concentration pollutant accumulate in the plant material growth in these soils, which will ultimately go to human body through food chain directly or indirectly causing a number of physic-chemical problems.

The objective of the present study is to assess the effect of Fertilizer industry effluent discharged on soil of agricultural field and to analyze physicochemical parameters of water and soil.

II. Experimental

In the present study, water samples have been collected from around the Fertilizer Plant area,Pulgaon(M.S.).The Samples were collected glass bottles and polythine bags with safety precautions. The chemicals uses in these tests standard (A.R.Grade). Reagent and Double distilled water is used is preparation. The examination of water quality parameters considered in the study of Temperature, pH, Hardness, TDS, Chloride, Alkalinity, DO were studied in using different types of techniques. The Flame photometer is used to determined the nitrogen, Phosphorus and potassium. All the parameters are analyzed by standard methods and techniques. Hardness of water was estimated by complexometric Titration method. Chloride contents were determined volumetrically by AgNO3 titrimetric method using potassium chromate as an indicator & was calculated in terms of mg/lit.

III. Results And Discussion

The physicochemical parameters data of water samples were collected in November-2014 are presented in Table No.1

Water Sample Results

Temperature

All physiological activities & life processes of aquatic organisms are generally influenced by water temperature. In the present study, temperature range from 18-28^{o}C.

PH

The pH value of water is an important of acidity, alkalinity & resulting value of the acidic-basic interaction of a number of its minerals & organic components. pH below 6.5 causes corrosion in pipes, resulting in release of toxic metals. pH of water in the studied region was found to be 7.0 to 9.5, which lies in the range of above the permissible limits

TDS

The Indian standard and world health organization, total dissolve solids is less than 500 mg/lit for drinking purpose.The work done the present study, Total dissolve solid was calculated to be 750mg/lit. The Result indicated that the sample of B.E.C.Fertilizer plant,Pulgaon area crosses the permissible limit range suggested by World Health Organization and Indian standards.

Hardness

The hardness of water is the main parameters But Hardness is not a pollution parameters but Ca ++ & Mg++ the two terms expressed

As CaCo3 indicates the quality of water. Due to large hardness value causes lather formation with soap. In the human body ,Calcium is needed in the few quantities through water provides only a part of requirement of body. The total hardness acceptable limit is 200 mg/lit which can be increase to 550 mg/lit. The resulting values of total hardness is are not within the permissible limit.The permanent hardness is found to be 670mg/lit.

Alkalinity

In the present study, total alkalinity was found to be 360 mg/lit. The permissible limit of alkalinity of water sample is 200 mg/lit.

Dissolved Oxygen (DO)

The dissolve oxygen concentration decrease the 5mg/lit, fish and other species unable to live very long time. The water species such as trout will death well above this level and catfish,carp are the low oxygen fish will be below the 5mg/lit. The DO was resulting some dug well points 3.5mg/lit. Due to high organic load in the water which causes the oxygen level down.

Chloride

In the sample Result of chloride was 280 mg/lit. The Chloride range of natural water low chloride percentage. The result indicates that chloride concentration above the permissible limits. The permissible limits value of drinking water prescribed by WHO and Indian Standard index 5.

SOIL SAMPLE RESULTS

The soil sample result is shown in Table No.2

Soil sample testing Result for the Month of December-2014

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	3.0	2.70	3.5	**2.90**	2.78	**3.0**	2.75
2	Bulk Density (Cm/cm3)	1.40-1.47	**1.85**	**1.95**	**2.0**	**1.95**	**1.70**	**1.80**	**3.0**
3	Moisture content(%)	------	20	23	22	24	21	17	22
4	Nitrogen (Mg/kg)	10Mg/kg	**60**	**45.5**	**70.0**	**55.5**	**100**	**85**	**120**
5	Phosphorus (Mg/kg)	0-7Mg/kg	**20**	**25.0**	**22.5**	**45.0**	**55.0**	**56.3**	**45.5**

6	Potassium (Mg/kg)	0-80 Mg/kg	**120**	**150**	**156**	**230**	**210**	**190**	**130**

Soil Sample Testing Result Janury-2015

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	2.60	2.73	2.74	285	2.70	2.95	2.70
2	Bulk Density (Cm/cm3)	1.40-1.47	**1.80**	**1.85**	**1.90**	**1.75**	**1.67**	**1.70**	2.0
3	Moisture content(%)	------	20	17	23	15	17	20	21
4	Nitrogen (Mg/kg)	10Mg/kg	**56.5**	37.9	56.0	46.5	80	76	90
5	Phosphorus (Mg/kg)	0-7Mg/kg	**18.0**	22.0	20.6	43.0	55.0	55.5	49.5

Soil Sample Testing Result In the Month Feb-2015

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	8.1	2.73	2.74	2.85	2.70	2.95	2.70
2	Bulk Density (Cm/cm3)	1.40-1.47	1.80	1.85	1.90	1.75	1.67	1.70	2.0
3	Moisture content(%)	------	20	17	23	15	17	20	21
4	Nitrogen (Mg/kg)	10Mg/kg	56.5	37.9	56	46.5	80	76	90
5	Phosphorus (Mg/kg)	0-7Mg/kg	18	22	20.6	43	55	55.3	49.5
6	Potassium (Mg/kg)	0-80 Mg/kg	124	155	166	240	220	210	135

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	3.0	2.70	3.5	**2.90**	2.78	**3.0**	2.75
2	Bulk Density (Cm/cm3)	1.40-1.47	**1.85**	**1.95**	**2.0**	**1.95**	**1.70**	**1.80**	**3.0**
3	Moisture content(%)	------	20	23	22	24	21	17	22
4	Nitrogen (Mg/kg)	10Mg/kg	**60**	**45.5**	**70.0**	**55.5**	**100**	**85**	**120**
5	Phosphorus (Mg/kg)	0-7Mg/kg	**20**	**25.0**	**22.5**	**45.0**	**55.0**	**56.3**	**45.5**
6	Potassium (Mg/kg)	0-80 Mg/kg	**120**	**150**	**156**	**230**	**210**	**190**	**130**

Soil Samples Testing Results for the Month of March-15

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	2.67	2.73	2.83	2.88	2.62	2.90	2.75
2	Bulk Density (Cm/cm3)	1.40-1.47	1.82	1.80	1.82	1.72	1.75	1.78	2.0
3	Moisture content(%)	------	12	10	15	10	14	15	14
4	Nitrogen (Mg/kg)	10Mg/kg	60.5	41	58.5	52.5	77	75	94
5	Phosphorus (Mg/kg)	0-7Mg/kg	25	24	20	42	64	55.3	60
6	Potassium (Mg/kg)	0-80 Mg/kg	130	150	155	230	190	230	180

Soil Samples Testing Results for the Month of April-15

Sr. No.	Parameters	Permissible Limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
1	Specific Gravity	2.7-2.80	2.65	2.60	2.75	2.85	2.60	2.95	1.80
2	Bulk Density (Cm/cm3)	1.40-1.47	1.80	1.75	1.82	1.65	1.72	1.80	1.95
3	Moisture content(%)	------	16	20	17	15	19	20	21
4	Nitrogen (Mg/kg)	10Mg/kg	60.5	41	58.5	52.5	77	77	94
5	Phosphorus (Mg/kg)	0-7Mg/kg	30	25	22	41	65	52	63
6	Potassium (Mg/kg)	0-80 Mg/kg	150	155	160	250	210	220	185

All the Sample testing Results above the permissible limits.

IV. Result &Discussion

*Range of major nutrient in soil

Nutrient status	**Nitrogen**(kg/hac)	**Phosphorus**(kg/hac)	**Potassium**(kg/hac)
Level in poor soil	<280	<23	<133
Level in medium soil	280-560	23-57	133-337
Level in fertile soil	>560.0	>57.0	>337.0

The nitrogen ,phospharus and potassium is is determine By flame photometer. The present study conclude that the N,P & K level in the soil sample is above the permissible limit. The disadvantage of concentration of N,P and K is high the growth of plant is decreses and the root of the plant is degrade and is posssible to mucus cancer in human body.

Water Sample Testing results.Table No.2

Sr.no	Parameters	Permissible limit	Result
1	pH	6.5-8.5	**9.5**
2	Tempreture	24-28 ^{o}C	**28**
3	Hardness (Mg/lit)	200	**550**
4	TDS (Mg/lit)	500	**750**
5	Alkalinity (Mg/lit)	200	**360**
6	Chloride (Mg/lit)	250	**280**
7	DO (Mg/lit)	4-7	**3.5**

V. Suggesions:

- We can suggest the Local Authority to discuss with Industry Management Regarding pollution issue and to get a proper solution.
- It is therefore recommend that careless disposal of the effluent wastes should be discourage and there is need for Industry to install a waste treatment plant with a view to treat effluent wastes before being discharge into the streams.
- We can suggest to Industry Management to follow the CPCB Rules

VI. Conclusions:-

The present work concludes that the effluent from the industry causes the pollution problems in the surrounding environment. The nutrient status of the samples showed that the soil quality of the surrounding field was poor and the effluent discharged in the nalha,canal,draine has been affecting the physicochemical characteristics of the soil. Through this study, it is concluded that the industrial effluent has substantially changed the water quality diverted from nalha and drain and canal consequently some chemical elements also increased in the soil of the irrigated farmland.

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