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Pollution Effects and Control Soil Pollution

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Abstract :

The present investigation deals with the assessment of pollution status along the wetland of Sinnar Tehsil in Nashik. Soil samples are collected from agriculture land of different villages in Sinnar Tahasil (Nashik). In this paper, the pH, electrical conductivity, bulk density, particle density, porosity, N, P, K, CaCO₃ values recorded. All these characteristics are helpful in better understanding of soil physics, agricultural application. Also this study helps to farmer for their proper crop choice. The requirement of agricultural product (sugarcane, bajra, vegetables, food & fodder for animals) to satisfy the domestic and industrial needs, have made farmers to use fertilizer and pesticide beyond the prescribed dosage.

Keywords : Soil Pollution, Heavy Metal Content, Physico-Chemical Characteristics, Contaminants

Introduction :

Soil pollution is when humans introduce harmful objects, chemicals or substances, directly or indirectly into the soil in a way that causes harm to other living things or destroys soil or water ecosystems. Soil pollutants include a large variety of contaminants or chemicals (organic and inorganic), which could be both naturally-occurring in soil and man-made. In both cases, the main soil pollution causes are the human activities.

The main reason why the soil becomes contaminated is due to the presence of manmade waste. The waste produced from nature itself such as dead plants, carcasses of animals and rotten fruits and vegetables only adds to the fertility of the soil. However, our waste products are full of chemicals that are not originally found in nature and lead to soil pollution.

'Indian culture' is the Indians' way of life. Because of the population diversity, there is immense variety in Indian culture. The Indian culture is a blend of various cultures belonging to belonging to diverse religion, castes; regions follow their own tradition and culture. [1] Soils are critical environment where rock, air and water interface. Consequently, they are subjected to a number of pollutants due to different anthropogenic activities (Industrial, agricultural, transport etc.) (Facchinelli et al., 2001; Jonathan et al., 2004). The chemical composition of soil, particularly its metal content is environmentally important, because toxic metals concentration can reduce soil fertility, can increase input to food chain, which leads to accumulate toxic metals in food stuffs, and ultimately can endanger human health. Because of



its environmental significance, many studies to determine risk caused by metal levels in soil on human health and forest ecosystem have attracted attention in recent years [2]. Alteration in the natural soil due to human activities is known as **Soil**.

Pollution or Soil Contamination.

Land pollution in India is due to the poisonous pesticides and fertilizers as well as corrosion during 2009, the issue of Uranium poisoning in the state of Punjab came into light, caused by fly ash ponds of thermal power stations. Other main reason of this type of pollution is poor garbage disposal services in both rural and urban areas of India. It is very common in India to find out a heap of garbage on the Street corners. Waste management strategies adopted in India have failed to keep pace with the industrial growth and urbanization. This has resulted in the accumulation of toxic metallic contaminants with a consequent loss in quality of soil, for the past few decades. The problem of environmental pollution due to toxic metals has begun to cause concern now in most major metropolitan cities. The toxic heavy metals entering the ecosystem may lead to geo accumulation, bioaccumulation and bio-magnifications. Heavy metals like Fe, Cu, Zn, Ni and other trace elements are important for proper functioning of biological systems and their deficiency or excess could lead to a number of disorders.[3] The heavy industrialization and the increasing urbanization are responsible for the rapidly increasing stress on the water and soil environment of the area.[4]

Types of Soil Pollution

- **Agriculture soil pollution** is caused due to the excessive use of pesticides and insecticides
- **Soil Pollution by industrial discharges** such as chemicals from mining and manufacturing of goods
- **Solid waste soil pollution**
- **Soil Pollution due to urban activities** such as urine, faeces, domestic garbage etc

Causes of Soil Pollution/Sources of Soil Pollution

Industrial Activities are one of the main cause of soil pollution. In India, as mining and manufacturing activities are increasing with time, soil degradation is also increasing. Extraction of minerals from the earth is responsible for affecting soil fertility.

Agriculture Activities such as use of insecticides and pesticides for a long period causes soil pollution. The repeated use of pesticides and insecticides causes insects and pests to become resistant to it. Instead of killing pests and insects, it degrades soil quality. Use of DDT, Aldrin and Dieldrin makes insects resistant against them. These pesticides are also water soluble and non-biodegradable. These toxic materials are then passed from lower trophic level to higher trophic level and get accumulated. This is known as **Biomagnification**.

Waste Disposal is a serious issue that causes soil pollution. Personal waste such as urine and faeces are dumped directly in the form of diapers. It causes both soil and water pollution. **Accidental Oil Spills** also promote soil pollution. Oil leaks from fuel stations deteriorate the quality of soil.

Acid Rain dissolve away the important nutrients of the soil, thus makes it unsuitable for agriculture.



Nuclear Waste also promotes soil degradation.

Heavy Metals such as lead, if mixes with soil degrades its nutrients quality.

Effects of Soil Pollution

- It affects the health of the humans. Crops or a plant grown on such contaminated soil absorbs toxic material from the soil. When animals or human beings consume these crops, or plants the toxic material is passed into their body. Long term consumption of these crops may cause chronic diseases which are non-treatable. These toxic materials such as heavy metals, organophosphates pesticides may prove to be **carcinogenic**. Organophosphate pesticides inhibit nerve impulse transmission as it acts as inhibitor of acetylcholine.
- It affects the growth and the yield of the plants. If plants are unable to get proper nutrients from the soil, growth decreases and thus affects the yield of crop plants.
- Soil fertility decreases as soil nutrients are either drain away due to acid rain or excessive use of pesticides and insecticides decreases the soil fertility.
- It alters the ecosystem balance by affecting the growth of the living organisms.
- It affects the metabolism of microorganisms and arthropods, thus affects the food chain. This in turn affects predators and carnivores.
- Harmful materials are passed from one trophic level to another trophic level. This increases mortality rate and extinction rate.

Prevention of Soil Pollution

- Contaminated soil site should be properly aerated
- Use plants to extract heavy metals
- Minimize the use of toxic pesticides and insecticides
- **Land farming** should be promoted for waste treatment
- **Bio augmentation** can be beneficial for treating the contaminants. Bio augmentation is defined as the use of certain bacteria for degrading contaminants
- **Bioremediation** is another method to prevent soil pollution. In this method, organisms are used to remove the contaminants from the contaminated site

Materials and Methods

Soil samples were collected in the depth of 0-20cm from 8 sites from Nasik District. Soil samples were completely air dried and passed through 2 mm sieve and stored in properly labelled cloth bags as per the standard procedures. Quartering technique was used for the preparation of soil samples. The sieved out particles are then oven dried to a temperature around 110°C for several hours in order to completely remove any trace of moisture.

• Study Area

Sample Site	Name of the region
S1	Dindori
S2	Niphad
S3	Kalwan
S4	Igatpuri
S5	Yevla
S6	Nandgaon
S7	Trimbakeshwar
S8	Sinnar





2. Methods

The soil pH and EC were determined from the saturation extract (1:2.5 soil-water ratio) of soils(3,4), organic carbon was estimated by Walkley and Black method (1,2). The available N (Alkaline permanganate method), available P (Olsen's method), available K and Na (Flame photometer method) were estimated by standard procedures. Free CaCO₃ was determined by rapid titration method, exchangeable calcium and magnesium was determined by Versenate method.

Table no. 1 shows the Physico-chemical characteristics of different samples

Sample No.	Area	pH (1:2.5)	E.C. (dSm ⁻¹)	OC (%)	CaCO ₃ (%)	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)
•	Dindori	6.75	0.88	3.86	4.79	235.45	16.54	452.04
•	Niphad	6.45	0.28	0.97	1.9	147.65	21.50	475.27
•	Kalwan	6.65	0.68	9.62	2.56	134.10	16.21	574.55
•	Igatpuri	7.51	0.69	3.16	3.06	229.07	11.07	595.67
•	Yeola	7.32	0.76	3.27	2.29	172.60	18.81	475.27
•	Nandgaon	7.30	0.85	4.85	3.04	219.37	19.16	576.66
•	Trimbakeshwar	7.25	0.57	4.80	2.59	246.86	21.24	599.90
•	Sinnar	7.45	0.37	2.28	3.74	182.01	21.14	456.26

Table no. 2 shows the Physico-chemical characteristics of different samples

Sample No.	Area	Ca (ml%)	Mg (ml%)	Na (ml%)	WHC (%)	Particle Density (mg m ⁻³)	Bulk Density (mg m ⁻³)	Porosity
•	Dindori	43.82	24.85	1.91	63.84	2.22	1.65	1.39
•	Niphad	45.69	6.37	0.98	58.55	2.38	1.40	1.70
•	Kalwan	58.69	38.94	1.62	66.28	2.32	1.60	1.45
•	Igatpuri	52.85	19.01	2.09	57.43	2.38	1.40	1.70
•	Yeola	45.15	18.58	2.14	50.11	2.43	1.35	1.80
•	Nandgaon	37.17	7.93	1.50	63.44	2.50	1.34	1.86
•	Trimbakeshwar	28.23	13.53	2.20	61.98	2.56	1.27	2.01
•	Sinnar	43.62	12.31	2.14	52.91	2.63	1.15	2.38

Discussion and Conclusion:

There are 283 000 sales outlets in the country. Increased demand on food grains and other agricultural products catering to requirement of various industries, availability of water, subsidy on fertilizer, increased fertilizer consumption, the land in India suffers from varying degrees of degradation, like the aggravated problem of soil erosion, salinity of soil, water logging. Soil fertility depletion is a cause of concern for Indian agriculture. There exists a gap of about 10 million tonnes of nutrients (NPK) between the removal of nutrients by crops and their addition through fertilizers. Though the chemical fertilizers are key input for agricultural



production their excess and indiscriminate use of have caused some problem especially under irrigated condition.[5]

A relation of rate of contamination with varying dose of fertilizer for different period of time needs to be clearly identified, which also depends on the vulnerability of the aquifer to pollutant load. Hence scope exists in this field to extend the work especially on the study of vulnerability and establish groundwater pollution maps for the region. Increase in poverty, hunger, lack of formal employment opportunities, demand for food, and proximity to markets and availability of cheap resource such as urban organic waste. The most common urban Agricultural activities are community gardens (formal & informal) home gardens, institutional garden. Nurseries managed by schools, hospitals, (Mubofu and Bahemuka 1999) despite serious.[6]

The sources of trace elements in urban soils and urban road dusts are mainly derived from traffic sources and industrial sources. However, the sources of trace element in agricultural soils are mainly influenced by parent materials, application of agrochemical fertilizer and pesticides.[7] Maintenance or enhancement of soil quality is a more important criterion for analysis and sustainability of soil ecosystems. Nevertheless, the undertaking of establishing a specific criterion for land quality is challenging because functions and subsequent values provided by soil ecosystems are variable and rely on the interplay of soil physical, chemical, and biological properties and cognitive operations which often differ significantly across spatial and temporal scales.[8]

Since phytoremediation has been identified as a cost effective, environmentally friendly, aesthetically pleasing process for removal of environmental pollutants *Avicennia marina* is found to be a potential species for protection of coastal ecosystem.[9] By controlling industrial and vehicular pollution of water, soil and air can prevent cadmium and lead contamination. Limiting the use of wastewater for irrigation and minimizing the use of sewage sludge, municipal compost and certain pesticides can help in controlling heavy metal pollution. Farmers need to be made aware of side effects associated with certain pesticides, fertilizers and irrigation water sources during cultivation. Washing of vegetables at farm should be done with clean water. Care should be taken during the transport and sale of vegetables.[10] Since the waste was disposed directly onto surface of soil, a number of contaminants including heavy metals readily penetrate and eventually they contaminate the soil and affect the surrounded crops and vegetation of the area.[11]

Conclusion :

The study helps in determining the values of different physico-chemical parameters and nutrient concentrations of soil from Nasik region. The bulk density ranged between (mg m^{-3}) 1.15 to 1.65, Porosity ranged between(%) 1.39to 2.38,water holding capacity ranged between(%) 50.11 to 66.28 shows that the quality of soil is good. pH ranged between 6.45 to 7.51 which is within the range of cultivation. Electrical conductivity ranged between (dSm^{-1}) 0.28 to 0.88 is also in recommended range. Organic carbon ranged between (%) 0.97 to 9.62,calcium carbonate ranged between(%) 1.9 to 4.79,available N ranged between (kgha^{-1}) 147.65 to 246.86 available P ranged between (kgha^{-1}) 11.07 to 21.50. According to this N and P is less in soil. So 25% more than recommended N and P dose of organic manures and



chemical fertilizers should be applied to the soil for better growth of appropriate crop. Available K ranged between (kg ha^{-1}) 452.04 to 599.90 which is in normal range.

Soil in Igatpuri and Trimbakeshwar is suitable for rice. Soil in Sinnar is suitable for bajra, maize, and wheat. The crops like soybean, cotton, maize, rice, tur, onion can be taken in kharif season. Also the crops like wheat, gram, onion can be taken in rabbi season according to availability of water. In summer season groundnut, onion can be taken. Soil in Niphad, Kalvan, Dindori tahsil is suitable for grapes, onion, soil in Yeola, Nandgaon is suitable for pomegranate. The soil status indicates growing deterioration of the soil in the study region. The effect of soil degradation will have bearing on the quality of groundwater, which is a major source of water supply in the region. The use of bio fertilizers and other organic manures need to be promoted and encouraged, along with controlled use of water resources.

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References :

Indian Culture: Traditions, Religions, Festivals, Music, Dance, Clothing, Food, Movies
May 26, 2016 By Vikash Chamaria Category: Indian Society

On Status of Soil Contamination in India Shikhar [HYPERLINK](#)

["http://www.waterandmegacities.org/?author=6"](http://www.waterandmegacities.org/?author=6) [HYPERLINK](#)

["http://www.waterandmegacities.org/?author=6"](http://www.waterandmegacities.org/?author=6) Kumar [Research](#) [HYPERLINK](#)

["http://www.waterandmegacities.org/category/research-area/"](http://www.waterandmegacities.org/category/research-area/) Area | December 14, 2011

Soil Pollution along Kalwa Bridge at Thane Creek of Maharashtra, India, , Pravin U. Singare, Ram S. Lokhande, Pragati P. Pathak *Journal of Environmental Protection*, 2010, 1, 121-128

Heavy metal concentrations in groundwaters and soils of Thane Region of Maharashtra, India. Bhagure [HYPERLINK](#)

["https://www.ncbi.nlm.nih.gov/pubmed/?term=Bhagure%20GR%5BAuthor%5D&cauthor_uid=20300835"](https://www.ncbi.nlm.nih.gov/pubmed/?term=Bhagure%20GR%5BAuthor%5D&cauthor_uid=20300835) GR¹, Mirgane SR., Environ [HYPERLINK](#)

["https://www.ncbi.nlm.nih.gov/pubmed/20300835"](https://www.ncbi.nlm.nih.gov/pubmed/20300835) Monit [HYPERLINK](#)

["https://www.ncbi.nlm.nih.gov/pubmed/20300835"](https://www.ncbi.nlm.nih.gov/pubmed/20300835) Assess. 2011 Feb;173(1-4):643-52. doi: 10.1007/s10661-010-1412-9. Epub 2010 Mar 19.

Study of Fertilizer Effect on soil status in and around Loni, Maharashtra, India, V. M. NATRAJ and DEEKASHA KATYAL, 3rd World Conference on Applied Sciences, Engineering & Technology 27-29 September 2014, Kathmandu, Nepal

Soil Quality Assessment and Heavy Metal Contamination in Agricultural Soil in and around Toranmal (Triable Region) of Maharashtra, N. S. Sonawane¹, C. P. Sawant, R. V. Patil, *Archives of Applied Science Research*, 2013, 5 (2):294-298

Assessment and investigation of trace element in soils with reference to Geo-accumulation Index: Jalgaon District, Northern Maharashtra (India) Golekar R B,



Baride M V , Patil S N , Yeole D R, INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES Volume 4, No 1, 2013,54-65

A review on physico-chemical properties of soil, SS Kekane, RP Chavan, DN Shinde, CL Patil, SS Sagar , International Journal of Chemical Studies 2015; 3(4): 29-32

Petroleum Hydrocarbons Pollution in Soil and its Bioaccumulation in mangrove species, Avicennia marina from Alibaug Mangrove Ecosystem, Maharashtra, India, Sakineh Lotfinasabasl 1, V.R.Gunale , N.S.Rajurkar , International Journal of Advancements in Research & Technology, Volume 2, Issue2, February-2013 | ISSN 2278-7763

Assessment of Heavy Metal Contamination in Vegetables Grown in and Around Nashik City, Maharashtra State, India, Kailas R. Labhade, IOSR Journal of Applied Chemistry (IOSR-JAC) e-ISSN: 2278-5736. Volume 5, Issue 3 (Sep. – Oct. 2013), PP 09-14

Assessment of Soil Fertility Around Municipal Solid Waste Disposal Site Near Sangamner City, Maharashtra, India Keshav K. Deshmukh and Sainath P. Aher, An International Research Journal of Environmental Science, ISSN: 0973-4929, Online ISSN: 2320-8031

